"Herding" in IPO Valuation – Evidence from Germany in "Hot" and "Cold" Markets

Susanna Holzschneider*

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Abstract

This paper analyzes IPO valuation with comparable firm multiples such as market-to-book and price-earnings ratios in the German stock market between 1997 and 2007. The offer price of newly issued shares has to reflect the firms financial and profitability characteristics, as well as investors' willingness to participate in the IPO. Investment banks determine expected market values of IPOs by using comparable multiples of firms already publicly traded. However, over the last few years, IPO and industry-wide market valuation of firms has showed severe variability, especially in particular industry segments. This paper analyzes whether changes in IPO valuation can be explained by the corresponding development of industry related firms. Furthermore, the explanatory power of these variables is expected to vary in different market phases and environments. Issuers and investment banks are likely to focus more on this public information in months with high IPO volume and favourable market conditions, rather than on firm characteristics. The results do not confirm the assumptions, as no clear relation can be found between monthly average multiple values of IPOs and traded stocks. Periods with high IPO volume, in particular, mean that these variables cannot explain the market valuation of the offering; the overall stock price performance is a more reasonable value driver.

J.E.L. Classification: G10, G30

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*Currently Visiting PhD Student at Stern School of Business, New York University, 44 West 4th Street, New York, NY 10012, USA, University of Hohenheim, Chair of Banking and Finance, Schloss Osthof Nord, 70599 Stuttgart, Germany, Phone: +49 (0)711 45923283, Fax: +49 (0) 711 45923448, S.Holzschneider@uni-hohenheim.de

I Introduction

When firms decide to complete an initial public offering (IPO), to raise equity by issuing shares on a public stock market, their shares have to be priced to allow potential investors to be found. The valuation of a firm and its shares is quite difficult, when no stock market value, normally the best indicator of expected firm's growth and profitability in the eyes of investors, is available. Investment banks use several methods to decide on an appropriate offer price, which reflects the firm's value as well as the market's willingness to purchase newly issued shares. Previous literature suggests that in the majority of cases underwriters of IPOs apply comparable multiples of firms already listed, such as market-to-book (MB) and price-earnings (PE) ratios, in conjunction with firm's accounting information, to determine expected market value. The multiple ratios of publicly traded stocks, however, may vary over time according to their valuation by the market. For example, technology firms during the dot-com bubble showed extremely high market values and multiple ratios. As underwriters and issuers orientate their pricing decisions to industry related public firms, the IPO valuation is expected to change correspondingly. In the German stock market during the boom phase in the technology and internet sector, initial public offerings were also valued very highly in terms of MB and PE ratios. This paper investigates the relationship between IPO and market valuation, to gain more insight to these observations on the German stock market between 1997 and 2007. The research question should provide a conclusion as to whether changes in IPO multiples can or cannot be explained by industry related market-to-book and price-earnings ratios. The reason for this argument is also analyzed in this paper. Underwriters and investors are expected to focus more on comparable firm multiples in periods with favorable market conditions and especially higher IPO volume, as more relevant information is available. They are likely to show some form of "herding" behavior regarding these positive valuation criteria and so neglect the firm's accounting and profitability characteristics. The focus on multiple ratios also constitutes a common valuation factor for participants, which is likely to reduce information asymmetries between issuers and the market, and to positively affect the IPO decision. These research questions have not been considered and proven in any existing literature, although several theoretical models exist which suggest a form of information spillover in periods with high IPO volume and positive effects on first market prices.

The results of several empirical tests in this paper are surprising. The valuation of IPOs does not directly correspond to the MB and PE multiples of publicly traded stocks in the same

industry. Neither can any positive valuation effects of previous IPOs and their multiple values be confirmed. The regression models analyze explanatory variables such as financial characteristics, industry multiples and market environment. In summary, in months with only a few public offerings, or in "cold" periods, firm's accounting information and industries' MB and PE ratios can explain the IPO market value. In the results for "hot" months, firm's characteristics are less relevant than the value driver, in terms of overall stock market performance before the IPO. Information spillover cannot be related to the multiple ratios under consideration. Instead, the stock price changes, in an environment with high IPO volume, encourage underwriters to increase valuation for newly issued stocks, disregarding the firm's financial characteristics. With these results, the paper contributes to a large extent to the existing literature about IPO valuation and market cycles. Also assumptions about asymmetric information distribution between issuers and investors as well as the decision to go public are considered in a new context and add important findings to previous investigations.

The paper is structured in four chapters: chapter II presents the related literature and theory on which this paper is based, and the reasons behind the development of the two main questions are presented. In chapter III, the research design is described. As well as explanations of the sample selection, important variables for the regression models are discussed with reference to previous literature. The empirical results follow in chapter IV. First, the descriptive statistics of the sample firms are presented. Chapter IV.2 analyzes multiple values over the time period from 1997-2007 in more detail. In IV.3, the regression models are applied to IPOs' market values, where differentiation between market phases shows the most relevant estimates (chapter IV.3.2). Also in IV.3.3, findings are approved, with assumptions of a different market environment related to asymmetric information distribution.

II Related Literature and Development of Hypotheses

Investment banks, acting as IPO underwriters, have to consider all relevant and available information about the firms going public as well as estimating the market's perception and demand, in order to set an appropriate offer price for new shares. The valuation of firms going public is very complex, as the firm's characteristics are not the only significant consideration in setting the initial price. The existing literature about IPO valuation considers underwriters' common techniques in valuing the issuing firm. For example, Roosenboom (2005: 16 et. seq.) and Deloof/De Maeseneire/Inghelbrecht (2002: 5 et. seq.) find that the discounted cash flow

(DCF) model and the dividend discount method (DDM) are very frequently applied in the French and Belgian IPO markets. With the DCF model the firm's expected cash flow (EBITDA adjusted for changes in working capital and net capital expenditure) over a given planning horizon is discounted by a rate that reflects the firm's risk. With the DDM the expected dividends, assumed to be a constant portion of net profits, are discounted by the costs of equity. The problem is in appropriately estimating cash flow and dividends over a 5-10 year period. Cogliati/Paleari/Vismara (2008: 14) confirm that with the expected growth rates of cash flows for Europe's IPOs between 1995 and 2001 were about 20% higher than actually achieved in the 5 years following the IPO.

However, the accounting information used most frequently by underwriters is that relating to comparable firm multiples such as the price-earnings (PE) ratio, market-to-book (MB) ratio and price-to-sales ratio (Kim/Ritter (1999:410)). For example, the price of an issue is decided by multiplying the firm's earnings per share by the average of PE ratios of comparable firms already traded publicly and valued by the market. The accuracy of PE multiples increases if comparable firms are selected on the basis of industry segments, firm's related risk and expected earnings growth rates (Alford (1992:.98, 102)). In terms of IPOs, however, Kim/Ritter (1999: 410 et. seq.) find that this seldom leads to precise valuation. Accounting information and comparable multiples can be chosen merely as a benchmark, but additional information about the market's demand is included in the preliminary and offer prices. On the other hand Beatty/ Riffe/ Thompson (2000: 8 et. seqq) and Bartov/ Mohanram/ Seethamraju (2002: 326 et. seq.) focus on accounting information such as earnings and book value of equity and revenue, finding significant explanatory power for market valuation and offering prices.

However, firms' MB and PE ratios show major movements industry-wide, as they reflect the industry's growth perception and investors' valuation of stocks. For example Ofek/Richardson (2002: 269 et. seqq.) show that the PE ratio of internet firms in the dot-com bubble was exceptionally high. Core/Guay/Van Buskirk (2003: 54) also find an increasing MB ratio over time (1975-1999), where the changes cannot be explained by divergent firm characteristics such as income, R&D spending, capital expenditures or sales growth. It would be reasonable to assume that this also affects the multiples of IPOs. For example, in Germany, firms going public during the profitable period of the new market or Germany's "Neuer Markt" (1997-2001) showed very high MB and PE ratios compared to IPOs in the following

years (2002-2007), during which IPO firms' multiples decreased sharply. Interestingly, the firm's characteristics and important accounting information did not change significantly between 1997 and 2007. The "Neuer Markt" period was also characterized by enormous initial returns after the first trading day, and by a high volume of IPOs. So, overall, this period of the German stock market has been described as a "hot issue" period. Since 2002, however, the IPO market has slowed down and turned into a "cold" phase. As well as the significantly lower PE and MB multiples, the IPO volume and the underpricing of these newly issued shares have also decreased.

The reasons for those IPO waves with high IPO volume and high underpricing (or high initial returns) have been investigated in more detail. Pástor/Veronesi (2006:1714) and Boehmer/Ljungqvist (2004:2 et. seqq.) find that firms' expected profitability, market return and uncertainty all affect the decision to go public. For example technological development can affect the capital market in those respects (also Maksimovic/Pichler (2001:459 et. seqq.)). Several models about the clustering of IPO are also related to the Myers/Majluf (1984:216 et. seq.) model, hypothesizing that more firms go public where the adverse selection costs of equity issue are low, e.g. when investors interpret the IPO decision more favorably or the information discrepancy between issuers and investors is reduced. For example, Subrahmanyam/Titman (1999:1072) model the dependency relationship between the IPO decision and investors' information acquisition. They come to the conclusion that higher liquidity in capital markets and informational efficiency make public equity markets more attractive for firms. Hoffmann-Buchardi (2001: 355 et seq.) argue that IPO valuation is related to firm- and market-wide factors. Positive information about market perception in offer prices of IPOs affects firms' decisions to go public. Investors are also able to "free-ride" on information about previous IPOs. Higher market valuation can therefore be achieved by following IPO firms, because they do not have to compensate investors' information production when the signal from previous IPOs is relatively precise. Alti (2005:1106, 1131) puts forward a similar idea: "hot" IPO markets are a result of information spillover. High IPO offering prices are an indicator of investor's private information, which reduces the information asymmetry between issuers and potential investors. This also reduces uncertainty in IPO valuation and supports the decision to issue equity. However, Froot/ Scharfstein/ Stein (1992:1463) show that information spillovers or investors' information "herding" can also result in market inefficiencies. They argue that short-term speculators are particularly likely to focus on only one source of information in making their trading decisions. "These

informational spillovers can be so powerful that groups of traders may choose to focus on very poor quality data, or even on completely extraneous variables that bear no relation at all to fundamentals.“ Empirical investigations (e.g. Lowry/Schwert (2002: 1174), Lowry (2003:31 et. seqq.), Benveniste, Ljungqvist, Wilhlem, Yu (2003:591)) support the argument that the decision to go public is related to previous IPOs and that firms are more likely to go public if the market valuation is especially high.

This idea about information spillover in the IPO decision can also be linked to the IPO valuation theory. As previous literature and market observations indicate, IPO multiples are likely to change with market conditions. The market valuation of IPOs seems higher in a favorable equity market environment, or “hot” issue phase. Considering these arguments, this paper intends to answer the first important question: [1] Can changes in IPO valuations be explained by multiples of comparable industry related firms? Furthermore, the second aim of this paper is related to the information spillover models presented above: [2] Are there “herding” effects on IPO valuation and comparable multiples in periods with high IPO volumes? This would indicate issuers, underwriters and investors focusing more on high comparable multiples of similar firms when valuing an IPO than on other relevant accounting information and on the firm’s characteristics. During “cold” issue phases with lower IPO volume, valuation proxies relating to the firm’s financial statements should have more explanatory power than the industries’ MB and PE ratios: also, because less information of previous IPOs in the same industry is available, investors’ demand is harder to estimate and the corresponding insecurity about the appropriate offering price is greater. Furthermore, this paper’s investigation is related to the asymmetric information hypothesis put forward by Myers/Majluf (1984). They argue that more firms are likely to issue equity during periods with lower informational asymmetries between managers of a firm and investors. Therefore, in periods with high IPO volume, investors are expected to interpret the firm’s information and decision to go public more favourably due to higher comparable industry multiples. Furthermore, the discrepancy between investors and issuers are assumed to be lower, as common valuation factors carry more weight than firm-specific information. A previous study by Bayless/Chaplinsky (1996: 271, 274) is closely related to this idea. They investigated the decisions concerning seasoned equity offerings (SEOs), relative to differing market phases. They compare announcement date prediction errors for equity issues in hot and cold market period, finding evidence that identical firms experience less negative market returns where the announcement date is in a hot market, compared to those announced in normal and cold

markets. However, the differences are not attributable solely to differences in market conditions, and only in cold periods are firm characteristics significant in explaining prediction errors. Investors seem to give more weight to firm-specific factors in cold markets, while in periods with higher volume of equity issues a greater portion of SEO valuation seems to be related to public information available to issuers and investors. Koop/Kai (2001:388, 391) also consider effective market valuation, but they make a distinction between IPOs and SEOs. Their results indicate more efficient pricing in SEOs than in IPOs. However, they do not find evidence of cold/hot issue periods and market conditions, e.g. indicators of economic upturns, changes in stock prices or stock price volatility, having any significant effect on valuation of equity offerings.

III Research Design

III.1 Sample Selection and Data Sources

The sample contains IPOs from January 1997 to December 2007 listed on segments of the Frankfurter Stock Exchange. This is the most important stock exchange, covering about 90% of the equity market in Germany, and is run by Deutsche Börse AG. This analysis concentrates on this stock exchange because the availability of data from minor exchanges in Germany is limited. Besides the Regulated Market (General and Prime Standard), which is based on public law and requires the highest transparency requirements of the European legislator, the Open Market (Freiverkehr) is an important segment of the German capital market, especially for small and medium-sized firms. The "Neuer Markt" has been a sub-segment of the Open Market between 1997-2003. In 2005 the Entry Standard has been introduced as the "successor" segment, which is also based on private law, and firms' shares are traded with lower transparency requirements. The sample includes all new issues as well as listings accompanied by raising new equity in all stock segments. Private placements and the transfer from one stock exchange or market tier to another are excluded, as well as public offerings of Banks and Reits (11 IPOs) due to differences in financial accounting. Between 1997 and 2007, initial public offerings of 569 firms have been completed. In the early phase (1997-2001) the numbers of equity issues have been considerably higher with 423, compared to 146 IPOs between 2002 and 2007. For a detailed investigation, complete information have been available for 483 IPOs.

The information is obtained from Deutsche Börse AG, which provides information about all offerings in terms of new issues, listings, transfers etc. Additionally, the primary market statistics for the Regulated and Open Market deliver the IPO date, offer price, first price at the

beginning of trading, bookbuilding span as well as the volume of the issue and market capitalization. Another important source has been Thomson Financial's Datastream. This database provides the closing price on the first trading day after the IPO and information on percentage price changes, volatility, monthly market-to-book ratios and price-earnings ratios of all shares traded in the German stock market between January 1980 and March 2008. Also the industry classification (ICB: "Industry Classification Benchmark") of each IPO was obtained from this database. The information from the financial statements (e.g. net income, assets, intangible assets, equity, total debt, capital expenditure, return on equity, earning per share etc.) is from the Database of Reuters Knowledge, where all firm reports are available and standardised in Euros. The original accounting information closest to the offering date is used for the analysis.

III.2 Methodology and Definition of Variables

To investigate the degree to which accounting information and comparable industry multiples affect IPO valuation, several ordinary least square regression models are analysed in this paper. The independent variable is the total market value of the IPO firm, which is calculated by multiplying the total number of shares after the IPO (including primary shares) by the following three prices: preliminary price, offer price and share price after the first trading day. Most of the IPOs are sold through the bookbuilding method, where a preliminary price range is set by the issuer and underwriter. As part of the roadshow before the IPO, underwriters offer shares to potential investors, who indicate their demand by their bidding prices within the preliminary range and by the amount of shares they are willing to buy. The preliminary price is calculated as the midpoint of the bookbuilding range, and is the best indicator for the underwriter's perception of the value of an IPO. Furthermore, the total firm value is calculated with the final offer price. The offer price and its difference from the preliminary price together indicate the investors' demand for an IPO. A higher offer price means that the information obtained during the bookbuilding phase or roadshow has been favourable. In Germany, however, underwriters are not able to set offer prices higher than the upper price of the bookbuilding range, as the investors make a binding bid during the roadshow period. To set a higher offer price, the whole process would have to be redone, which would delay the IPO. The total market value is therefore also calculated by multiplying all outstanding shares by the share price after the first trading day. As IPOs are often underpriced, meaning that the offer price is deliberately set lower than the price which could be obtained in the market, it is a good indicator of the market's perception and demand for these newly issued shares.

Previous studies have used a variety of proxies to measure the pricing and valuation of an IPO. For example Kim/Ritter (1999: 417) use PE and MB ratios of the IPO firms. Kim/Krinsky/Lee (1995:456) regress the explanatory variables on the share price. In an offering, however, underwriters and issuers are probably concerned with the total valuation of the firm or proceeds and not solely with the offer price. This model necessarily includes the issue proceeds as an independent variable. Trueman/Wong/Zhang (2000: 142) and Core/Guay/Van Buskirk (2003:49 et. seq.) also use the total market value of equity, as well as a deflated model in which market value and explanatory variables are scaled relative to the book value of equity. Beatty/Riffe/Thomson (2000: 10) prove, for a sample of IPOs, that market value deflation by book value of equity or revenue increases the explanatory power of the independent variables (earnings and book value of equity per share) of the regression models (for discussion see: Brown/Lo/Lys (1999: 86 et seqq.)). Furthermore, they apply a log transformation to their value variables and also show an improved model fit. This transformation seems appropriate, as a non-linear or convex relationship between firm value and accounting information, as discussed by Burgstahler/Dichev (1997: 189 et. seqq.), Fischer/Verrecchia (1997: 519 et. seqq.) and Hand (2000: 13 et. seq.) can be assumed. Additionally, the influence of potential outliers and of heteroscedasticity can be reduced by using the natural logarithm. For this reason, this log-transformation is also applied to the three different measures of market value in this study, as well to all value variables included in the regression models.

The analysis takes into account the firm's financial information, in the form of several independent variables on the right hand side of the regression model. First of all, the value of the firm's total assets is a relevant indicator of its size, level of operations and perceived investor risk in the offering. This proxy is used less often in the valuation models, but the studies related to IPO underpricing often find a significant negative relation between this variable, as a proxy for risk, and the initial return (see Jenkinson/Ljungqvist (2001: 70 et.seq.), Koop/Li (2001:386)). Here the correlation to IPO values is expected to be positive. The amount of intangible assets in relation to total assets of the firm indicate the difficulty of valuing a firm based on accounting variables and substantial positions. Furthermore, the ratio of intangible assets to total assets ("intanratio") is assumed to be related to the industry or the innovativeness of the firm, as it indicates spending on research and development (R&D) e.g. on patents or licences. Small and technology orientated IPOs are expected to have a higher proportion of intangibles assets than older companies in the same industry segments.

Therefore the effects on market valuation, in this context, can be either positive or negative. Furthermore, the book value of equity is, included in the regression model as an explanatory variable, according to previous studies (e.g. Bartov/Mohanram/Seethamraju (2002: 326)). As the dependent variable reflects the market value of equity, and the influence of comparable industry multiples (MB and PE ratio) is of major interest, the book value is included as a control for differences in size between firms, and for the effects on valuation (see Kim/Ritter(1999: 416 et. seq.)). A related variable, "leverage", indicates the firm's amount of debt in relation to its sum of total debt and equity. Firms with higher debt burdens are expected to have a higher default risk and chance of bankruptcy. Additionally, a higher debt burden means higher interest payments, which is likely to reduce the possible dividends for shareholders and is therefore negatively valued by potential investors (see Jensen (1984: 324 et. seqq.), Koop/Li (2001:386)).

Additionally, several variables are included to reflect the profitability of the firm and are therefore very important for estimating present and future cash flows, which is also the baseline for DCF methods in IPO valuation. The ratio of earnings per share (EPS) sets the operating income (before deprecation and amortization) of the firm in relation to total shares outstanding (see also Kim/Krinsky/Lee (1995: 456), Bartov/Mohanram/Seethamraju (2002: 325)). Another ratio is included by introducing the return-on-equity (ROE) ratio for the year in which the IPO took place. This ratio sets a firm's profit (net income) in relation to the book value of common equity. This shows potential shareholders, when previous ratios are extrapolated into the future, the profit that can be achieved with the invested capital. The difference between operating income and net income is calculated by adding/subtracting non-operating income, interest expenses and taxes. Other previous papers also use growth rates of sales, total operating income and earnings as profitability measures and expected value drivers for IPOs (e.g. Beatty/ Riffe/Thompson (2000:11), Core/Guay/Van Buskirk (2003:48), Boehmer/Ljungqvist (2004: 15). Kim/Ritter (1999: 434) also suggest that the comparable firm multiples for IPO valuation should be adjusted to different levels of profitability (e.g. sales and operating cash flows) to increase the predictability of a firm's market valuation. Furthermore, the accounting information regarding the firm's capital expenditure is included as an explanatory variable ("capex"). This expenditure is an indicator for future benefits in terms of firm value and expected earnings, as they indicate the firm's investments in assets. Core/Guay/Van Buskirk (2003:48) and Kim/Krinsky/Lee (1995: 459) include this variable in analyzing (IPO) valuation. The first regression model [1] can be formalized in the following equation, where "MV(Price)" is calculated using the three different prices described above.

For a detailed definition of the variables see table I. The term ε is the random error variable of the regression model.

$$(1): MV(Price) = \beta_1 + \beta_2(Assets) + \beta_3(Intanratio) + \beta_4(Equity) + \beta_5(Leverage) + \beta_6(Capex) + \beta_6(ROE) + \beta_8(EPS) + \varepsilon$$

The major interest of this paper is the effect of industry multiples and particularly their influence on valuation and accounting information. For this reason, I introduce the multiples "MB" and "PE" to the second regression model. "MB" stands for the market-to-book value and is defined as the market value of common equity divided by the balance sheet value of common equity. "PE" is the variable for the price-earnings ratio, defined as the price for the stock divided by consensus forecast of earnings per share for the next financial year. Kim/Ritter (1999: 430) have shown that the earnings forecast for the following year is a better multiple value for estimating IPO prices than historical- and current year's forecasted earnings. These ratios were obtained from Thomson Financial Datastream for every firm whose shares were traded on the German stock market (between 1980 and 2008) for each month between 1997 and 2007. These firms are categorised by ICB industry, corresponding to the classification of the IPOs. For each sample IPO, the multiples are calculated as the average MB and PE ratios of all tradable shares of the same industry in the month before the offering date. As I do not match IPOs and firms by a range of characteristics, this method allows the overall industry firm valuation to be ascertained, as well as the broader effects on IPO offer prices, which is expected to be positively correlated.

With the same method two further variables are created: "Vola" and "perform". The first term, "vola", is the mean of the 3-month moving average of historical volatility of all tradable firms' stocks for each industry classification. This variable is included to provide a control for the valuation uncertainty of the market. Pástor/Veronesi (2005:1720) argue that more firms go public when uncertainty about the future profitability of the industry is high, but also that the valuation in terms of market-to-book value increases with higher volatility of market prices. In an empirical investigation of this model by Boehmer/Ljungvist (2004:9), the volatility of stock returns in the sample firm's industry is used. Koop/Li (2001:388) introduce the daily S&P return variance prior to the offering as a "misevaluation" factor for efficient IPO and SEO prices. The second term, "perform", is the variable of the average 3-month percentage price change of all stocks traded in the month before the IPO, also classified by the ICB industries according to the sample firms. Pástor/Veronesi (2005:1720) also suggest that IPO volume is dependent on recent market returns, as it indicates low risk aversion in

investors, and higher market valuation of firms. The majority of existing literature regarding IPO underpricing shows that higher stock market prices before the offering increase the initial returns on the newly issued shares, after the first trading day (e.g. Loughran/Ritter (2002:426 et.seqq.)) This variable is therefore included as a potential valuation driver; the effects on accounting information and the comparable firm multiples are especially interesting in terms of "information spillover". The regression model is expanded in two steps. At the second stage (2) the MB and PE ratios are included as independent variables. The third equation (3) also includes the macroeconomic factors, which are likely to increase valuation within a positive market environment.

$$(2): MV(Price) = \beta_1 + \beta_2(Assets) + \beta_3(Intanratio) + \beta_4(Equity) + \beta_5(Leverage) + \beta_6(Capex) + \beta_6(ROE) + \beta_8(EPS) + \beta_9(PE) + \beta_{10}(MB) + \varepsilon$$

$$(3): MV(Price) = \beta_1 + \beta_2(Assets) + \beta_3(Intanratio) + \beta_4(Equity) + \beta_5(Leverage) + \beta_6(Capex) + \beta_6(ROE) + \beta_8(EPS) + \beta_9(PE) + \beta_{10}(MB) + \beta_{11}(Vola) + \beta_{12}(Perform) + \varepsilon$$

IV Empirical Results

IV.1 Descriptive Statistics of Firm and Market Characteristics

An empirical investigation of changes in financial statements, comparable multiples and IPO valuation requires first of all a univariate analysis of the relevant variables. The descriptive statistics show the characteristics of IPO firms and of market environments during different issue periods. Several classifications and definitions of hot and cold IPO phases can be found in recent literature: Periods with high IPO volume (especially in one industry segment) or periods with high underpricing can be considered as "hot". For example, Helwege/Liange (2004:542 et seqq.) investigate how firms in both periods differ, and which alternative characterization of hot and cold markets is appropriate. They find that hot market firms are not necessarily small start-up firms clustered in certain industries. However, categorization by the level of IPO underpricing shows more distinct differences in firm characteristics. Bayless/Chaplinsky (1996: 260, 265 et. seqq.) compare SEO announcements in different market cycles, and their classification of hot and cold periods is based on quartile rankings of issue volume. When the highest quartile is exceeded in three consecutive months, the period is defined as "hot"; where the issue volume falls below the lowest quartile in three consecutive months, the period is defined as "cold". Surprisingly, they do find significant differences in financial information (e.g. free cash flow, return on assets, total assets,

leverage) in the firms issuing equity, but no significant differences in market conditions such as stock return and price-earnings ratios of traded shares. Because of the smaller sample size in this paper, the differentiation between hot and cold market periods is based on the median value of IPO volume per month. If the total number exceeds the median value of 10 IPOs per month, then the month is considered as "hot", otherwise as "cold". If the offering is in a month with less than 10 other public offerings, it is considered to be an IPO in a cold issue period.

The differences in firm's accounting information and profitability measures are presented in table II. The mean and median values for the complete IPO sample as well as for both sub-samples are reported, as are the p-values of the t-test of equality of the mean and the Wilcoxon-Mann-Whitney test. The p-value of the first test indicates the probability of the null hypothesis that the mean of both samples are equal. While the Wilcoxon-Mann-Whitney test (or Wilcoxon rank-sum test) estimates the null hypothesis that the two samples come from the same distribution and the p-value shows the probability of the hypothesis' validity. The comparison shows that IPOs in hot periods are smaller, measured by total asset value, and have lower debt levels. This supports the suggestion that hot IPOs take advantage of "windows of opportunity" and go public although they are not necessarily under financial constraints and so could increase their debt. The p-values indicate that the differences are significant. Profitability values also show distinctions between the different IPO cycles. The Wilcoxon-Mann-Whitney test confirms that in cold months, firms show higher operating income as well as higher net sales. However, looking at the mean of both variables, the reverse conclusion can be drawn, although this difference is not confirmed by the t-test. This indicates that the standard deviation and diversity of both variables is much higher in the hot sample. "Capital expenditure" only shows significant differences in firms' spending on assets when the equality of mean is tested (Hot: 65.218 mio. Euro, Cold: 13.634 mio. Euro). In contradiction to this, the median values and differences are found to be much smaller: hot; 1.560 Mio. Euro, cold; 1.735 mio. Euro. However, the firms in the hot period seem to have greater future growth potential, because their asset volume is significantly lower than that found in the cold sample. Furthermore, the performance ratios (ROE and EPS), which are also included in the regression models, show no significant differences in the mean and median values. Neither are intangible assets, nor total book value of equity, distinct in hot and cold market periods.

[Insert table II]

The transaction characteristics of the sample taken from both market phases do not allow a clearer conclusion to be drawn (see table III). Only the preliminary price shows a higher mean and median value (with a Wilcoxon-Mann-Whitney test p-value below 10%), but neither the offer prices nor the price after the first trading day are greatly different between the two periods. Interestingly, the increase in mean values from the preliminary price range to the "last" price is higher in the cold period (11.62 Euro) than in the hot (9.53 Euro). The number of shares offered, and therefore the value of proceeds, differs significantly; these variables show much higher means and medians in months of high IPO volume. The market value, calculated as the total number of shares multiplied by the offer price, shows a hot period median of 136.00 mio. Euro, in contrast to 97.48 mio. Euro with a Wilcoxon-Mann-Whitney test p-value of 0.001. Surprisingly, the mean is much higher in the cold issue phase (p-value: 0.103), which indicates that few very large companies went public in these months, which increased the average market valuation in the cold issue phase.

[Insert table III]

A clearer distinction can be made by looking at firm and industry multiples as well as market characteristics. Panel A of table IV shows the mean and median market-to-book ratios and price-earnings ratios in the month prior to each sample IPO. The MB ratio of all tradable firms in the related industry (MB Ratio (market)) shows much higher valuation in the hot market. Also during these months, IPOs seem to follow previous public offerings which were valued much higher than in the cold sample (MB Ratio (prev. IPO)). Furthermore, the IPOs' median MB valuation is significantly higher in the hot than in the cold market: 8.232 and 4.185 with a p-value below 0.1%. However, the book value of equity does not differ significantly, as shown in table II. The same conclusion can be drawn in an analysis of the median PE ratios (probabilities of the t-test are lower than 10%). The IPOs have significantly higher price-earnings ratios in hot months, while the earnings per share of these firms vary around a mean of 2.402 (median: 0.390). Firms going public in this market cycle also follow much higher PE ratios of previous IPOs and industry averages, which is indicated by the median "PE Ratio (prev. IPO)" and "PE Ratio (market)". The market conditions represented by volatility and by 3-month percentage price change of the traded stocks in the IPO firm's industry also confirm conclusions drawn in previous literature. IPOs in a month of large numbers of equity issues follow months with a mean share price volatility of 0.476 (median: 0.490) and 3-month percentage price change of 15.082% (median: 6.213%) in the related

industry segments, compared to a volatility mean of 0.397 (median: 0.375) and an average positive price increase of 3.450% (median: 2.432%) in a cold month. These differences are significant, according to equality tests. This is also confirmed by data from Panel B of table IV. Here, the values are calculated per month, and not for every sample IPO. In more detail: for each hot/cold month the mean/median of MB/PE ratios and the volatility and percentage price changes of all tradable shares in the German stock market are calculated. However, the monthly market-to-book and price-earnings ratios are smaller in a hot month. This suggests that although many firms follow high market valuation of previous public offerings and comparable industry firms, the valuation in the month of the IPO date is not necessarily higher across the market.

[Insert table IV]

IV.2 IPO's and Comparable Firm Multiples

The descriptive empirical analysis confirms that the considered multiples of the IPOs differ between market phases. However, the valuation of publicly traded firms does not show the expected low probabilities of the tests of equality. The months of high IPO volume do not show considerably higher MB and PE ratios in shares of firms traded on the German stock exchanges. As this paper is concerned with whether or not IPO valuations can be explained by multiples, the relationships between firms' and market's MB and PE ratios need to be investigated in more detail.

Figure I shows the average monthly market-to-book ratio of all IPOs and all publicly traded shares in Germany. The IPO MB ratio is much more volatile than the total stock average. The new market period and the dot-com bubble, in particular, show very high market values for initial public offerings. Due to only 6 IPOs having been completed in the two following years (2002-2003), no clear conclusion about valuation changes in these years can be made. After 2006, however, increasing values can be confirmed, with the highest MB ratio in May 2006. The market average indicated by the dotted line shows higher values only between 1998 and 1999, before the increase in IPO valuations. After 1999 the ratios for market valuation of equity remained between approximately 5 and 9. As a control for industry-wide effects, two sub-samples are here examined more closely: the technology and industry sectors. These segments are the largest groups in the sample, according to ICB classification, with 204 technology firms and 94 IPOs related to the sector of industry goods and services. Figure II shows the movement of IPO's MB ratios and already publicly traded firms in the technology

segment. A similar pattern is confirmed by results from figure I. High valuation and volatility in the IPO ratios occurred in the first part of the relevant decade, where the internet and technology firms dominated the IPO market. The average valuation since 2006 has been, by comparison, much lower (except in June 2007). Also, the MB ratios of the technology firms already listed are more stable, varying between a lowest value of 3.6 in January 1997 and a highest value of 18.42 in November 2000. The same conclusion can be drawn from the sample of industry firms (figure III). Interestingly, the average market valuation was negative in the beginning of 1998, and then increased to a MB ratio of 12.34 in February 1999, while the IPOs had its highest market valuation in relation to book value of equity in May 1999.

[Insert figure I-III]

In Figure IV the monthly price-earnings ratio of the complete stock sample is compared with the sample firms. No simultaneous movement of the IPOs' PE ratios or of the market average are seen in this graph. Valuation and changes in the valuation of firms going public are higher in the years between 1997 and 2001. The industry-wide average of all traded firms also shows more volatility compared to the market-to-book ratios, and achieves very high values in January 1999 and October 2001. Interestingly, the two months with the highest ratios of the entire stock market seem to follow high IPO PE ratios, where the reverse would be expected. After 2004, however, the PE values of IPOs greatly exceed the relatively low PE ratios of all traded firms across the stock market. Figure V shows this relationship for the technology segment. Here the PE ratio of the IPOs corresponds with figure IV. Only price-earnings are lower across all technology stocks, and without exceptionally high peaks in a few months. Between October 2003 and September 2004, higher PE ratios were achieved, with a maximum of 913.91. Unfortunately, during this time only one IPO took place (PE ratio: 100), so the effect on firms going public can not be identified. Firms' multiples in the industry goods and service sector also increased (to a maximum of 264.52 in December 2002), but one year earlier, from November 2002 to November 2003, a period in which no IPO took place in this sector. Overall, figure VI indicates a generally lower level of IPO PE ratios, whereas two high values are obtained in November 2006 and July 2007 driven by a small number of very large public offerings. It can be concluded that the graphs for PE/MB ratios of IPOs and the market do not provide any evidence of their changing in response to each other: neither can any clear relation between both multiple series be seen across different industry sectors.

[Insert figure IV-VI]

For this reason, the analysis is expanded here by investigating the cross-correlation as well as the first-order autocorrelation of these variables. To this end, the 11-year time period of the sample is shown divided into several sub-periods relating to the number of IPOs (see figure VII). The quartiles of the IPO volume per year are calculated for the complete sample, as well as the technology and industry samples. Years with a number of IPOs falling within the lower quartile are defined as "cold", while years of IPO volume within the highest quartile are defined as "hot" issue periods.[1] The years with a number of issues between the lower and upper quartile are defined as "normal". Consecutive years with the same classification are grouped together. The years of 1997-1998 are "normal" with an increasing volume, so that 1999-2000 is a period defined as "hot", with two years of the highest IPO volume in the 10-year sample. 2001 can still be defined as a "normal" period, but with a clearly decreasing number of issues. So that the "cold" period occurred between 2002 and 2004: three years with an IPO volume in the lowest quartile. The three following years are also defined as a "normal" phase. For both the complete sample and the two sub-samples, the same groups can be recognized over the same time period.

[Insert figure VII]

First of all the cross-correlation between the MB/PE ratios of the IPOs and the traded shares are estimated for the three samples as shown in figure VIII. Surprisingly, the cross-correlations are negative in the normal (1997-1998) and hot (1999-2000) periods, indicating that higher IPO market-to-book multiples are also more likely to correspond to lower ratios across all traded firms and for the technology and industry sample. With the decreasing IPO volume for the normal year of 2001, the correlation becomes positive (except for industry firms). However, as there are only a few IPOs, with longer time gaps between the offering dates, no clear conclusion can be drawn. The same argument holds for the cold years of 2002-2004. The period between 2005 and 2007, with 131 IPOs, however, also shows a positive cross-correlation between MB ratios of IPOs and the market. Even the normal periods (1997-1998 and 2005-2007) do not indicate the same relation of IPO multiples to market valuation.

[Insert figure VIII]

Figure IX shows the results for cross-correlation of price-earnings ratios for the sub-periods of the IPO market. Here again, the three samples do not seem to correspond to each other, and show different developments. While the cross-correlation of the IPO and market ratio is positive in the first normal period (1997-1998), the industry sample shows a negative relationship. In the hot phase, however, the (small) cross-correlation values become negative

[1] Years with an IPO volume smaller or equal to the lower quartile range are defined as „cold". Years with an IPO volume larger than the upper quartile range are defined as „hot".

for all sub-samples. To draw a conclusion for the next three years is not straightforward, for the reasons outlined above. In the final "normal" phase, only the complete IPO sample shows a positive cross-correlation of PE ratios, while both sub-segments show a small but negative relation between IPO and market valuation. For this figure, no final conclusion can be made, as no clear development across the industry segments and time periods can be recognized. Overall, the correlation values are very small, and no significant interaction (positive or negative) between these variables can be confirmed.

[Insert figure IX]

The first-order autocorrelation of the IPO multiples is also analyzed, in order to estimate whether the valuation of previous IPOs is more relevant than the market average. In figure X, the continuous line indicates the autocorrelation of MB ratios for the sample including all IPOs. The autocorrelation changes from positive, in 1997-1998, to negative in the three subsequent periods (from hot to cold between 1999 and 2004) and then turns positive again for the last normal market phase. The graphs showing the areas of technology and industry, however, show an initial negative autocorrelation in the "normal" phase, which then becomes positive in the hot market. In subsequent years, the value for autocorrelation became negative again, while, in the period between 2005 and 2007, both a positive value for the industry sample and a negative value for technology IPOs can be seen. In "normal" phases, the valuation of an IPO seems to be related to previous public offerings and their multiple values. Looking at the industry segment separately, however, this conclusion can also be drawn for IPOs during the "hot" market of 1999-2000.

[Insert figure X]

Finally, figure XI shows the first-order autocorrelation in terms of IPOs' price-earnings ratios. Here, the estimates are positive in the normal phase of IPO volume, becoming negative for the period between 1999 and 2000 across the three sub-samples. This indicates that, especially in a month with high numbers of IPOs, the PE multiples of previous IPOs become less relevant in an IPO's market valuation. The reverse relationship, however, is found in the last normal phase of the market, and corresponds to the first sub-period. Overall, the values for first-order autocorrelation are relatively small and do not confirm that there is any dependence over the month. In the appendix, figures XII, XIII, XIV show the cross- and autocorrelation of the IPOs according to the three sub-samples discussed. However, comparison across the different industry classifications also does not show any clear development of the variables across the market phases. The estimates above also do not show

that there is any clear relationship between the market and IPO valuation. The movement and correlation of PE and MB ratios do not correspond to each other. Therefore, the first important question of this paper cannot be answered positively: changes in IPO valuation cannot be explained by the overall market valuation of tradable stocks. This result is surprising, as practitioners and existing literature would suggest (albeit without confirmation) that high IPO market values accompany high investor perception, and therefore high overall market value of stocks.

IV.3 IPO Valuation

IV.3.1 Regression Estimates on IPO Valuation

The regression models discussed in III.2 aim to give more insight into estimating the determinants of IPO valuation and the effects of the market environment. As the analysis above shows rather puzzling results, the coefficients and significance of the multiples in the context of firms' accounting information and market environment are especially interesting. The first OLS-regression estimates [1]-[3] in table V show the first model *(1)*, only in terms of firms' financial and profitability characteristics regressed on the total market value (calculated with preliminary, offer and last prices). The R-squares show the greatest degree of fit to the regression model on preliminary market valuation (R^2= 70.3%), and the least percentage, for the market value calculated with the last trading price at the offer day (R^2= 65.7%). The F-statistics, indicating the ratio of the explained variability from the regression model (R^2) and the unexplained variability, show that the model is useful and the variables (or at least one) have an association with market valuation. The values of the F-statistics also decrease with the different offer prices. Similar statistical characteristics can also be seen in the following regression models.

[Insert table V]

In equation *(1)* the coefficients for the variables of assets, leverage and the EPS of the firm are highly significant, to the 1% level, in explaining IPO valuation, calculated with the number of shares and the three different prices during the offering process. The estimates show that larger firms, in terms of assets, are also valued more highly, a 1% increase in assets resulting in a 0.677% higher market valuation. Higher profitability in terms of earnings per share is also positively correlated with the dependent variable. However, the level of debt and the associated higher bankruptcy risk of the firm on offer is interpreted negatively by IPO participants. The additional variables for intangible assets and book value of equity show

negative signs, although these are not significant. The ratio of intangibles seems to reduce the valuation of a firm rather than indicating innovation. Only the result for the equity measure is surprising: the negative relationship indicates that a 1% increase in book value of equity results in a 0.056% reduction in market value calculated with the offer price. Presumably, smaller firms have been the most overvalued. Profitability measures, however, show the expected positive signs: future growth expectations and return on invested capital are valued positively by underwriters and investors.

The second regression model in equations [4]-[6] (see table V) includes the following additional two multiples: market-to-book and price-earnings ratios of all publicly traded shares in the same industry segment as the sample IPOs. The variables increase the degree of model fit in terms of the R^2, and are significant at the 1% level. The coefficient of the MB ratio shows a negative indication. A positive relation of IPOs' market values and industry-related firms had been expected: however, the results from chapter IV.2, or figure VIII, can be confirmed, indicating a negative cross-correlation between these comparable multiples in the first four years of the sample period. The economic relevance of the MB ratio to IPO valuation is very low, as the coefficient is rounded up to -0.001. A similar minor effect is seen in the comparable PE multiple of previously traded shares, although the coefficient indication is positive. This also supports some of the previous chapter's findings in figure IV, where the cross-correlation of IPO's and market's PE ratios is positive in the "normal" periods of issue volume in the periods of 1997-1998 and 2005-2007.

The final regression model *(3)* on market value includes the variables allowing for market effects (see [7]-[9] in table V). The independent variable for volatility ("vola") is positively related to the IPO valuation as suggested by Pástor/Veronesi (2005:1720), although not a significant factor. Additionally, the "perform" variable shows a positive indication, and is also significant at the 1% level. The measure of the 3-month percentage price change of related industry stocks indicates that valuation increases in line with market performance in the months prior to the IPO; also as suggested by Pastor/Veronesi (2005:1720). The coefficient is also much higher than for the PE and MB variables. This confirms that the market environment is a more important IPO value driver than the comparable multiples. Interestingly, "intanratio" also becomes significant (at 1% level) in this regression equation, while the interpretation or meaning of "leverage" changes slightly in [7] and [8]. With the exception of this variable, issuers, underwriters and investors can not be said to value or

interpret the firms' and markets' characteristics differently, because the models' estimates do not change with the three prices in the IPO process.

IV.3.2 *IPO Valuation in Hot and Cold Markets*

The regressions above show that the variables discussed reasonably affect IPO valuation by underwriters and investors. While the explanatory power of comparable multiples seems to be small in comparison to firm's financial characteristics and market conditions, the PE and MB ratios may explain market valuation to a greater or lesser degree according to market phase. The idea of information spillover would suggest that in phases with high IPO volume firms are valued according to higher market multiples, and firms' characteristics become less relevant. The reduced information asymmetry between issuers and investors due to the same valuation factors and better positive response to issue announcements would also explain the higher number of firms going public. In order to analyze this hypothesis, the sample is split into two sub-samples, "hot" and "cold", classified by the median numbers of IPOs per month (see chapter IV.1). The regression models are applied to the two samples; the changes in coefficients should then indicate which of the valuation variables becomes more or less important.

In table VI, the OLS-regression estimates for the cold sample are reported. The first model (1) in regressions [10]-[12] shows similar results to the complete sample findings. Instead of earnings-per-share, the profitability variable "capex" is significant at the 1% level, and positively affects the market value of IPOs. The indicator for intangible assets in relation to total assets also moves from negative to positive. In months with low IPO volume, the value placed on innovation outweighs insecurity about the valuation of assets in place. The results for the second regression model [13]-[15] are similar to the estimates from regression [4]-[6]. The variables for assets, leverage and capital expenditure are significant at the 1% and 5% levels, and coefficients show the expected signs. Again, the multiple values of the market are significant in explaining IPO valuation, where "MB" shows a negative and "PE" a positive correlation. For both variables, however, the economic relevance is very low, because the coefficients show values slightly below +/- 0.001. The results for the complete regression equation are more interesting. In contrast to the results in table V, the variables "perform" and "vola" have no significant influence on IPO valuation. Particularly, the proxy for previous market performance shows lower coefficients and lower t-statistics. The comparison of market conditions also confirms that previous market price changes are higher in "hot" than in

"cold" IPOs. Therefore, this result suggests that market return becomes less relevant in IPO valuation when performance is low. Consideration of the "hot" sample should support these findings.

[Insert table VI]

The second sub-sample includes all IPOs completed in a month with more than the median number of initial public offerings. The results are shown in table VII, and similar to the "cold" sample, the intercept of the regression models being highly significant with a coefficient in the region of 16.00. This means that the regression models applied in this paper are not complete enough to explain the market valuation of IPOs. As this paper is concerned with the effects of specific market characteristics, and as the intercept coefficients are closely similar, the two sub-samples can be compared. The β_1 indicates that the missing independent variables seem to be equal in "hot" and "cold" estimates and that they are not relevant in explaining valuation differences.[2]

Compared to the estimates of the complete and the cold IPO samples, the regressions [19]-[21] in table VII show changes in the explanatory power of variables. Although the value of a firm's total assets is significant, the level of debt no longer has a negative effect on IPO valuation. The profitability measures "ROE" and "EPS" show significant positive coefficients and high t-statistics. In contrast to the cold regression estimates, the "capex" variables are no longer significant, even changing from positive to negative signs. The second model (2) also includes the market or industry multiples for each IPO ([22]-[24]). The same firm-specific accounting measures are related to IPO valuation as shown in model (1). However, the PE ratio is also significant, and affects the IPO valuation positively, although the coefficients are very small. Furthermore, the MB ratio does not show high enough values of t-statistics to indicate significance at the relevant levels. The third regression model on market value is applied in equation [25]-[27], and provides this paper's central insight into changes in hot and cold market phases. In addition to the positive correlation of assets, the ratio of intangible assets to total assets is highly significant and it occurs with a negative correlation to the dependent variable. In the cold market regression analysis, this variable showed a positive influence in market value (without significance). Leverage and capital expenditure of the

[2] In the appendix in table IX the results for the regression models with an intercept dummy "cold" on the complete sample are reported. This confirms the argument, and shows significant changes in two variables, whereas almost all other variables change signs. Hot and cold market samples and the considered independent variables change, and this is not due to the absence of variables of the regression equation. The differences are more pronounced in the models on the two sub-samples.

firms going public do not effect the valuation in a hot market environment differently than a cold issue phase. Additionally, the other profitability proxies, EPS and ROE, which were significant in the first two regression models (1) and (2) in the hot phases, lose their explanatory power. Compared to the complete and cold sub-samples, the multiple variables PE and MB also do not show any significant relationship to the market value in the regression model (3). However, the proxies for market environment can be expected to indicate more relevance. The volatility measure is not significant: however, the coefficient is much higher in regression [25] and [26] than in the previous result, and turns negative in [27]. This suggests that in periods with high IPO volume, investors in particular are concerned about volatility in the market. Greater uncertainty about market development could result in reduced willingness to buy shares, thereby affecting prices after the first trading day negatively. A more pronounced effect is seen with the variable "perform", which is significant at the 1% level. Higher market valuation follows a positive price change in traded stocks in the three months prior to the offering. Interestingly, during the cold market months, this variable has no effects on IPO valuation, as seen in table VI. The estimates for [16]-[18], however, show significant effects of MB and PE multiples of industry-related firms for each IPO, which cannot be confirmed for the hot issue phases ([25]-[27]).

[Insert table VII]

The results indicate changes in IPO valuation and varying influences of firm and market characteristics. In a cold environment, assets, leverage and capital expenditure of the firm going public are relevant: however, during phases with more IPO volume, the value of total and intangible assets is more important for underwriters and investors in setting offer prices. However, the hypotheses about information spillover in terms of favorable industry multiples are not confirmed. "Herding" on available public information of market's MB and PE ratios is not seen in phases with a higher number of equity issues. In cold periods, these variables are more important in explaining IPO valuation. During hot markets the previous performance of the stock markets indicates such behavior. In months with high IPO volume, the performance of already traded shares is also high, and regression estimates indicate that this positively affects the market value of newly issued shares. This is not the case for the other sub-sample of IPOs. Issuers, underwriters and investors, then, give more weight to market performance when it is favorable and when more IPOs are taking place. The variable "perform" may include market information on which participants rely in preference to firms' accounting information and comparable multiples. In contrast to previous suggestions, MB and PE

multiples can be considered as firm related information, and have only minor influences. “Herding” occurs in connection with aspects related to positive market performance. The results pertaining to the second question with which this paper is concerned do not show the expected effects of multiple values, but suggest some form of herding in respect of public information. Overall, the relevance of MB and PE ratios on IPO valuation is not greatly significant.

IV.3.3 Information Asymmetries and IPO Valuation

Another aspect to be considered is the information asymmetry between issuers and investors. As proposed by Myers/Majluf (1984: 216 et. seqq.), more firms issue equity if agency costs are low. For example, common valuation factors of issuers, underwriters and potential investors reduce information asymmetries and related costs. Therefore, it would be reasonable for periods with high IPO volume to also have more equality of information distribution between participants. Indicators of this IPO environment are, for example, the initial returns after the first trading day. As there are several theories regarding explanations of IPO underpricing, it can be argued that increased information asymmetries between issuers, underwriters and investors require higher initial returns as a form of compensation for investors to participate in the offering (e.g. Rock (1984:187 et. seqq.), Beatty/Ritter (1986:213 et seqq.)). However, periods of higher IPO underpricing coincide, or are often followed by periods of high IPO volume (e.g. Lowry (2003)). Also in this sample, hot periods in terms of IPO volume have a median value of initial returns of 7.94%, compared to 3.7% in cold issue periods, a significant difference according to the Wilcoxon-Mann-Whitney test. The total sample mean is 33.91% (median: 5.29%). This does not necessarily indicate that high IPO volume periods are the result of reduced agency costs for the issuer of equity. In order to gain more insight into the distinct valuations of IPOs in relation to information asymmetries between participants, the regression models in periods with high and low underpricing should be examined.

The complete IPO sample is once more split into two sub-samples by initial returns after the firm’s shares have been listed for the first time. IPOs with underpricing lower than the median value of 5.29% are grouped together as “UP: Low” and those with initial returns above the median are grouped as “UP: High”. The estimates for regression model (3) on market value calculated with the offering price are shown in table VIII. Interestingly, the results are similar to hot and cold sub-samples [17] and [26]. The valuation equation [28] for the sample of low

initial returns shows a significant positive coefficient for the variables “assets” and “capex”. Larger (or less risky) firms with higher growth perspectives have a higher market valuation. However, firms with relatively lower book values of equity receive a higher offering price. Debt levels also negatively affect the IPO valuation, significant at the 1% level. In the estimates for IPOs in cold months, the same variables (other than “equity”) showed significant explanatory power for the relevant variable. Additionally, the multiple variables of market-to-book and price-earnings-ratio are highly significant and show a negative/positive indication of the coefficients. This is also consistent with the results for firms in cold issue periods, in which these variables also affect IPO valuation. Additionally, the average 3-month performance of industry related stocks determines the market value in regression [28], which was not found in previous estimates. These results confirm, however, that the valuation of IPOs with lower initial returns is similar to that of cold issue firms. The intercept of the regression models is also very close. Accounting information and multiple ratios explain IPO market value when the information asymmetry between investors and issuer (underwriter) is assumed to be low. The assumption that in cold periods the firm is valued according to financial statements, so that the informational differences between participants is low and underpricing is reduced, is therefore reasonable.

Before a final conclusion is reached, however, the estimates for the sub-sample of IPOs with higher underpricing should be discussed. Regression estimates [29] show significant coefficients for the variables “assets” and “intanratio”. Higher levels of firms’ assets in place increase the market valuation of IPOs, while an increased ratio of intangible to total assets seems to increase uncertainty, and therefore has a negative effect on the dependent variable. Another significant explanatory proxy is “perform”, indicating the 3-month average stocks price change before the IPO. The economic impact of stock market performance is almost twice as high as it is in low initial return IPOs in [28]. These estimates correspond to the findings of regression [26] considering the hot market IPOs, where the same variables were found to be significant with the same sign of coefficients. The valuation of IPOs with considerably higher underpricing, and presumably higher information asymmetries between participants, is the same as in hot issue phases. This suggests that in IPOs where valuation is driven by market return, rather than by comparable multiples or firm characteristics, the information asymmetry between issuers and investors is also higher. While this paper has previously argued that IPOs seem to be valued by the common factor of market performance, this factor does not influence the information gap. When valuation is determined by the

market, initial returns are also higher for investors in these IPOs. In the case of IPO valuation by profitability and industry-related firms, the compensation of investors by allocation of underpriced shares is low. This presumably reflects the reduced uncertainty for an investor bidding for newly issued shares which seem to be priced appropriately in a market context. The results do not necessarily confirm a close relationship between reduced information asymmetries and a higher number of IPOs. Lowry (2003: 6) summarizes in her investigation that adverse selection costs are only marginally significant in explaining IPO volume fluctuation, rather the firm's demand for capital and changes in the investor optimism determining the decision to go public.

[Insert table VIII]

V Conclusion

The paper considers IPO valuation with comparable firm multiples of market-to-book and price-earnings ratios. Changes in the explanatory variables are analyzed according to IPO market phases with high and low equity issue volumes. With the sample seen of German IPOs between 1997 and 2007, no significant changes in firm and transaction characteristics can be confirmed in "hot" and "cold" market periods. However, the market environment for firms going public in months with high IPO volume is much more favorable. These IPOs do not only have higher MB and PE values, but they also follow months of higher multiple ratios in previous equity issues and industry related public firms. Previous volatility as well as average percentage price change of the stock market is also higher than that seen in the IPOs in "cold" markets. However, this paper's first important research question cannot be answered as expected. The IPO multiple ratios do not correspond to the overall market valuation of publicly traded firms. Higher monthly MB and PE ratios in newly issued stocks are not correlated to the monthly multiple values of industry related firms. Some sub-periods of the investigated period show a positive, and others a negative, cross-correlation of these values. Across industry segments another, different, development is found. Furthermore, the autocorrelations of the monthly IPO multiple ratios do not confirm the theory that previous IPOs provide more important information for firm valuation then previously traded shares.

The second aim of this paper, relating to models of IPO waves and information spillover effect, also shows interesting results. The regression estimates of the "cold" sample, defined by the number of IPOs in a month, confirm that financial information, profitability measures and multiple ratios are all relevant in market valuation of firms going public. Only the MB and PE ratios seem to have minor economic effects. The market-to-book ratio of previously

traded firms in the same industry also has a negative sign of the coefficient. The “hot” sample regressions, however, prove that in addition to the firm’s size, the valuation is also driven by the 3-month average percentage price change before the IPO. The analysis indicates that “hot” IPOs follow months with high market performance, but that this also significantly affects valuation. The “herding” effects on multiple values in periods with high IPO numbers cannot be confirmed, as these variables have no significant influence in explaining the dependent variable. Underwriters and investors are more likely to show “herding” behavior in relation to information included in the stock price changes. Additionally, the expected lower information asymmetries with common valuation factors such as MB and PE ratios are not found. When initial returns after the first trading day are used as an indicator of the information gap between issuers/underwriters and investors, months with high IPO volumes also show higher asymmetries. Interestingly, market valuation in IPOs with high/low initial return is very similar to valuation in hot/cold market phases. This means that firms do not necessarily choose to go public because of reduced agency costs in equity issues.

The results of this paper do not support several assumptions made in previous papers and theoretical models, but still form a major contribution to the existing literature about the valuation of publicly traded firms and the decision to go public. To gain more insight into the effects of multiples on valuation, the study could be improved by matching some comparable firms in terms of size, risk and industry directly. A larger sample size from a more active stock market could also help to support the results from the German market and prove further findings.

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Table I

Definition of Variables

Name	Definition
Assets	Natural logarithm of total assets.
Intanratio	Intangible assets divided by total assets.
Equity	Natural logarithm of book value of total equity.
Leverage	Total debt divided by the sum of total debt and equity.
Capex	Natural logarithm of capital expenditure.
ROE	Net income divided by common equity.
EPS	Basic earnings per share excluding extraordinary items.
PE	Monthly average of price-earnings ratio of all tradeable shares in Germany in the related industry sector of the IPO. Average PE-ratio one month before the offering date is used.
MB	Monthly average of market-to-book ratio of all tradeable shares in Germany in the related industry sector of the IPO.Average PE-ratio one month before the offering date is used.
Vola	3-month moving average of the volatility of all tradable shares in Germany in the related industry sector of the IPO. Average volatility one month before the offering date is used.
Perform	Percentage price change over last 3 month of all tradeable shares in Germany in the related industry sector of the IPO. The average price change ratio one month before the offering date is used.
MV(Preliminary)	Total number of shares (including primary shares) at the IPO multiplied with the midpoint of the bookbuilding range.
MV(Offer)	Total number of shares (including primary shares) at the IPO multiplied with the offering price.
MV(Last)	Total number of shares (including primary shares) at the IPO multiplied with the last price after the first trading day.
Cold	Dummy variable which equals one if the IPO took place in a month with fewer IPOs than the median, otherwise zero.

Table II

Firm Characteristics

The accounting variables are from the IPO firms' financial reporting closest to the IPO date. Total Assets, intangible assets, total equity, operating income, net sales and capital expenditure are denoted in mio. €. Leverage is calculated as total debt divided by the sum of total debt and total equity. ROE is the return (net income) divided by common equity. EPS stands for basic earnings per share excluding extraordinary items. "Hot"("cold") defines IPOs occurring in month with high (lower) total number of IPOs than the median value. The p-value denotes the probability of rejecting the null-hypothesis of the t-test of equality of means and the Wilcoxon-Mann-Whitney test, if the hot and cold samples come from the same distribution.

		Total	Hot	Cold	P-Value
Assets	Mean	788.775	1445.270	212.341	0.113
	Median	36.54	31.605	43.235	0.010
Intangible Assets	Mean	21.668	28.154	15.950	0.450
	Median	0.360	0.370	0.320	0.823
Equity	Mean	193.805	317.007	85.620	0.154
	Median	18.250	15.005	19.420	0.156
Leverage	Mean	0.253	0.227	0.276	0.056
	Median	0.147	0.120	0.175	0.074
Operating Income	Mean	41.413	65.284	20.453	0.123
	Median	3.465	2.855	4.130	0.061
Net Sales	Mean	312.816	461.630	182.150	0.162
	Median	22.645	18.295	30.960	0.006
Capital Expenditure	Mean	37.734	65.218	13.634	0.089
	Median	1.625	1.560	1.735	0.854
ROE	Mean	36.790	30.184	48.181	0.238
	Median	18.215	19.930	15.780	0.308
EPS	Mean	2.402	3.732	1.234	0.231
	Median	0.390	0.330	0.455	0.112

Table III

Offer Characteristics

Preliminary price is the midpoint of the bookbuilding range. The last price is the share price after the first trading day. Proceeds are calculated as the number of offered shares (including shares from an overallotment option) multiplied with the offer price. Market value is calculated as total number of shares outstanding after the IPO multiplied with the offer price (in mio. €) . "Hot"("cold") defines IPOs occuring in month with high (lower) total number of IPOs than the median value. The p-value denotes the probability of rejecting the null-hypothesis of the t-test of equality of means and the Wilcoxon-Mann-Whitney test, if the hot and cold samples come from the same distribution.

		Total	Hot	Cold	P-Value
Preliminary Price	Mean	22.014	22.221	21.813	0.807
	Median	19.000	19.500	17.872	0.064
Offer Price	Mean	23.837	22.890	24.774	0.286
	Median	19.500	19.725	19.000	0.781
Last Price	Mean	32.602	31.764	33.437	0.532
	Median	22.000	23.500	20.100	0.150
Number of Shares	Mean	5,344,407	5,807,602	4,885,329	0.502
	Median	2,050,000	2,219,622	1,897,250	0.019
Proceeds	Mean	123,623,200	134,400,000	113,000,000	0.532
	Median	39,092,500	42,000,000	32,719,326	0.010
Market Value	Mean	7,560.00	556.589	14,372.51	0.103
	Median	124.00	136.00	97.48	0.001

Table IV

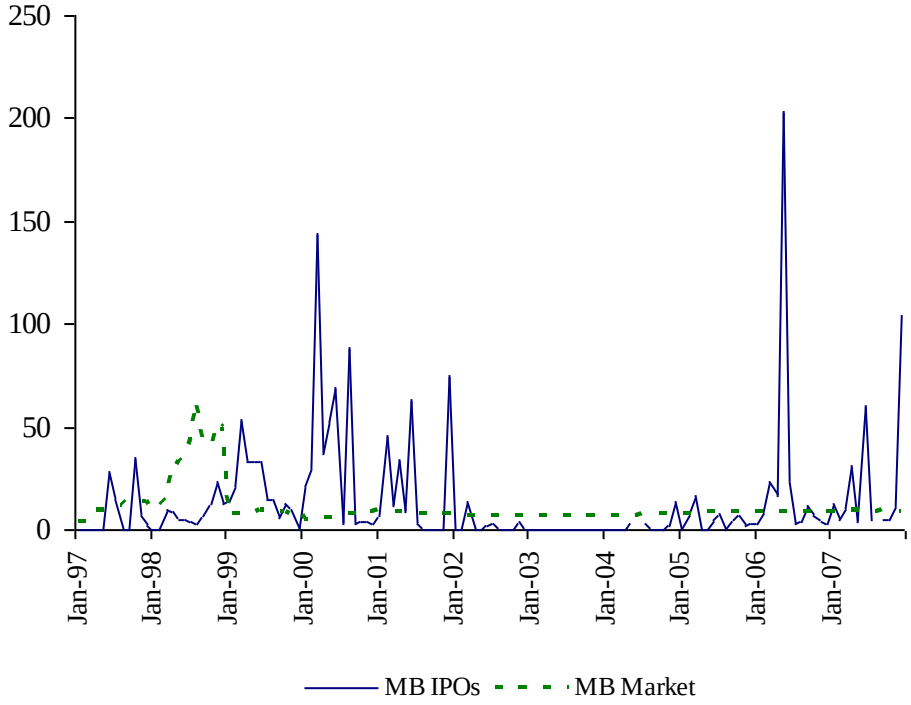
Macroeconomic conditions

Panel A: "MB Ratio (IPO)" is the market-to-book ratio of the sample IPOs. "MB Ratio (Market)" is the market-to-book ratio one month before each sample IPO. "MB Ratio (prev. IPOs)" is the average market-to-book ratio of IPOs in the month before each sample IPO. Market-to-book ratio is defined as market value of the ordinary (common) equity divided by the balance sheet value of the ordinary (common) equity in the company. The "PE Ration (IPO)" is the price-earnings ratio of the sample IPOs. "PE Ration (Market)" is the price earnings ratio one month before each sample IPO. PE Ratio (prev. IPOs) is the average price-earnings ratio of IPOs in the month before each sample IPO. "Volatility" is the 3-month moving average of volatility one month before each sample IPO. The "% Price Change" is the percentage share price change over 3 month before each sample IPO. The values are calculated as an average of all tradable shares in Germany related to the industry sector of each IPO. ***Panel B****:* The average values per month of all tradable shares across all industries are calculated. "Hot"("cold") defines IPOs occurring in month with high (lower) total number of IPOs than the median value. The p-value denotes the probability of rejecting the null-hypothesis of the t-test of equality of means and the Wilcoxon-Mann-Whitney test, if the hot and cold samples come from the same distribution.

Panel A		Total	Hot	Cold	P-Value
MB Ratio (IPO)	Mean	60.346	58.738	61.741	0.925
	Median	5.016	8.232	4.185	0.000
MB Ratio (Market)	Mean	16.614	7.357	25.676	0.136
	Median	5.301	7.912	3.944	0.000
MB Ratio (prev. IPOs)	Mean	84.040	165.957	13.825	0.000
	Median	8.445	11.864	7.059	0.000
PE Ratio (IPO)	Mean	157.907	174.112	144.257	0.389
	Median	42.989	53.959	34.807	0.001
PE Ratio (Market)	Mean	104.956	55.443	151.848	0.208
	Median	31.400	42.489	25.157	0.000
PE Ratio (prev. IPOs)	Mean	163.056	163.935	162.303	0.930
	Median	86.378	96.313	44.951	0.000
Volatility	Mean	0.436	0.476	0.397	0.000
	Median	0.424	0.490	0.375	0.000
% Price Change	Mean	9.024	15.082	3.450	0.000
	Median	4.132	6.213	2.432	0.000

Panel B		Total	Hot	Cold	P-Value
MB Ratio	Mean	10.548	8.267	10.862	0.306
	Median	8.351	7.857	8.386	0.740
PE Ratio	Mean	170.050	66.026	184.399	0.192
	Median	44.935	37.710	46.635	0.300
Volatility	Mean	0.239	0.271	0.234	0.019
	Median	0.202	0.224	0.198	0.788
% Price Change	Mean	5.640	12.038	4.757	0.009
	Median	4.581	7.444	3.903	0.060

Figure I: MB Ratios of IPOs



Firgure II: MB Ratio Technology IPOs

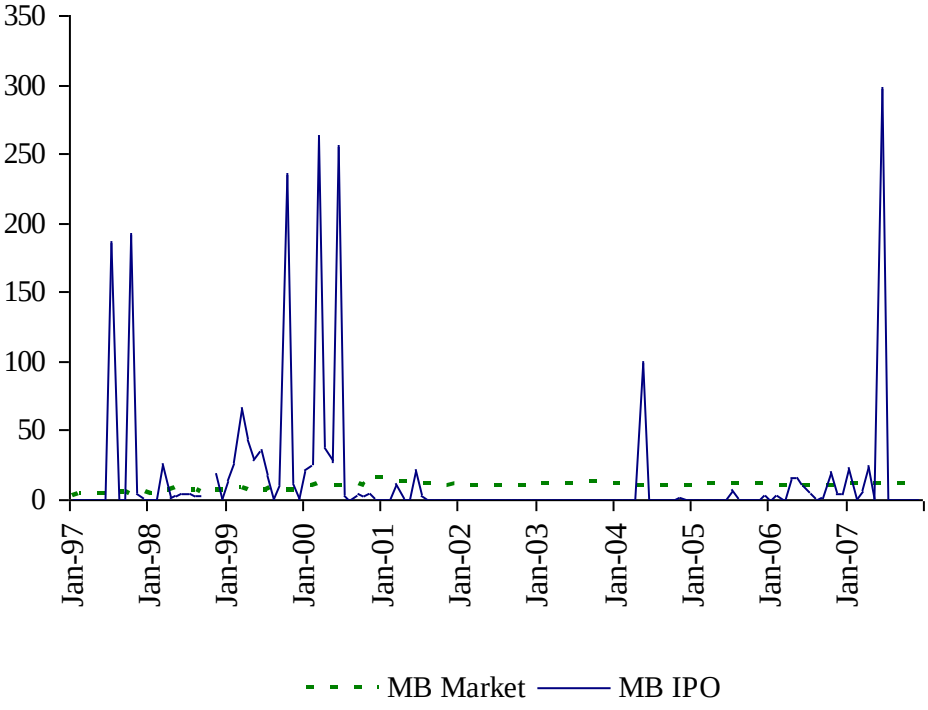


Figure III: MB Ratios of Industry IPOs

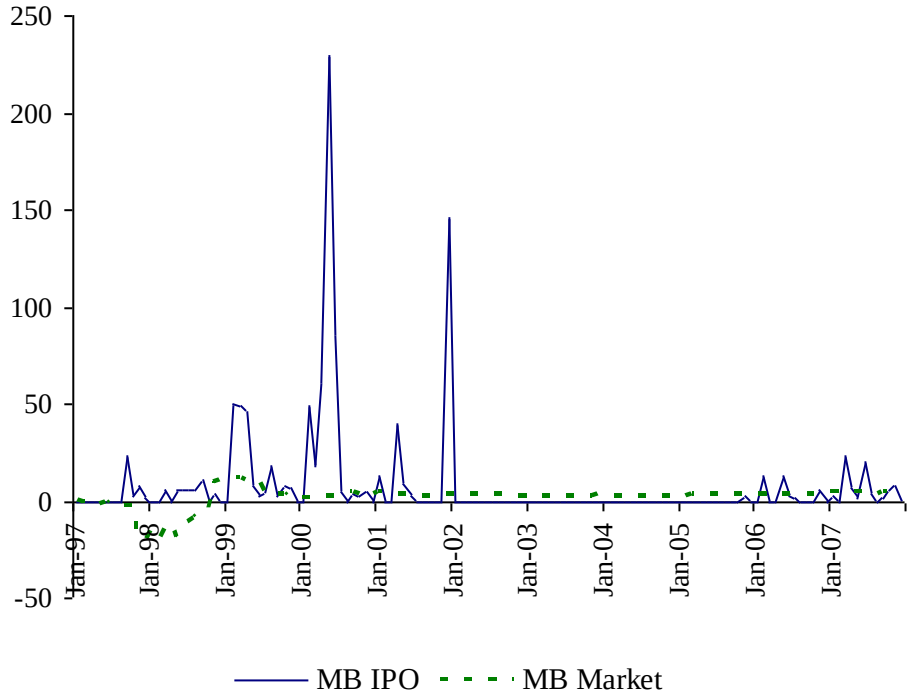


Figure IV: PE Ratios of IPOs

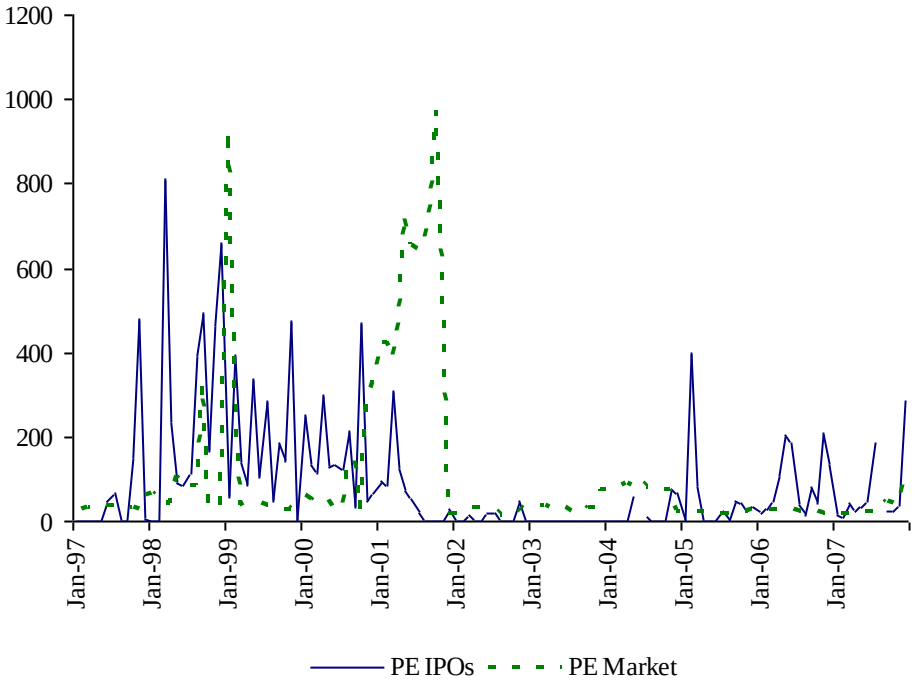


Figure V: PE Ratio of Technology IPOs

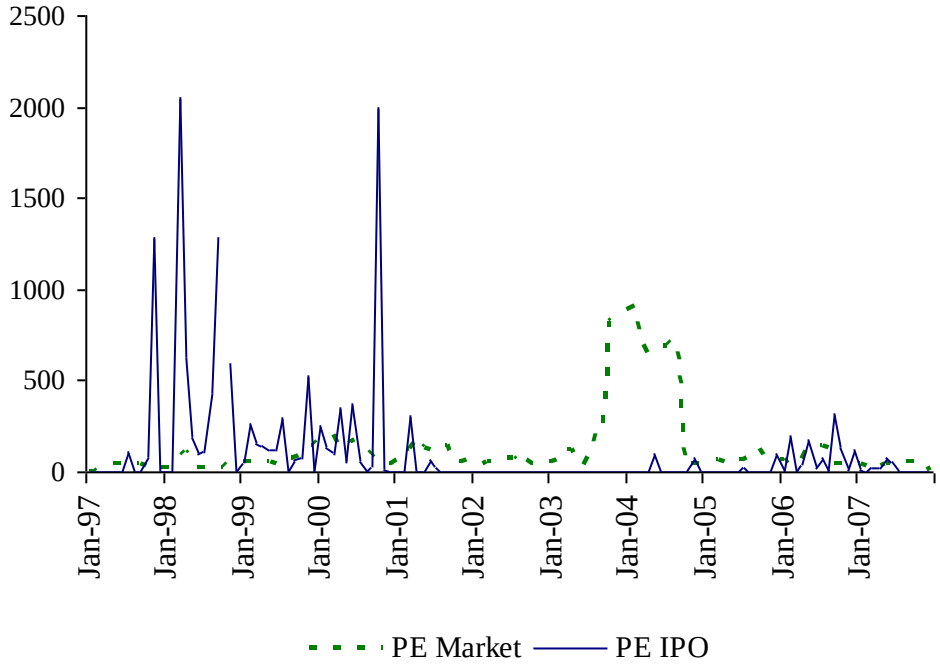


Figure VI: PE Ratio of Industry IPOs

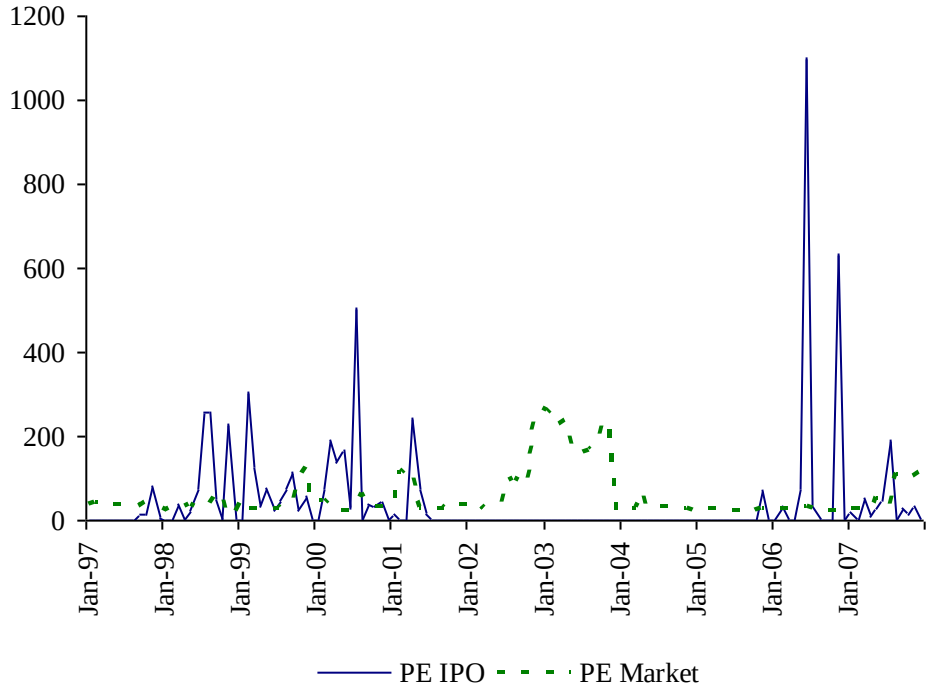


Figure VII: IPOs per Year

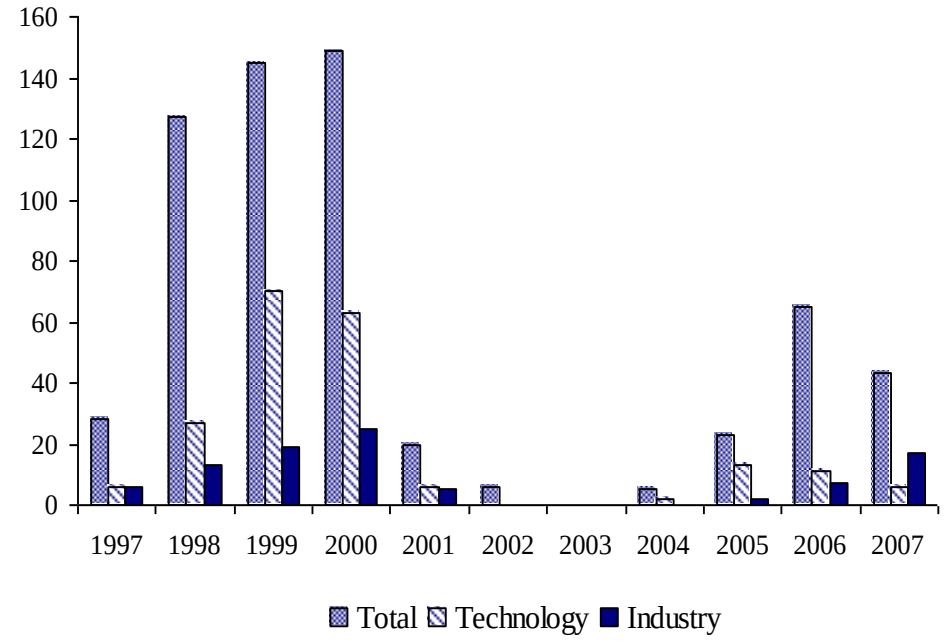


Figure VIII:
Cross-Correlation of MB Ratios of IPOs and Market

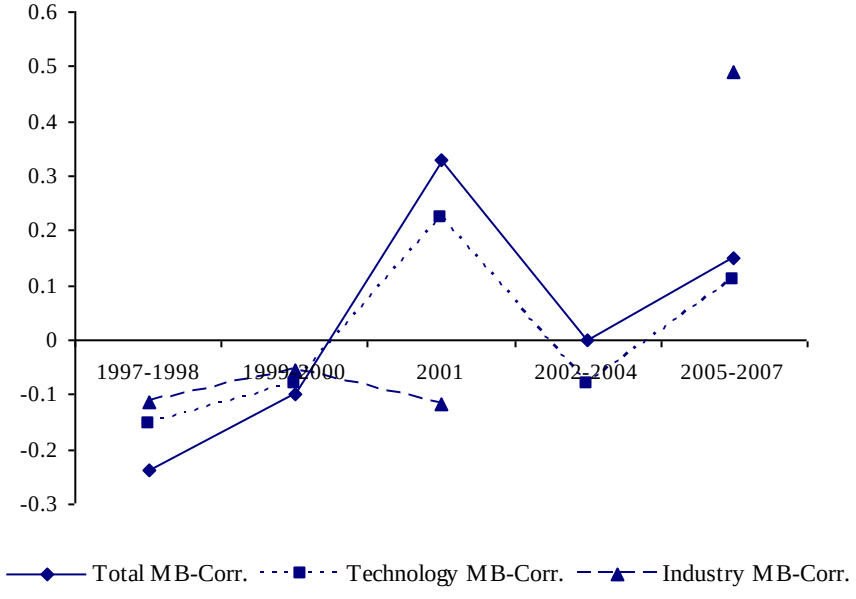


Figure IX:
Cross-Correlation of PE Ratios of IPOs and Market

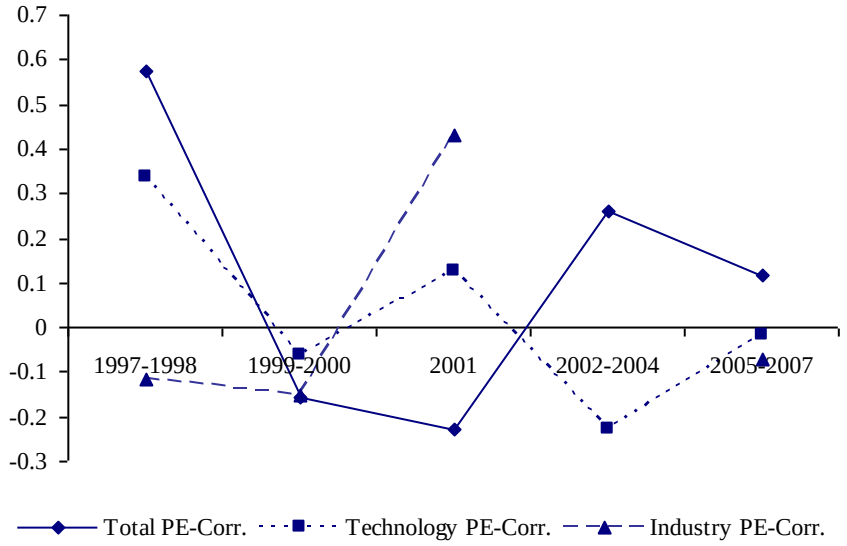


Figure X:
Autocorrelation of MB Ratios of IPOs

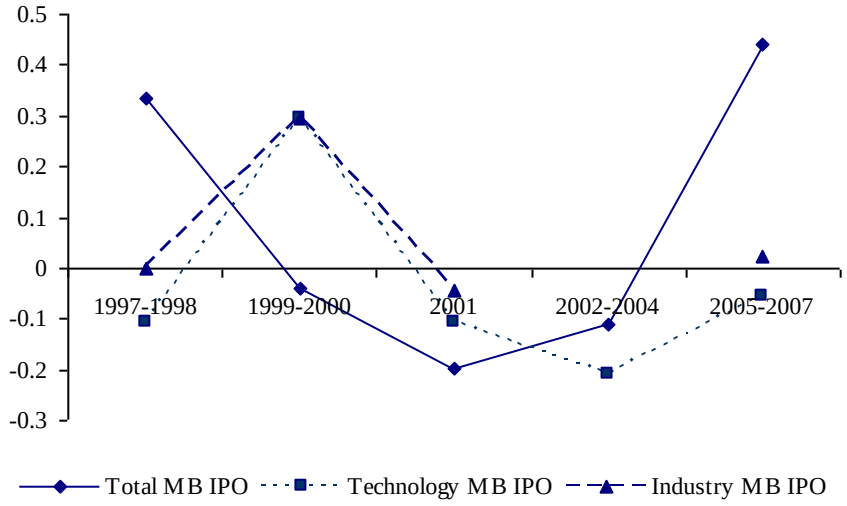


Figure XI:
Autocorrelation of PE Ratios of IPOs

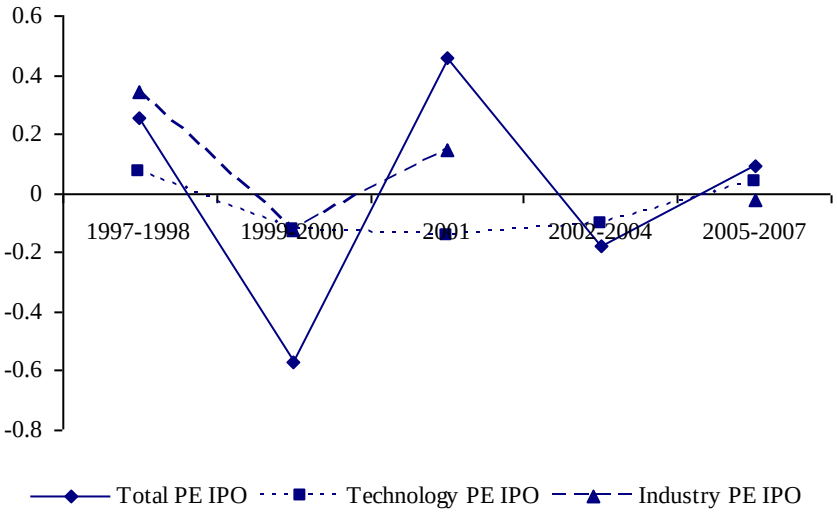


Table V

Regression Models on Market Value

For definition of variables look at table VIII. The regression models use White's (1980) heteroskedasticity-consistent standard errors and covariance. The values of the t-statistics are denoted in parentheses. Significance is indicated with * for 10% level of significance, ** for 5% level of significance, *** for 1% level of significance.

	MV(Preliminary) [1]	MV(Offer) [2]	MV(Last) [3]	MV(Preliminary) [4]	MV(Offer) [5]	MV(Last) [6]	MV(Preliminary) [7]	MV(Offer) [8]	MV(Last) [9]
Assets	0.677	0.667	0.748	0.674	0.664	0.747	0.626	0.611	0.686
	(6.009)***	(6.016)***	(8.850)***	(5.891)***	(5.894)***	(8.831)***	(5.766)***	(5.781)***	(8.388)***
Intanratio	-0.001	-0.001	-0.001	-0.001	-0.005	-0.001	-0.001	-0.001	-0.001
	(-1.432)	(-1.472)	(-1.433)	(-1.475)*	(-1.519)	(-1.426)	(-2.723)***	(-2.935)***	(-3.371)***
Equity	-0.064	-0.056	-0.136	-0.068	-0.060	-0.141	-0.028	-0.018	-0.091
	(-0.631)	(-0.561)	(-1.792)*	(-0.656)	(-0.593)	(-1.846)*	(-0.293)	(-0.190)	(-1.272)
Leverage	-0.569	-0.577	-0.816	-0.557	-0.566	-0.829	-0.427	-0.434	-0.666
	(-2.096)**	(-2.084)**	(-2.813)***	(-2.038)**	(-2.036)**	(-2.857)***	(-1.565)*	(-1.575)	(-2.413)***
Capex	0.059	0.065	0.053	0.051	0.058	0.055	0.045	0.052	0.047
	(1.492)	(1.588)	(1.281)	(1.316)	(1.425)	(1.305)	(1.233)	(1.371)	(1.182)
ROE	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(1.548)	(1.474)	(1.196)	(1.480)	(1.404)	(1.165)	(1.435)	(1.345)	(1.068)
EPS	0.013	0.013	0.013	0.012	0.013	0.013	0.006	0.006	0.005
	(7.107)***	(7.376)***	(7.462)***	(6.902)***	(7.166)***	(7.385)***	(3.103)***	(3.157)***	(2.380)***
PE				0.001	0.001	0.001	0.001	0.001	0.000
				(22.419)***	(22.832)***	(3.714)***	(23.318)***	(23.738)***	(60.19)***
MB				-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
				(-3.525)***	(-4.146)***	(-4.726)***	(-2.327)**	(-2.691)***	(-2.996)***
Vola							0.092	0.003	0.111
							(0.228)	(0.080)	(0.217)
Perform							0.018	0.019	0.022
							(6.443)***	(6.901)***	(6.873)***
Intercept	16.315	16.328	16.452	16.352	16.352	16479	16.260	16.304	16.388
	(86.833)***	(84.145)***	(82.751)***	(84.313)***	(84.313)***	(82.164)***	(57.975)***	(56.988)***	(50.011)***
R^2	0.703	0.694	0.657	0.730	0.732	0.659	0.769	0.766	0.718
F-Statistic	78.111	75.043	63.139	69.103	66.431	49.305	69.085	67.637	52.628

Table VI

Regression Models on Market Value: Cold Market

For definition of variables look at table VIII. The regression models use White's (1980) heteroskedasticity-consistent standard errors and covariance. The values of the t-statistics are denoted in parentheses. Significance is indicated with * for 10% level of significance, ** for 5% level of significance, *** for 1% level of significance.

	MV(Preliminary) [10]	MV(Offer) [11]	MV(Last) [12]	MV(Preliminary) [13]	MV(Offer) [14]	MV(Last) [15]	MV(Preliminary) [16]	MV(Offer) [17]	MV(Last) [18]
Assets	0.630	0.613	0.764	0.633	0.615	0.764	0.609	0.589	0.739
	(4.131)***	(4.149)***	(6.238)***	(4.042)***	(4.062)***	(6.199)***	(3.820)***	(3.832)***	(5.611)***
Intanratio	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001
	(1.679)*	(0.170)*	(0.851)	(1.433)	(1.431)	(0.767)	(1.487)	(1.499)	(0.800)
Equity	-0.060	-0.047	-0.184	-0.064	-0.052	-0.191	-0.057	-0.044	-0.180
	(-0.477)	(-0.388)	(-1.857)*	(-0.494)	(-0.417)	(-1.915)**	(-0.443)	(-0.356)	(-1.795)*
Leverage	-0.785	-0.789	-1.046	-0.752	-0.760	-1.074	-0.704	-0.702	-0.981
	(-2.3060)**	(-2.281)*	(-2.959)***	(-2.207)**	(-2.203)**	(-3.026)***	(-2.024)**	(-1.991)**	(-2.734)***
Capex	0.125	0.135	0.107	0.113	0.123	0.112	0.118	0.129	0.121
	(2.381)***	(2.521)***	(1.947)**	(2.246)**	(2.413)***	(2.001)**	(2.313)**	(2.500)***	(2.180)**
ROE	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(1.459)	(1.365)	(0.957)	(1.375)	(1.278)	(0.920)	(1.390)	(1.298)	(0.347)
EPS	0.037	0.037	0.037	0.033	0.033	0.032	0.046	0.049	0.055
	(1.072)	(1.082)	0.903)	(1.001)	(0.983)	(0.795)	(1.282)	(1.333)	(1.188)
PE				0.001	0.001	0.000	0.001	0.001	0.000
				(25.497)***	(25.578)***	(2.272)**	(16.936)***	(16.801)***	(1.812)*
MB				-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
				(-3.903)***	(-4.594)***	(-4.938)***	(-2.611)***	(-3.084)***	(-2.824)***
Vola							0.155	0.230	0.547
							(0.251)	(0.354)	(0.611)
Perform							0.008	0.009	0.013
							(1.130)	(1.287)	(1.374)
Intercept	16.435	16.462	16.481	16.439	16.471	16.523	16.395	16.399	13.327
	(66.351)***	(65.490)***	(65.606)***	(66.338)***	(65.574)***	(65.079)***	(44.316)	(43.080***	(34.186)***
R^2	0.781	0.776	0.737	0.816	0.812	0.741	0.818	0.814	0.766
F-Statistic	67.037	65.184	52.616	63.881	62.186	41.177	52.036	50.841	34.031

Table VII

Regression Models on Market Value: Hot Market

For definition of variables look at table VIII. The regression models use White's (1980) heteroskedasticity-consistent standard errors and covariance. The values of the t-statistics are denoted in parentheses. Significance is indicated with * for 10% level of significance, ** for 5% level of significance, *** for 1% level of significance.

	MV(Preliminary) [19]	MV(Offer) [20]	MV(Last) [21]	MV(Preliminary) [22]	MV(Offer) [23]	MV(Last) [24]	MV(Preliminary) [25]	MV(Offer) [26]	MV(Last) [27]
Assets	0.753	0.757	0.712	0.756	0.758	0.705	0.719	0.712	0.639
	(6.727)***	(6.427)***	(5.630)***	(7.186)***	(6.854)***	(5.855)***	(5.249)***	(4.931)***	(4.444)***
Intanratio	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.001
	(-1.221)	(-1.209)	(-1.142)	(1.653)*	(-1.660)*	(-1.536)	(-2.153)**	(-2.214)**	(-2.170)**
Equity	-0.130	-0.134	-0.072	-0.116	-0.118	-0.049	-0.111	-0.110	-0.035
	(-0.882)	(-0.900)	(-0.472)	(-0.836)	(-0.843)	(-0.331)	(-0.761)	(-0.742)	(-0.239)
Leverage	-0.144	-0.176	-0.227	0.226	0.203	0.113	-0.206	-0.271	-0.467
	(-0.301)	(-0.351)	(-0.422)	(0.464)	(0.398)	(0.207)	(-0.428)	(-0542)	(-0.192)
Capex	-0.048	-0.048	-0.040	-0.086	-0.086	-0.072	-0.069	-0.064	-0.040
	(-0.664)	(-0.632)	(-0.535)	(-1.129)	(-1.081)	(-0.909)	(-1.037)	(-0.935)	(-0.564)
ROE	0.006	0.006	0.009	0.005	0.005	0.007	0.001	-0.001	0.001
	(3.077)***	(3.130)***	(3.982)***	(2.600)***	(2.644)***	(3.320)***	(0.086)	(-0.044)	(-0.453)
EPS	0.010	0.011	0.013	0.009	0.009	0.011	0.003	0.003	0.004
	(3.335)***	(3.407)***	(3.973)***	(3.006)***	(3.084)***	(3.606)***	(0.980)	(0.931)	(1.192)
PE				0.07	0.007	0.007	0.001	0.001	-0.004
				(2.381)***	(2.446)***	(2.042)***	(0.283)	(0.243)	(-0.106)
MB				0.011	0.008	-0.006	0.002	0.001	-0.009
				(0.501)	(0.375)	(-0.264)	(0.145)	(0.092)	(-0.511)
Vola							0.444	0.293	-0.028
							(0.573)	(0.374)	(-0.034)
Perform							0.020	0.022	0.026
							(3.922)***	(4.316)***	(4.629)***
Intercept	16.201	16.213	16.293	15.714	15.716	15.893	16.029	16.142	16.578
	(50.906)***	(49.548)***	(47.728)***	(40.553)***	(39.276)***	(35.301)***	(35.962)***	(34.764)***	(31.087)***
R^2	0.641	0.629	0.593	0.672	0.660	0.617	0.741	0.641	0.717
F-Statistic	23.566	22.298	19.162	20.506	19.438	16.137	22.922	23.566	20.296

Table VIII

Regression Models on Market Value: Controlling for Asymmetric Information

Regression [28] inludes all IPOs which have lower initial returns than the median value. Regression [29] inludes all IPOs which have higher initial returns than the median value. Initial return is calculated: last share price after the first trading day divided by the offer price minus one. For definition of variables look at table VIII. The regression models use White's (1980) heteroskedasticity-consistent standard errors and covariance. The values of the t-statistics are denoted in parentheses. Significance is indicated with * for 10% level of significance, ** for 5% level of significance, *** for 1% level of significance.

	UP: Low	**UP: High**
	MV(Last) [28]	MV(Last) [29]
Assets	0.787	0.490
	(7.417)***	(2.310)**
Intanratio	-0.000	-0.001
	(-0.086)	(-3.024)***
Equity	-0.263	0.154
	(-3.146)***	(1.092)
Leverage	-1.017	0.118
	(-3.493)***	(0.185)
Capex	0.077	-0.014
	(1.529)**	(-0.218)
ROE	0.000	0.002
	(0.403)	(1.603)
EPS	0.043	0.009
	(1.253)	(3.127)
PE	0.001	-0.003
	(6.142)***	(-0.653)
MB	-0.001	-0.005
	(-2.648)***	(-1.143)
Vola	-0.251	0.638
	(-0.401)	(0.866)
Perform	0.014	0.026
	(2.836)***	(3.432)***
Intercept	16.612	16.207
	(40.634)***	(27.195)***
R^2	0.776	0.701
F-Statistic	38.912	19.621

Appendix

Figure XII: Auto/ Cross-Correlation of MB/PE Ratios of all IPOs

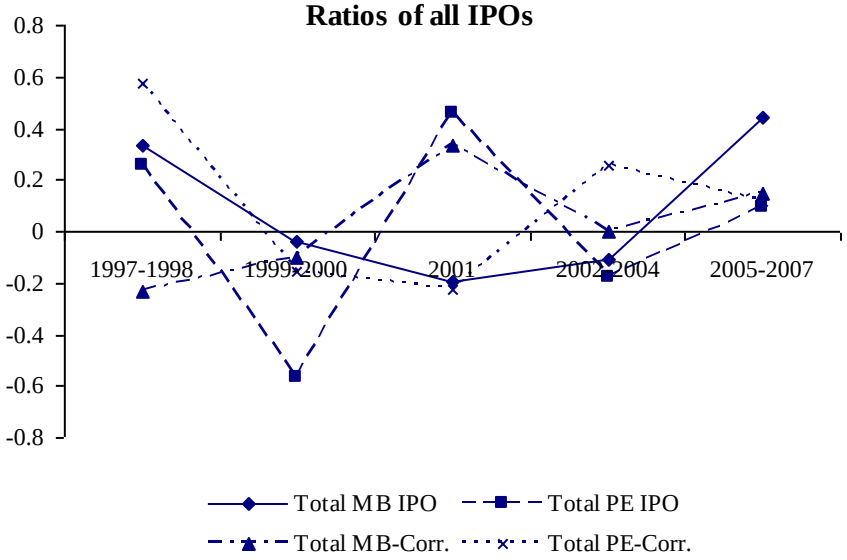


Figure XIII: Auto/Cross-Correlation of MB/PE Ratios of Technology IPOs

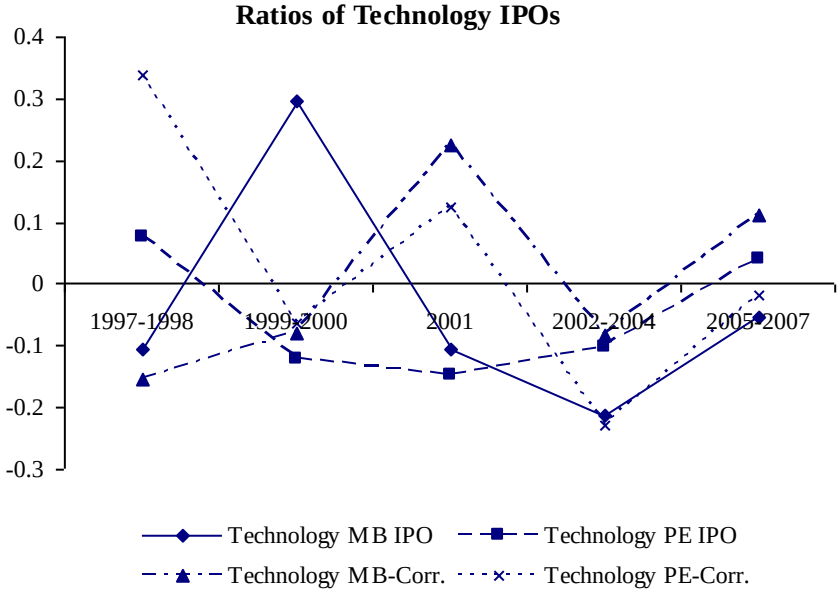


Figure XIV: Auto/Cross-Correlation of MB/PE Ratios of all Industry IPOs

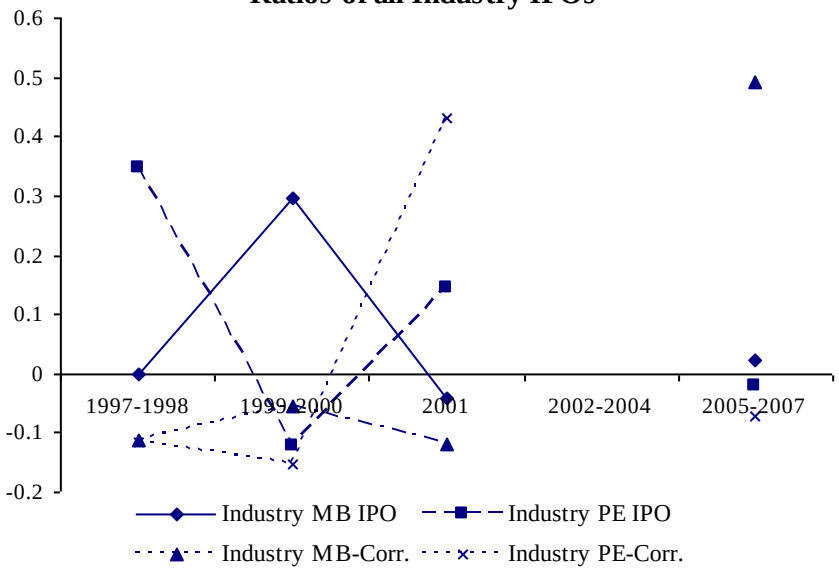


Table IX

Regression Models on Market Value (Hot/Cold)

	MV(Peliminary) [10]	MV(Offer) [11]	MV(Last) [12]
Assets	0.694	0.695	0.656
	(4.904)***	(4.776)***	(4.819)***
Intanratio	-0.001	-0.001	-0.001
	(-2.109)*	(-2.211)**	(-2.341)**
Equity	-0.107	-0.107	-0.038
	(-0.713)	(-0.711)	(-0.264)
Leverage	-0.256	-0.306	-0.432
	(-0.541)	(-0.623)	(-0.869)
Capex	-0.054	-0.054	-0.049
	(-0.874)	(-0.850)	(-0.759)
ROE	-0.001	-0.001	0.001
	(-0.050)	(-0.145)	(0.550)
EPS	0.003	0.003	0.004
	(0.945)	(0.916)	(1.283)
PE	0.001	0.001	-0.001
	(0.188)	(0.176)	(-0.041)
MB	0.004	0.003	-0.011
	(0.299)	(0.199)	(-0.595)
Vola	0.120	0.066	0.195
	(0.175)	(0.096)	(0.268)
Perform	0.0120	0.022	0.026
	(4.096)***	(4.480)***	(4.641)***
Cold*Assets	-0.066	-0.093	0.060
	(-0.322)	(-0.457)	(0.337)
Cold*Intanratio	0.001	0.001	0.001
	(2.282)**	(2.347)**	(1.767)*
Cold*Equity	0.450	0.060	-0.139
	(0.224)	(0.305)	(-0.783)
Cold*Leverage	-0.441	-0.390	-0.554
	(-0.748)	(-0.645)	(-0.906)
Cold*Capex	0.166	0.179	0.174
	(2.147)**	(2.269)**	(2.108)**
Cold*ROE	0.001	0.001	-0.001
	(0.431)	(0.516)	(-0.246)
Cold*EPS	0.041	0.044	0.051
	(1.137)	(1.204)	(1.109)
Cold*PE	-0.001	-0.001	0.001
	(-0.141)	(-0.128)	(0.048)
Cold*MB	-0.005	-0.004	0.009
	(-0.351)	(-0.260)	(0.534)
Cold*Vola	0.184	0.268	0.249
	(0.250)	(0.361)	(0.323)
Cold*Perf	-0.012	-0.012	-0.013
	(-1.337)	(-1.359)	(-1.188)
Intercept	16.276	16.315	16.408
	(55.963)***	(54.467)***	(44.858)***
R^2	0.791	0.788	0.750
F-Statistic	37.250	36.641	27.464

Continuing Table IX

Regression Models on Market Value (Hot/Cold)

For definition of variables look at table VI. The regression models use White's (1980) heteroskedasticity-consistent standard errors and covariance. The values of the t-statistics are denoted in parentheses. Significance is indicated with * for 10% level of significance, ** for 5% level of significance, *** for 1% level of significance.