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Return Behavior of Initial Public Offerings and Market Efficiency

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Abstract

This paper is an event study on Initial Public Offering's return behavior after the dot com bubble. Cumulative Abnormal Returns are used to measure the performance against a market index. The results suggest that the market correctly prices IPOs in the long run thus upholding the Market Efficiency hypothesis. Moreover, value weighted CARs show that large IPOs are more likely to outperform smaller IPOs, however in the long run there is an unpredictable pattern. The study found float and previous market return as significant variables for the short term returns. As for the long term, significant variables were found to be the enlisting market and the ratio of Volume of shares traded on the first day to Shares offered.

Acknowledgments

Our gratitude is to God for all the fortunes and our parents for making these fortunes possible. We would like to thank Lund University, both the Business Administration and Economics Departments for providing us with the knowledge we sought and needed. We also would like to recognize our friends for making this a lifetime experience, and for their help and support.

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Chapter 1: Introduction

Return Behavior of Initial Public Offerings

Many Financial researchers have been intrigued by the return behavior of IPOs. The literature they have produced is split into two time periods: short term and long term. In the long run return behavior, there exist two opposing theories. On one hand, researchers such as Steven X. Zheng (2007) and Ritter (1994) seem to agree that generally IPOs under perform the market in a period of 3 to 5 years after the offer. However, a different group of scholars as Eugene E. Fama (1998) contest the underperformance theory and argue that the market is efficient in the pricing of securities. Hence, IPOs can either underperform or over perform the market and the probability of each outcome is equal. If the sample is tested as a whole no significant abnormal returns can be discerned.

As for the short term IPOs yields positive returns due to the underpricing of the underwriter. The positive returns are due to the difference between the offer price and the open price. Investors view this as an opportunity to make reasonable returns in a short time span. Tim Loughran and Jay R. Ritter (1994) have been great advocates of the underpricing theory and have written articles together exploring the field and have attempted to explain the phenomena.

Research Topic

Our research will consist of an event study to observe the market reaction to IPOs. The observations will be used to investigate the Market Efficiency hypothesis based on the American market for different time periods. The short-term will be the event window and will involve the first 5 days of trading. We then have a post event window, always after the first 5 days of trading, which is the first year performance that will also be split into two periods the first and second 6 months. We will apply the Cumulative Abnormal

Returns (CARs) method to measure performance since we believe the method to be more suitable. Using our data we will investigate and try to corroborate previous research theories of the short and long run behavior of IPO returns. In addition, we will run several regressions to examine possible explanatory variables that might influence the return behavior.

Theoretical Dispute

The underperformance hypothesis undermines the Market Efficiency theory. This dilemma arises from the different methodologies applied to measuring performance. With regards to the underperformance hypothesis the buy-and-hold abnormal returns (BHARs) method is used to measure IPO long term performance. In brief, the BHARs compound single-period returns at a monthly frequency. However, the alternative hypothesis uses the Cumulative Abnormal Returns (CARs) method to measure the performance. According to Fama (1998) using CAR to measure long term performance is more reliable because the BHAR method compounds previous year's bad performance and causes spurious underperformance returns. While CAR is the sum of the difference between the logarithms of actual return and expected return that eliminates the compounding effect. (Gompers and Lerner 2003)

Hypothesis

We believe that the market correctly prices securities and thus the Market Efficiency theory holds. Market efficiency will be observed, in the post event window where there is no significant abnormal return statistically different from zero. As for the event window we expect to see significant positive returns in first day of trading. Furthermore, firm size of the IPO will be closely related to the performance; where large firms are expected to perform better than small firms.

Research Limitations

Concerning the data collected and the respectable time period we are unable to perform the long term tests of 3 years after the year 2003. Hence, for 2004 and 2005 we assume the long term period to be 1 year after the IPO. Moreover, the data lacks information on certain firm characteristics such as book to market ratio, Venture Capitalist backed IPO, and others features that could have been used as explanatory variables in the multivariate regressions.

Paper Outline

The following chapter will provide the general background into IPO literature and discuss the various issues managers must consider when going public. Chapter 3 will include the pervious research and explain the difference between the BHAR and CAR methods. Then chapter 4 will include the methodology we applied to measure the returns and will contain the motivation behind the variables used in the regressions. Chapter 5 will describe the data and the rationale for the time period used. The proceeding chapter will contain the results and their association with our hypothesis. Finally, chapter 7 will be our concluding remarks on the research.

Chapter 2: Background Literature of Initial Public Offers

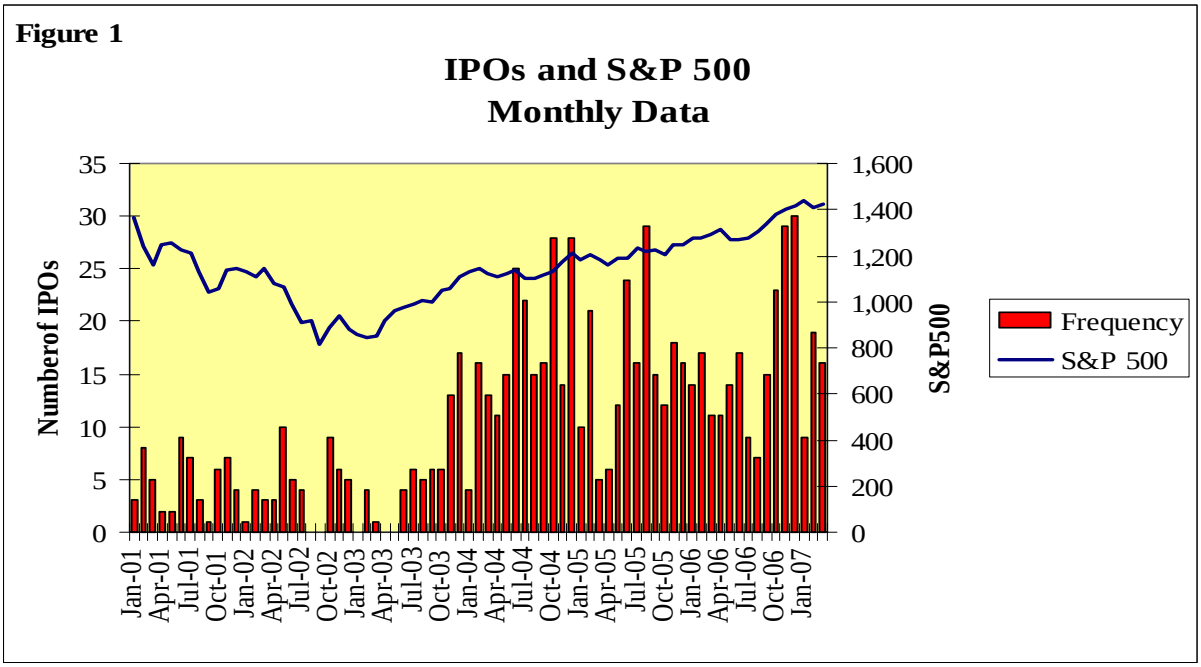
What an Initial Public Offering?

The Initial Public Offer (IPO) is the first time a firms sells its common shares to investors in the stock exchange. Firms issue stock to raise capital for their respective business operations. In order to initiate an IPO a firms employs another specialized financial firm called the underwriter. The underwriter works like an intermediate between the issuing firm and the general public. The firm sells its common shares through the underwriter at what is called the offer price, and then the initial price of the first day of trading is called the open price. The offer price is almost always lower then the open price.

Macroeconomic Impact on Initial Public Offerings

The frequency of IPO issues is dependent on the macroeconomic state, for instance during the year 1975 there were only 6 IPOs in the United States of America for non-financial firms, because the economy was going through a recession. On the other hand, there were 660 IPOs for U.S. non-financial firms during 1996, when the economy was flourishing (Ogden, Jen and O'Conner 2003). Also, managers of the issuing company, with help from the underwriter, try to initiate an IPO when they believe that the market will have higher probabilities of overvaluing their company; this is called Timing the Market. This timing relationship can be appreciated in Figure 1, which shows the number of IPOs per month and the S&P 500 Index for the same period. The graph illustrates a clear connection between both variables for the period 2001 – 2007.

Figure 1



Motives behind the Initial Public Offerings

At some point in the early life of a firm the managers must decide whether to go public, consequently issuing an IPO, or remain private. From the firm's viewpoint, the main reason to pursue an IPO is to raise additional funds. The following are the main uses of the additional funds:

- For further investment in capital
- Product Development, this includes Research and Development
- Repayment of Debt
- Mergers and acquisitions
- Other reasons, such as increasing working capital

On the other hand, the previous financier perspective, usually the venture capitalist, considers an IPO as a possible profitable exist strategy.

There are many benefits of going public from the management side. To begin with, the company gains access to the new mean of financing, which is beneficial for the firm, if

additional funds are required in the future. Moreover, there becomes a separation of ownership and control; meaning riskier projects can be undertaken with probabilities of higher returns that managers might have refrained from if their own wealth was invested. Finally, an IPO can help reduce debt and enhance the credit rating.

Costs associated with Initial Public Offerings

However, there are disadvantages associated with the benefits, which managers consider before initiating an IPO. The most prominent cost is underpricing because this could have potentially been additional proceeds. Ritter (2006) refers to this cost as the money left on the table. In addition, there are information asymmetry and agency costs of managerial discretion associated with the separation of ownership and control. Other costs are the underwriter spread, the time invested by managers to prepare for an IPO like investor relations activities, and other general costs such as legal and auditing services.

The Role of the Venture Capitalist

Venture capitalists (VC) view an IPO as a possible exit strategy with profitable rewards for their investment. VCs can play an important role by offering their expertise to the firm to insuring a smooth IPO. They can also help in the negotiation of the offer price and lessen information asymmetry problems. Moreover, VCs are very capable in correctly timing an IPO, which in turn is in their best interest.

The Procedure of an Initial Public Offering

The role of the Underwriter

The chief role of the underwriter is to play the intermediary between the company and the public while mitigating information asymmetries. Subsequent, the underwriter establishes the offer price, and then acts as a transfer agent; we will discuss later the two methodologies for offering. The underwriter can also assist and provide legal support such as filing for the Securities and Exchange Commission (SEC), and extend their help to the company in fulfilling the necessary regulatory requirements. Also some underwriters offer aftermarket support such as being a market maker in the early stages of the IPO.

Considering the different roles an underwriter can perform, choosing the optimal underwriter is one of the most important tasks in the IPO procedure. The firm must choose an underwriter that can serve its size and its industry, since some underwriters are specialized while others can be more general. Another factor is the fees the underwriter charges such as the underwriter spread or they might demand warrants. Moreover, the management must consider, whether the underwriter will provide legal and financial advice after the offer, and aftermarket support.

The offering method

As it has been pointed out earlier, there are two types of offering techniques, which literature call: the “firm commitment” method and the “best effort” method. Respectively, the first method is when the underwriter buys all the shares of the company at a fixed price and then resells them in the market; here the underwriter assumes the risks of selling. While, the “best effort” method, the underwriter acts as a broker where they find the best buyers and negotiate the highest possible price; consequently, using this

method the issuing firm has no fixed price but rather a range and assume price risk. (Ogden, Jen and O'Conner 2003)

Considering the market to enlist

Finally, the IPO firms must choose which market to enlist. Before the NASDAQ was created in 1970s, most IPO firms traded Over the Counter (OTC) market. Only a few large and well established firms were able to list directly into the New York Stock Exchange (NYSE) because of high regulatory requirements. However, after NASDAQ was formulated most small and middle size firms enlisted there before enlisting into the NYSE, since the NASDAQ had a more relaxed regulation policy.

CHAPTER 3: Previous Research

The behavior of IPO performance has received significant attention from financial scholars. They have applied different methodologies as well as different sample periods to their research. Previous studies concur that IPO companies are underpriced by the underwriter's offer price. This discount price provokes an instant market correction that can be translated into significant positive returns for the first day of trade. However, the subsequent long term behavior of returns on IPO investments has led to the development of two main conflicting hypotheses. The first one, which had been accepted and discussed for a long time concludes that IPO firms have a long-run underperformance in comparison to a market index for at least the following 3 to 5 years. The second theory asserts that IPO firms do not underperform in the long run. They believe in the Market Efficiency hypothesis. In other words, IPO firms can either overperform or underperform making it impossible to suggest the existence of a general pattern. The rest of the chapter will have an in-depth look at each theory and comment on the results of previous research.

Underpricing and Short term Overperformance Hypothesis

Researchers have commonly found IPO firms to be generally underpriced by their lead underwriter. This generates a significant return for the investors who were able to acquire at the underwriter's offer price. There are several different explanations for the general underpricing as well as the consequent short term overperformance of IPOs.

The most prevalent cause of short term overperformance is due to underpricing. Underpricing has several explanations. One of them consists of the uncertainty about the value of the offered shares. This uncertainty is augmented if we consider there is information asymmetry between informed and uninformed investors. Uninformed investors would potentially suffer the winner's curse if they trade with the informed. So, in order to attract uninformed investors underwriters have to underprice the offered

shares (Rock 1986). Other authors also suggest that some firms can voluntarily lower the price of their shares as a way of signaling and differentiating themselves from lower value firms. This will attract more investors who, in collaboration with analysts, generate information that will later be reflected in secondary market prices. Another reason for underpricing is litigation risk for the underwriters. As an intermediary between the issuer and investors, the underwriter can benefit by setting a high price for the new stock. If investors consider the price to be too high the underwriter can be sued and there exists a good probability of litigation success for the investors (Ogden et al 2003).

An additional explanation contends that overoptimism in the market is potentially a cause for overperformance. Because IPO firms are underpriced and there are high return expectations in the aftermarket this causes the prices to rise. Some authors assert that IPOs are consequently over valued relative to comparable firms (Purnanandam and Swaminathan 2004, Zheng 2007). As we have shown in the previous chapter (Figure 1), firms initiate an IPO when there are favorable market conditions. When investors are optimistic they are willing to pay higher prices for the offered shares.

Another reason for short term overperformance is a result of supply constraints during the first days of trading. There exists a supply constraint due to the small number of floating shares succeeding the offering (Zheng 2007). Another restriction that limits the supply of shares in an IPO is the lockup agreement. This is when pre-IPO owners and insiders agree to keep their owned shares for a certain amount of time subsequent to the offering. This period is normally 180 days. The median of shares subject to lockup for offerings from 1991 to 2000 was 65% (Ogden et al 2003). In addition to this, during the first days of trading there is also a short sell constraint. Considering these factors simultaneously the shares become oversubscribed. Thus investors will not receive their optimal amount of shares for the IPO, so they will typically either buy more shares to reach their optimal allocation. Or they will wish to sell their small amount of received shares at a higher price than the offer price. An IPO that is oversubscribed will typically go through a short-term price increase in the secondary market (Ellis 2005 and Zheng 2007). Due to the supply constraint, the opinion of pessimistic investors will not be reflected during the

initial secondary market prices. Given that this negative opinion is not incorporated in the stock price, IPO prices are normally overvalued (Miller 1977 and Mayshar 1983).

High demand and volume of traded shares is also a source of price increase that leads to short term overperformance. It has been found that the trading volume in the first days is extremely large, equivalent to 70% of the offered shares (Aggarwal 2003). As mentioned previously, IPOs are generally oversubscribed. In addition to this, day traders, investors who profit on capturing price movements in volatile stocks, contribute to this high volume (Geczy et al 2002, Ellis 2005). As we will show in Chapter 6, returns on IPO firms are quite volatile in the first days of trading. Flippers, investors that receive shares in an IPO and sell them in the next few days, also have influence in this short term volume. Finally, market microstructure where dealers in the market arrange their inventories to play a role of market makers for the new stock, influence the high volume. Interdealer trades represent 23% of the trading volume on average (Ellis 2005).

Long run Underperformance Hypothesis

Empirical studies by different authors suggest that IPO stocks underperform in the long run (Loughran, Ritter and Rydqvist 1994, Ogden et al 2003, Zheng 2007). Several explanations have been found for this phenomenon. Some of them are closely related to the previously mentioned explanations for the short term overperformance.

To begin with, overoptimism and overreaction are some of these reasons. Some IPOs are successfully timed when valuations are high. Investors assume that IPOs are preceded by strong earnings at the moment they go public. Many investors fail to recognize that earnings growth is normally mean reverting and so the earnings of IPO firms in the long run revert back to their mean, in other words they decrease. This will result to low long run returns for investors who will respond by selling their shares. This phenomenon could be explained as the market slowly correcting for the past overreaction.

Another explanation for long run underperformance is the agency problem related to the cash received in the IPO. Empirical studies show that the market underreacts to agency problems related to new cash raised in the IPO. This is translated into high valuations in the short term and underperformance in the long run. This phenomenon is more sensitive if the firm has lower capital expenditures or higher opening bid-ask spreads (Zheng, 2007).

Houge, Loughran, Suchanek and Yan (2001) have found a relation between initial uncertainty about the value of the IPO firm and its subsequent performance. Particularly they found that firms with wide initial bid-ask spreads, high flipping ratios and late opening have poor long term returns. These characteristics reflect divergence of opinion and uncertainty about the value which can produce short term high returns and long run underperformance.

Another cause for this long run underperformance hypothesis is that the supply constraints are removed with time after the IPO. This is because market makers have completed their inventories and lockup agreements have expired. The latter happens usually after 180 days and it allows insiders to trade their shares. Approximately 65% of the outstanding shares are subject to lockup, therefore only the remaining shares are tradable during the first six months (Zheng, 2007, Ogden et al 2003). Therefore, the supply of tradable shares has increased while the demand pressure has decreased.

Market Efficiency Hypothesis

More recent studies have opposed the well known IPO long-run underperformance behavior mentioned above. These authors' main assertion is that the market efficiently reacts to IPOs and therefore it is not possible to predict an overreaction or underreaction. Two main explanations have been found for this, one of them is related to the methodology employed and a second related to IPO firm characteristics.

Fama (1998) argues that “market efficiency survives the challenge from the literature on long-term return anomalies”. Long-term return underperformance tends to vanish if the applied technique is reasonably modified, therefore possible abnormalities can be dependent on the methodology in use. As a whole, a dominant occurrence of overreaction or underreaction cannot be identified. Given this unpredictable split it can be argued that market efficiency holds. If market efficiency holds, abnormal returns expected values is zero, however there might be apparent anomalies that randomly lead to overreaction or underreaction.

Gompers and Lerner (2003) also argue that abnormality depends on the method of measurement employed. They reveal that when event-time buy and hold abnormal returns are used there appears to be underperformance. Alternatively, if cumulative abnormal returns are used this uderperformance disappears. Chapter 4, which elaborates on the methodology used for our research, describes this more into detail.

Brav and Gompers (1997) find an explanation for IPO long-term underperformance. Certain IPO firm characteristics affect their future performance. When these characteristics are considered in abnormal return measurements the anomalies are considerably reduced. They created different portfolios of IPOs according to size and book-to-market equity. After using benchmarks that control for these variables they found that abnormality disappears. They concluded that many IPOs are small companies, thus returns are influenced negatively when the whole sample is equally weighted. On the other hand, if the sample is value-weighted negative returns are considerably reduced making them not significantly different from zero. IPO low returns are similar to companies of the same size and book-to-market equity ratio. Therefore, the long-run IPO underperformance is basically limited to small firms.

CHAPTER 4: Methodology

The applied methodology can be separated into two parts. The first one consists of event studies in which we attempt to measure abnormal returns for IPOs in the selected sample. Different estimation windows and portfolios are used. The objective is to discover the existence of abnormal returns that are significantly different from zero. The second applied methodology consists on running linear regressions using different explanatory variables. This way we will try to find out the impact of the variables on possible positive or negative anomalies in IPO returns.

Rationale

In order to detect the effect of IPO events on anomalous returns we use cumulative abnormal return (CARs) methodology. An alternative method is the buy and hold abnormal returns (BHARs). The method we apply has been found by other researchers to be the most adequate for this purpose.

Fama (1998), and Gompers and Lerner (2003) conclude that using measures as CARs is preferred over BHARs. Buy and hold can increase underperformance because it compounds the returns of previous periods. For this reason past poor performance of a firm can be magnified by this method. This causes the spurious rejections of Market Efficiency theory. Fama (1998) describes the BHARs method as a bad-model problem and it becomes more sensitive as the time horizon is increased. On the other hand, CARs do not suffer this compounding effect. However, bad model problems become less serious on daily or short period windows because expected returns are closer to zero. In that sense, there is a lower effect on abnormal returns in short term. In spite of this, Fama (1998) suggests that for theoretical and statistical considerations long term returns should be obtained by sums of short term abnormal returns or based on averages rather than by BHARs. For the aforementioned reasons we have relied on the CARs method for our research.

Event Studies: Measuring Abnormal Returns

In order to carry out event studies the behavior of share prices is analyzed around the date of the IPO. Different event and post event windows are used in order to measure the behavior of IPO prices in the short-run and in the long-run. Our event window will be used to measure the anomalies of IPO returns in the short-run. This event window consists of the immediate periods subsequent to the offering date. We split it into different fractions of time. First we measure the underpricing, which is the difference between the open price of the first day of trade and the underwriter's offer price. Then we include the first day of trading, with and without the underpricing. The return from the offer price to the first day of trade closing price is referred to as the money left on the table. Given the fact that IPO prices experience high volatility during the first day of trading, we also include the first five days of trading as part of the event window. In this case they are observed with and without the underpricing as well as the first day of trade.

We also divide the post event window into different periods. These post event windows will be used to measure anomalies in IPO returns once the impact of the first days of trade has subsided. For this reason all of our long-run performance measures consider time periods excluding the first five days of trading. Our post event windows consist of the first year, which is split into two semesters. The reason behind this is to observe the effect of the expiration of lockup agreements which generally happens after the first six months. Some authors have found a negative reaction in IPO returns after this date maybe due to the fact that individuals subject to lockup are willing to sell their shares and supply is considerably increased. In the case of IPOs prior to year 2004 the time period allows us to increase the post-event windows for two more years. That part of the sample is also analyzed for time periods of two and three years, individually and cumulatively.

Different models can be used when performing event studies. Normally an estimation window prior to the event of interest is used to measure expected normal performance which is later compared to the actual values during the event. A market model can be used for this purpose. It assumes a stable relation between the market return and a given

security. It uses the security's market beta to remove the part of the return that is explained by variations in the market's return. A simplified version of this model is the adjusted market model which assumes that the mean is equal to zero and the market beta is equal to one. Given that IPO returns have no historic performance available we use this model in our research. In other words, this means that the expected normal returns are equal to the market returns for every time window we analyze. To measure abnormal returns we use the S&P500 Index as benchmark of normal performance. Therefore anomalous returns for IPOs would be those that deviate from the return on this index for the same period of time.

Market Model for Measuring Normal Performance

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

where ε_{it} is the abnormal return:

$$\varepsilon_{it}^{*} = R_{it} - \alpha_i - \beta_i R_{mt}$$
$$\varepsilon_{it}^{*} = R_{it} - E\left[R_{it} \middle| \Omega_{it}\right]$$

Given the fact that IPO returns have no historic performance the adjusted market model is used. Therefore the model is simplified by setting α_i equal to zero and β_i equal to one.

$$\varepsilon_{it}^{*} = R_{it} - R_{mt}$$

This way we obtained the abnormal returns for each day using the logarithmic returns on the IPOs and the S&P 500 Index. These are then aggregated through time to complete each window of interest, and obtain the Cumulative Abnormal Returns for each period. CARs for IPO *i* from day t_1 to day t_2 are defined as follows:

$$CAR_i(t_1, t_2) = \gamma' \varepsilon_i^{*}$$

Where γ' is a vector of ones from position t_1 to t_2 and zeroes elsewhere.

In the next step we aggregate the CARs across securities. We obtain the average of the anomalous returns for the IPOs included in our sample.

$$\overline{CAR}(t_1,t_2)=\frac{1}{N}\sum_{i=1}^{N}CAR_i(t_1,t_2)$$

$$Var\left[\overline{CAR}(t_1,t_2)\right]=\frac{1}{N^2}\sum_{i=1}^{N}\left(CAR_i(t_1,t_2)-\overline{CAR}(t_1,t_2)\right)^2$$

We follow the null hypothesis that cumulative abnormal returns are on average equal to zero. Our alternative hypothesis is that the IPO shares underperform or overperform the market. Assuming normal distribution:

$$\overline{CAR}(t_1,t_2)\tilde{}\,N\left(0,\overline{\sigma}^2(t_1,t_2)\right)$$

We then test our null hypothesis by the following standard normal test statistic:

$$\frac{\overline{CAR}(t_1,t_2)}{\sqrt{\left(\frac{VAR\left[\overline{CAR}(t_1,t_2)\right]}{N}\right)}}\ \tilde{}\ N(0,1)$$

The significance of the CARs for each partition of time will be obtained to determine if IPO firm's shares underperform, overperform or perform in the same way as the market. The sample of IPO firms will be separated into portfolios to determine if abnormal returns become significant according to firm size.

Multivariate Regressions: Possible explanatory variables

In the previous section we explained how we will measure abnormal returns. We will also use specific characteristics to try and determine what factors influence this behavior. We will model this in a multivariate regression were abnormal returns will be the dependent variable and the firm characteristics as the independent variables. The possible independent variables are the following:

- **Logarithm of the Size of the company**: it has been documented that larger IPO firms behave closer to the market. Therefore we would expect small firms to have a worse performance (Gompers and Lerner 2003). We use the logarithm of company size to smoothen the distribution from extreme outliers in the data. We initially thought of also including the logarithm of size of issue but decided to drop the variable since we found a high correlation of 0.83 with respect to the log of company size.
- **Float**: this is the percentage of outstanding shares offered for public trading. This variable could have a two sided effect. A low float might limit the supply of shares compelling the price to increase. However it might be too low that it will limit the liquidity of the shares, thus penalizing the price (Ogden et al 2003). We found a high correlation between float and new cash ratio of 0.86. New Cash Ratio is the new cash available to the firm relative to the size of the company after the offering (Zheng 2007). This variable deals with the agency problem of managerial discretion in the use of these funds. (Ogden et al 2003). Given that Float is an easier concept to understand we decided to include this variable and drop New Cash Ratio since there is a correlation between the variables.
- **Volume of trading first day / Shares offered**: this is the ratio of the first day traded volume over the shares offered. A close relationship has been found between initial returns and volume of trade for the initial days. Hot IPOs are characterized by high initial returns and high trading volume, whereas cold IPOs show the opposite, low initial returns and volume (Ellis 2005). This characteristic might indicate which IPOs are typically overvalued.
- **Market performance of the previous month**: it has been widely commented by Ogden et al (2003), Ritter (2006) and Fama (1998) that firms and underwriters successfully time the market for IPOs. We use cumulative daily returns of the market index for the month prior to the date under examination.
- **Market**: firms can either be listed on the NYSE, NASDAQ or AMEX. Originally firms listed on NASDAQ because they didn't fulfill the needed requirements to be part of NYSE. Therefore normally small companies list on

NASDAQ and later enlisted into the NYSE after they fulfilled the necessary regulatory requirements. We expect a close relationship between this variable and the size variables. This variable will be treated as a dummy variable where 1 will be signed to the NYSE and zero otherwise.

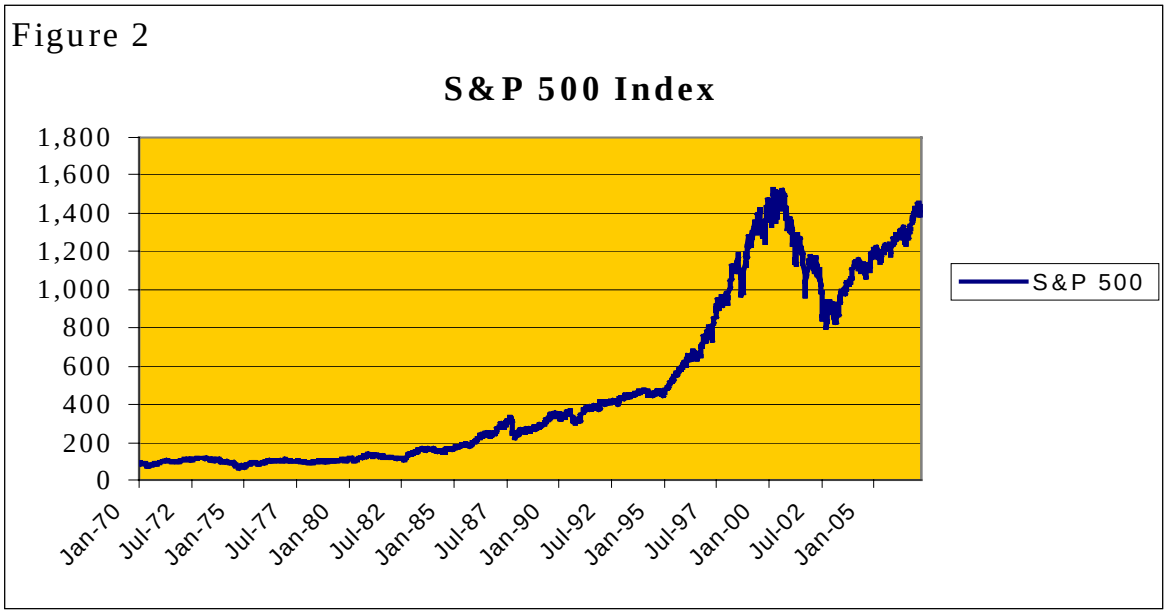
- **Industry**: we will examine a possible relation between specific industries and abnormal returns. It is of particular interest to observe for short-term abnormal returns, whether specific industries are subject to greater underpricing. We classify our sample of IPOs into the following categories: Industrial Production, Information Technology, Communications and Media, Transportation, Professional Services, Retail, Financial and Insurance, Chemicals, Commodities, Utilities, Real Estate, Pharmaceutical and Health, and Food and Beverages. However, the only ones that show more than sixty observations are Pharmaceutical and Health, Financial and Insurance, and Information Technology industries. Belonging to any of these most active industries is treated as dummy variable in our regression
- **Underwriter**: we treat the lead underwriters as dummy variables. Large underwriters will be given a 1 value and the rest 0. We are interested to observe whether the underwriter choice has an effect on the underpricing as well as on the long run performance. Large underwriters are categorized as those that led at least 30 offerings.

CHAPTER 5: Data Selection

Previous research conducted on IPO performance could have been influenced by the inclusion of firm offerings during the stock market boom of the nineties, which is illustrated in figure 2. The Overoptimism led to high valuations especially for technological companies. For that reason many companies rushed their IPOs, this resulted to a large amount of overvalued and rather inexperienced firms being offered in the market. Consequently, this bubble crashed in the beginnings of this decade.

Samples that include IPOs from the second half of the nineties might face an exaggeration of initial returns and further underperformance. To avoid this possible bias in our study we exclude the years of the bubble. Therefore, it becomes particularly interesting to analyze IPO performance after this event. The sample of IPOs we use is from the year 2001 until 2005.

Figure 2



The list of IPO companies we studied and offer prices were obtained from Hoover's database. The market prices for each firm were taken from three different databases: Quote Media, Market Watch and Yahoo Finance. Our sample consisted of IPOs that where listed in Hoover's IPO database and whose daily market prices where available for one year after the IPO date. Another requirement is that the offer price must be at least $5

and the offer size at least $5,000,000. Therefore, we ended up with a sample that included 535 firms which satisfy our criteria.

Table 1

Number of IPOs and Size of offerings

	Number of Issues	**Average** (USD million)	**Median** (USD million)	**Maximum** (USD million)	**Minimum** (USD million)
2001	47	$528	$130	$8,680	$8
2002	47	$295	$100	$4,600	$9
2003	59	$220	$119	$2,876	$10
2004	199	$188	$100	$2,827	$11
2005	183	$165	$110	$1,288	$5
Total	*535*	*$223*	*$105*		

From Table 1 we can witness a considerable increase in the amount of issues for the years 2004 and 2005. This is probably closely related to the fact that the American stock market was recovering from the crash. As we had mentioned in previous chapters, this pattern is coherent with the fact that underwriters and firms try to time their IPOs when the market is flourishing and more likely over value companies. With respect to the distribution of the size of IPO firms we see higher averages than medians. This is due to the fact that the sample consists of many small companies and few very large companies. In our sample, the size distribution can be observed in Figure 3.

Figure 3

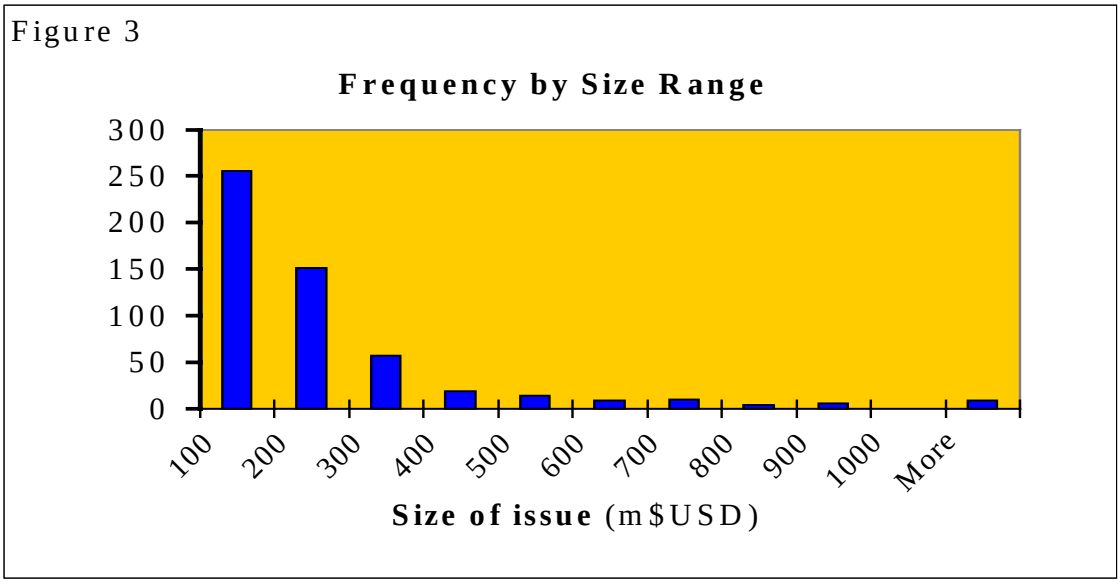


Table 2
IPOs by Market

	Number of Issues	**Average** (USD million)	**Median** (USD million)	**Maximum** (USD million)	**Minimum** (USD million)
AMEX	17	$53	$18	$255	$5
NASDAQ	314	$93	$72	$1,700	$6
NYSE	204	$437	$212	$8,680	$64
Total	*535*	*$223*	*$105*		

Table 2 categorizes the IPOs into their enlisted market. There are generally larger companies enlisted in the NYSE, while the smallest companies of the sample are enlisted in AMEX. Looking at the range of the company sizes hints out the strictness of the regulatory requirements in each market. Where the smallest offering in NYSE is $64 million, the smallest companies for AMEX and NASDAQ are $5 and $6 respectively. This points out the difficulties small companies face trying to enlist in the NYSE. Regarding the number of offerings, the most active market is NASDAQ with 314 observations, while AMEX only shows 17 IPOs for the same time period.

Table 3
IPOs by Industry

	Number of Issues	**Average** (USD m)	**Median** (USD m)	**Maximum** (USD m)	**Minimum** (USD m)
Pharmaceutical & Health	90	$224	$62	$2,333	$12
Financial & Insurance	73	$392	$126	$4,600	$9
Information Technology	65	$134	$83	$1,700	$11
Professional Services	57	$224	$118	$1,667	$12
Real Estate	43	$239	$208	$703	$60
Commodities	35	$156	$108	$570	$8
Communication & Media	32	$239	$138	$1,025	$12
Retail	30	$102	$83	$324	$8
Transportation	29	$210	$162	$609	$65
Food & Beverages	20	$560	$114	$8,680	$5
Utilities	13	$321	$144	$1,560	$11
Chemical	10	$450	$319	$1,288	$36
Construction	9	$137	$135	$198	$22
Other Industrial Production	29	$148	$114	$672	$6
Total	*535*	*$223*	*$105*		

In Table 3 we group the IPOs into fourteen different industries. The last group, Other Industrial Production, includes several sub-industries such as Textile & Apparel, Security Products, Auto Part and other general manufacturing. In our sample we observe a boom in the Pharmaceutical & Health sector, which is the most active industry in IPO for our time period. The Pharmaceutical & Health sector also has the lowest median for company size. The Financial & Insurance and Information Technology are the second and third, respectively, most active industries in our sample. Companies grouped in these last three industries together account for 43% of the offerings. With regard to company size averages, all industries exhibit similar figures.

Table 4
IPOs by Underwriter

	Number of Issues	**Average** (USD m)	**Median** (USD m)	**Maximum** (USD m)	**Minimum** (USD m)
Goldman, Sachs & Co.	60	$460	$197	$4,600	$40
Morgan Stanley & Co.	47	$413	$216	$2,827	$42
Credit Suisse Securities LLC	46	$442	$76	$8,680	$42
Lehman Brothers Inc.	41	$147	$120	$420	$42
Citigroup Global Markets Inc.	39	$245	$165	$1,288	$36
Merrill Lynch, Pierce, Fenner	37	$156	$90	$846	$54
Friedman, Billings, Ramsey &	25	$126	$124	$300	$9
UBS Securities LLC	23	$123	$100	$252	$40
Banc of America Securities	22	$190	$104	$882	$30
J.P. Morgan Securities Inc.	18	$169	$105	$720	$49
Deutsche Bank Securities	15	$179	$117	$646	$40
Bear, Stearns & Co. Inc.	14	$129	$130	$234	$42
SG Cowen & Co., LLC	13	$45	$42	$68	$33
Other	135	$91	$48	$2,876	$5
Total	*535*	*$223*	*$105*		

Finally, we group the IPOs by Lead Underwriter. Our sample includes 65 different underwriters. Our grouping criterion was to include the underwriters that took part in at least 10 offerings and group the remaining underwriters into the last category called “Others”. Consequently, we group the underwriters into fourteen categories. From Table 4 we can observe that 75% of the IPOs are distributed amongst the top thirteen underwriters, while the rest is distributed amongst the fifty-two smaller ones. This table also indicates that the average and median sizes of IPOs are quite smaller for SG Cowen & Co and the set called “Other”.

CHAPTER 6: Results

Analyzing Abnormal Returns

We previously mentioned in Chapter 4 that we will apply the CARs to measure anomalous returns for IPO firms. In table 5 we include the mean CARs for IPO firms as well as their test statistic. In order to determine if the returns are significantly different from zero we compare them to the critical values. For confidence levels of 95% and 99% the critical values are ±1.96 and ±2.5758 respectively.

Table 5

Mean Cumulative Abnormal Returns. ***All IPOs***

Event window results are divided into two parts, one that includes the returns if an investor held an IPO since the offer price, and a second one that considers returns after the first day opening market price. Underpricing is (Opening Price / Offer Price); Left on table is (First day Closing Price / Offer Price); First five days are the cumulative daily returns starting from the Offer Price to the fifth day closing price. The rest of the columns show CARs for the time period signaled in bold, without considering the offer price. It's important to recall that Post-Event Window CARs start counting from the sixth day of trading.

Event Window							
	Returns including Offer Price				*Returns excluding Offer Price*		
	Under-pricing	**Left on table**	**First 5 days**		**First Day**	**Next 4 days**	**First 5 days**
Number of IPOs	535	535	535		535	535	535
CAR (Equally weighted)	7.94%	9.28%	8.49%		1.34%	-0.79%	0.54%
Test Statistic	*16.76*	*14.86*	*11.59*		*3.60*	*(2.20)*	*1.08*
CAR (Value weighted)	6.88%	7.86%	8.04%		0.98%	0.17%	1.16%
Test Statistic	*14.52*	*12.59*	*10.97*		*2.64*	*0.48*	*2.29*

Post-Event Window							
	Subsequent to first five days of trading						
	Months 1-6	**Months 7-12**	**Year 1**	**Year 2**	**Year 3**	**Years 1-2**	**Years 1-3**
Number of IPOs	535	535	535	153	153	153	153
CAR (Equally weighted)	-0.94%	-0.27%	-1.17%	3.43%	-0.28%	4.19%	3.93%
Test Statistic	*(0.66)*	*(0.18)*	*(0.53)*	*0.99*	*(0.07)*	*0.84*	*0.69*
CAR (Value weighted)	5.08%	4.37%	9.51%	0.02%	7.19%	14.65%	21.88%
Test Statistic	*3.55*	*2.85*	*4.28*	*0.01*	*1.89*	*2.93*	*3.82*

As we have expected the results in the event window which include the offer price are all statistically significant at both confidence levels. This means that IPO firms do experience an underpricing of their share when they go public. Investors that participate in an IPO since the offer price can obtain on average a 7.94% abnormal return just for the underpricing or a 9.28% if they wait and sell their shares at the first day closing price. On the first day of trading there seem to be returns above the market. Turning our attention to the abnormal returns without the underpricing, the first day of trading still exhibits significant abnormal returns. Though what is intriguing is that from day 2 to 5 there is significant negative abnormal return. This can be viewed as the period when the market is correcting for the first day positive high returns. If the first five days (excluding the underpricing) are considered altogether we see a positive 0.54% abnormal returns that are not significantly different from zero.

Looking at the value weighted CARs, which are weighted according to issue size. We still observe high significant positive returns for the first day of trading. Interestingly, the anomalous return from day 2 to 5 is neither negative nor significant any more. Moreover, the abnormal returns for the first five days (excluding the offer price) appear to be statistically significant. This could imply that the negative adjustment to high first day returns is more typical behavior for small firms.

Analyzing the Post-Event window also provides interesting results. First of all, equally weighted CARs for months one to six are negative but not significantly different from zero. On the other hand, value weighted CARs for the same time period are positive and significant with a mean of 5.08%. Large firms seem to have much higher returns than smaller firms for the first semester of our post-event window. Considering the second semester, equally weighted CARs still show negative results, however not significantly different than zero. As for the value weighted for second semester, returns are still positive and statistically different from zero even at 99% confidence level. For the whole first year, equally and value weighted CARs show similar results as the first and second semester. Equally weighted abnormal returns are negative but not significant and the

value weighted returns are positive and statistically significant. The results for Year 2 show no significant abnormal returns for both the equally and value weighted returns. However, the equally weighted returns are no longer negative but still statistically not significantly different from zero. As for the value weighted returns they close to zero, which might be the market correction for the previous high performance. In Year 3, we observe significant positive returns for the value weighted returns but no significant returns for the equally weighted. If we take the aggregate CARs from the first year to the second and third year respectively, we notice that all returns are positive for the equally and value weighted. However, the equally weighted returns are not significant, which suggests that there is no abnormal performance in this category for the long run. The value weighted returns nonetheless have significant positive returns. We should note that our number of observations for this specific time period, from 2001 until 2003, has decreased from 535 to 153 and this time period is characterized by a slow down in the market due to the crash of the dot com bubble and unusual events such as September 11.

After observing the difference in results of equally and value weighted returns for our sample we decided to take a closer look at IPO performance according to the size of the offering. Looking at Table 6 below, we classify the IPOs into four different separate sets. Two consists of IPOs below the median size, and the two sets are IPOs above the median size.

As we have previously seen the abnormal returns during the event window, including the underpricing, are significant for all sizes. Although, the first day returns excluding the underpricing is only significant for the group containing the largest companies. As for the next 4 days, all the categories exhibit negative returns. However, the group with the smallest companies has negative abnormal returns and is significant at a 90% confidence level. This is particularly interesting since in Table 5, the value weighted returns showed positive returns but they were still not significant. If we look at the 5 day return excluding the offer price, we see again that only the largest companies have significant positive returns, and the returns below the median have non significant negative returns.

Table 6

Mean Cumulative Abnormal Returns *by Size of Offering*

The sample of IPOs was grouped into four different portfolios. Each of them corresponds to one quartile of the IPO size distribution. The first portfolio includes 132 offerings that range between $5 and $59 million. The second one includes 135 IPOs between $60 and $104 million. The third one consists of 132 offerings between $105 and $195 million. Finally the fourth quartile includes 136 IPOs greater than $195 million. With respect to abnormal returns for more than one year, the number of IPOs included in quartiles 1,2,3 and 4 are 31, 43, 35 and 44 respectively.

Event Window

	Returns including Offer Price			*Returns excluding Offer Price*		
CARs by Size (Equally Weighted)	**Under-pricing**	**Left on table**	**First 5 days**	**First Day**	**Next 4 days**	**First 5 days**
$5 < $59	6.10%	7.57%	5.91%	1.47%	-1.66%	-0.19%
Test Statistic	*7.56*	*6.71*	*3.71*	*1.80*	*(1.65)*	*(0.15)*
$60 < $104	8.57%	9.48%	8.48%	0.91%	-1.00%	-0.09%
Test Statistic	*10.59*	*7.97*	*5.59*	*1.21*	*(1.50)*	*(0.08)*
$105 < $195	9.82%	11.48%	11.06%	1.66%	-0.42%	1.24%
Test Statistic	*7.73*	*7.11*	*6.77*	*1.86*	*(0.58)*	*1.33*
$196 < $8,680	7.28%	8.61%	8.49%	1.33%	-0.11%	1.21%
Test Statistic	*8.91*	*8.73*	*8.12*	*2.82*	*(0.31)*	*2.06*

Post-event Window

	Subsequent to first five days of trading						
CARs by Size (Equally Weighted)	**Months 1-6**	**Months 7-12**	**Year 1**	**Year 2**	**Year 3**	**Years 1-2**	**Years 1-3**
$5 < $59	-9.17%	-6.94%	-16.12%	9.30%	5.03%	-4.31%	0.63%
Test Statistic	*(2.75)*	*(1.92)*	*(3.26)*	*1.16*	*0.60*	*(0.38)*	*0.05*
$60 < $104	0.81%	3.12%	3.99%	5.27%	-6.92%	16.80%	10.04%
Test Statistic	*0.30*	*0.87*	*0.82*	*0.86*	*(0.86)*	*1.75*	*0.92*
$105 < $195	0.60%	0.16%	0.84%	6.44%	-2.33%	-6.52%	-8.82%
Test Statistic	*0.19*	*0.07*	*0.27*	*0.71*	*(0.24)*	*(0.55)*	*(0.64)*
$196 < $2,333	3.81%	2.41%	6.26%	-4.90%	4.09%	6.37%	10.44%
Test Statistic	*1.99*	*0.97*	*1.79*	*(0.99)*	*0.87*	*0.80*	*1.11*

With respect to the post-event window, we observe that for the first semester only the smallest companies and the largest companies are significantly different than zero with opposite signs. In the second semester there are no significant returns for a confidence interval of 95% but at a confidence interval of 90% the smallest companies show significant negative returns. The same trend applies for the one year performance except

that the smallest companies are significant at a 95% and 99% confidence interval. Interestingly, for the second year the smallest companies have positive returns though not significant while the large companies have negative returns again not significant. This could be a possible but not significant market correction for the largest IPO prices after a first year of positive performance. For the third year, there are no significant returns, and the same applies for the cumulative for two and three years. For the companies around the medium they do not exhibit any significant returns throughout the post event window. The fact that none of the categories exhibit abnormal returns above or below the market after the first year means that they are all statistically not different from zero in the long-run.

Multivariate Regressions

Short term

Table 7

Short Term Regressions

The following columns show the coefficients and test statistics of the explanatory variables for short term abnormal returns. The first column shows the explanantory variables and the four colums to the right show the regression results for Underpricing, First Day Abnormal returns, Four Day CARs after the first day of trade and First Five Day CARs respectively. Underneath each variables' coefficient the respective test statistic is shown.

	Underpricing	First Day	Next 4 Days	First 5 Days
	1	2	3	4
Intercept	0.0949	0.0007	-0.0308	-0.0301
T-Statistic	*2.754*	*0.026*	*-1.122*	*-0.786*
Underpricing	n/a	-0.0464	0.1089	0.0624
T-Statistic		*-1.212*	*2.870*	*1.181*
Volume 1st Day / Shares Offered	n/a	0.0466	-0.0161	0.0306
T-Statistic		*5.692*	*-1.982*	*2.700*
Log Size of Company	0.0110	-0.0076	0.0072	-0.0004
T-Statistic	*0.856*	*-0.739*	*0.705*	*-0.029*
Previous Month Market Return	0.2937	0.1336	0.0434	0.1770
T-Statistic	*2.258*	*1.284*	*0.421*	*1.232*
Float	-0.1103	-0.0070	0.0182	0.0112
T-Statistic	*-4.584*	*-0.358*	*0.937*	*0.413*
Large Underwriter (Dummy)	0.0168	0.0018	-0.0057	-0.0039
T-Statistic	*1.589*	*0.213*	*-0.677*	*-0.331*
NYSE (Dummy)	-0.0145	0.0099	0.0049	0.0148
T-Statistic	*-1.156*	*0.985*	*0.492*	*1.066*
Pharmaceutical and Health (Dummy)	-0.0397	0.0063	-0.0053	0.0010
T-Statistic	*-2.952*	*0.580*	*-0.494*	*0.066*
Financial and Insurance (Dummy)	-0.0021	0.0047	0.0191	0.0238
T-Statistic	*-0.150*	*0.432*	*1.754*	*1.571*
Information Technology (Dummy)	-0.0062	0.0028	-0.0083	-0.0054
T-Statistic	*-0.403*	*0.231*	*-0.680*	*-0.320*
R-squared	0.0907	0.0710	0.0351	0.0386
Prob(F-statistic)	0.0000	0.0000	0.0417	0.0225

By examining the first regression, we see that float has the highest explanatory power with a negative coefficient. Meaning that IPOs with a higher float (ratio of shares offered to shares outstanding) are subject to lower underpricing. This supports the theory of supply constraint. Where the more limited the supply of shares leads to more investors' oversubscription and thus this drives prices up. Another explanation is that float is used as signaling by the pre-IPO owners. Having a smaller float can be interpreted as their unwillingness to give up a large amount of control on their company and accordingly signal commitment to the company after the IPO.

Another significant variable in this regression is the previous month market return. This positive coefficient can be interpreted as when the market is thriving people in general are more optimistic and give higher valuations to companies. This supports the market timing theory which follows the idea that many underwriters and issuing firms successfully time the market.

The Pharmaceutical and Health industry dummy variable is also another significant variable in this regression. This variable has a negative coefficient which suggests that IPOs belonging to this industry are subject to a lower underpricing in relation to other industries. We can refer back to chapter 5 where we observed that the Pharmaceutical and Health industry have the largest amount of IPOs in our sample. Also we can presume that investors were optimistic about this industry. Thus this industry is underpriced to a less extent. The result also demonstrates the importance of industry in relation to underpricing for issuing firms. However, other two major industry categories, on the other hand, lack explanatory power for this dependant variable.

The rest of our variables do not have statistically significant explanatory power. However, with respect to underwriter, the t-static is not far from the critical value for a 10% significance level. Therefore, offerings led by our category of large underwriters show a slightly higher underpricing. This might be due to the fact that investors are more willing to participate in such offerings creating a higher demand for the new shares.

The company size and the market where an IPO is enlisted do not show significance as explanatory variables. As we have noticed in the previous section, IPOs are significantly underpriced regardless of the size of the company. The same logic applies to the enlisting market.

Looking at the second regression we see that Volume of Trade during the first day over Shares Offered is significant and positive. As expected, IPOs with high volume traded with respect to the shares offered have high initial returns. These are two common characteristics of hot IPOs where there exist considerable interested investors resulting to high demand and price increase.

The results from this regression show that it is hard to predict how the market will react to an IPO. Even though we have shown previously that there are significant abnormal returns, the variables used, except for volume traded to amount of shares offered, are unable to explain this anomaly.

In the case of our third regression we can identify a close relationship between underpricing and the IPO performance on the four days after to the first day of trading. This explanatory variable is positive and significant at a 99% confidence level. This implies that firms that experience high underpricings also experience positive returns for this time period.

In this regression, the proportion of Volume of traded shares during the first day to the amount of shares offered as an explanatory variable is negative and significant at a 95% confidence level. This is interesting given the fact that this same variable showed a positive relation to the first day abnormal returns. Suggesting that hot IPOs experience a high volume of trade during the day of their offering and positive returns for that same day but have an inverse return performance for the next four days. This could mean that during the next 4 days after an IPO, companies that overperformed on the first day are then corrected by the market.

Looking at our major industry categories we can appreciate that the Financial and Insurance industry shows a positive and significant coefficient. This means that abnormal returns for this industry will be 1.9% higher for this time period.

In the case of the fourth regression we obtain similar results as for the first day abnormal returns. Likewise, the ratio of volume of shared to the amount of shares offered is the only significant explanatory variable. It still shows a positive coefficient however slightly lower than in the previous regression for the single day return.

By referring to the p-value of our F-statistic for each of our regressions separately we can infer through a joint test that the regressions are significant. Therefore we reject the null hypothesis that all coefficients are equal to zero, and conclude that our models have explanatory power. The R^2 of these regressions could be increased if other variables that were not available in our research were to be included. Some of these variables are: the latest earnings-per-share, underwriter spread, venture capitalist backing status and the use of the proceeds of the offering among others.

Long term

Table 8

Long Term Regressions

Regressions for Cumulative Abnormal Returns are shown in the following columns. Column 1 displays regression results of aggregate CARs for the first year subsequent to our event window. The second and third columns show the aggregate CARs for the following two and three years. Again, the test statistic is shown underneath its respective coefficient.

	CARs 1 year	CARs 2 years	CARs 3 years
	1	2	3
Intercept	-0.2434	-0.2182	-0.4271
T-Statistic	*-1.477*	*-0.599*	*-1.039*
Underpricing	-0.4708	-0.8766	-1.1153
T-Statistic	*-2.069*	*-1.333*	*-1.503*
Log Size of Company	0.0526	-0.0730	0.0222
T-Statistic	*0.863*	*-0.554*	*0.150*
Float	-0.0364	0.3256	0.4291
T-Statistic	*-0.312*	*1.303*	*1.522*
Previous Month Market Return	-1.4808	-0.9764	-1.9260
T-Statistic	*-2.396*	*-0.993*	*-1.737*
Volume 1st Day / Shares Offered	0.0737	0.3023	0.2707
T-Statistic	*1.515*	*2.471*	*1.962*
Large Underwriter (Dummy)	0.0554	-0.0726	-0.2037
T-Statistic	*1.104*	*-0.616*	*-1.531*
NYSE (Dummy)	0.1702	0.3443	0.3347
T-Statistic	*2.847*	*2.559*	*2.205*
Pharmaceutical and Health (Dummy)	0.0055	0.0208	-0.0053
T-Statistic	*0.086*	*0.128*	*-0.029*
Financial and Insurance (Dummy)	0.1377	0.2523	0.3586
T-Statistic	*2.108*	*1.967*	*2.478*
Information Technology (Dummy)	-0.0637	0.0286	0.1255
T-Statistic	*-0.871*	*0.197*	*0.767*
R-squared	0.0806	0.1074	0.1334
Prob(F-statistic)	0.0000	0.0843	0.0218

The table above consists of the three regression run in order to identify explanatory variables in the long run. Examining the first regression, we see a significant positive coefficient for the NYSE dummy variable. This coefficient implies that firms listed in the

NYSE have a one year abnormal performance of 17% in relation to non-NYSE firms. This variable has a correlation of 0.5 with the log of the size of the company. For this reason, if we exclude NYSE dummy variable from our regression, the logarithm of size of the company also becomes significant. This is consistent with the CARs shown in Tables 5, 6 and 7. The size of the company seems to play an important role in determining the long-run performance of an IPO. These results are similar to the ones obtained by Brav and Gompers (1997), where post-IPO performance depends considerably on the size of the company.

Another interesting result is the Market return for the month prior to the offering. This variable shows a negative and significant coefficient. This is inline with evidence of market timing by underwriters and issuing firms. They take advantage of market optimism and upward trends to sell firm shares. Considering that market returns are mean reverting, our result shows that optimally timed IPOs will tend to have a poor one year abnormal performance. The coefficient indicates that for every percentage point of positive market return for the month prior to the offering, the IPO firm will have a 1.48% abnormal return after one year.

Interestingly, there is a negative and significant relationship between underpricing and one year abnormal returns. This means that companies that suffer a lower underpricing have a better one year abnormal performance. In other words, firms that are more underpriced tend to have a poor one year performance. This is consistent with the idea that underpricing is more severe when there are more information asymmetry problems.

Finally, it is also worth noting the role of industry. In this case, the Financial and Insurance industry IPOs show a positive and significant coefficient. Companies belonging to this industry tend to have 13.7% higher abnormal returns. Our other two major industry categories do not have a significant explanatory power. As we have previously mentioned, the industry a company belongs to plays a role in its long term performance.

With respect to the first two years abnormal performance we still observe a positive and significant relationship for companies listed in the NYSE. In this case they tend to overperform 34.4% in relation to the other firms in our sample.

Interestingly, the ratio Volume of trade on the first day to Shares offered appears to have a positive and significant relation to abnormal returns after two years. This is surprising given the fact that this first day variable remains relevant after 2 years. This suggests that hot IPOs have a good performance after two years.

Regarding industry, we can again see a positive and significant relation for IPOs belonging to the Financial and Insurance industry and two year abnormal returns.

For the three year abnormal returns, we observe similar results as for the two year abnormal returns. NYSE dummy variable, Volume First Day / Shares offered, and the Financial and Insurance dummy variable are again positive and significant. This means that the same inference can be given to the abnormal returns after two and three years.

Our results for the long term IPO performance, with respect to our sample time period, have relieved that belonging to NYSE and to the Financial and Insurance industry in the years 2001 until 2005 could be used as an explanatory for positive returns. However, to reaffirm what has been previously said, the NYSE is positively correlated to the logarithm of company size. Also, the ratio of Volume traded during the first day to the amount of Shares offered remains positive and significant in the long-run and can be used as an explanatory variable.

Chapter 7: Conclusion

The objective of this paper was to investigate the return behavior of IPOs and explore this behavior in relation to the Market Efficiency hypothesis. In the long run, we fail to reject that CARs are on average equal to zero, therefore our results lead us to conclude that the market is efficient. To test for Market Efficiency in the post event window we consider equally weighted CARs because they engross our IPO sample as a whole. As indicated in Table 5, there are no significant returns in the post event window for equally weighted CARs. Moreover, Table 6 shows a relevant connection between IPO size and performance for up to the first year. Smaller firms have a negative and significant performance for this time period, while larger firms have an opposite and significant performance. However, for the cumulated years the returns are not statistically different from zero.

Concerning the variables used to explain abnormal performance for the long run we found interesting relations. First of all, and as mentioned before, the size of the company plays an important role in defining long-run abnormal performance. Particularly, being listed in the NYSE has a high explanatory power for positive abnormal returns. Interestingly, we also demonstrate the efficient market timing for IPOs by underwriters and issuing firms. The market performance during the month prior to the offering has a negative and significant coefficient for IPO abnormal returns for one year. We also found a surprising positive and significant relation between the ratio of Volume of trade during the first day to Shares Offered and the abnormal returns for two and three years. Hot IPOs with high volumes of trade in their initial day seem to have a better performance in the long run.

Regarding the short run, our results have shown that IPOs are generally underpriced, regardless of their size, by the underwriter. The subsequent first day equally-weighted and value-weighted CARs for our whole sample are also positive and significant. The underpricing and first day return enables investors whom acquire at the offer price to make considerable positive and significant returns for one day investments. However,

during the four days after the offer, the market seems to correct for the first day returns. This can be seen in Table 6 of our results, where IPOs regardless of size have negative CARs which are critical at a 90% significance level for the quartile of smallest firms. Furthermore, the first five days show no significant abnormal returns except for the very large companies.

With respect to our regression results for the short term performance we found that float has a negative and significant explanatory power on underpricing. This supports the supply constraint theory that indicates that a more restricted supply of shares increases the demand and prices of the security. Previous market performance also plays an important role in explaining underpricing, which seems to be augmented with better market index performances. This suggests that investors remain optimistic and are willing to pay more for the new shares.

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