A Longitudinal Study of IPOs in New High Tech Industries

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Abstract

This study provides a unique approach to examining issues related to initial public offerings (IPOs). The price behavior of IPOs in new industries is analyzed relative to IPOs in established industries. There are fundamental differences between IPOs of companies in new industries and those in established industries in that there is greater uncertainty regarding future earnings, less competition and fewer barriers to entry. The results indicate that IPOs in new industries outperform IPOs in established industries during holding periods of one to ten years. Furthermore, IPOs in new industries tend to merge less often, declare bankruptcy less often and delisted less often than firms conducting an IPO in established industries. In addition, by chronologically tracing firms within an industry, this study shows that the quality of entrants differs throughout the history of the industry.

A Longitudinal Study of IPOs in New High Tech Industries

Initial Public Offerings (IPOs) of companies in new industries differ fundamentally from IPOs of companies in established industries. Issues of IPOs by companies in established industries offer financial statements that can be compared to past financial statements of other companies in the industry. Historical and forecast information on the profitability of a more established industry can provide a gauge of the profit potential for companies issuing IPOs in that industry. In contrast, financial statement information provided with an IPO in a new industry can only be compared to the short financial histories of a few companies in that industry. There is rarely a consensus of forecasts on the future profits for the new industry, even though there may be extensive media coverage and wide speculation about the future prospects for the new industry.

This paper conducts a longitudinal study of 59 new industries from their first issue in the industry to as long as 28 years beyond the initial IPO in the industry. Our objective is to provide answers to these new questions: Could IPOs from new industries be primarily responsible for the observed anomalies in the IPO literature, from initial underpricing to long term underperformance? More specifically: Are IPOs from new industries riskier than IPOs in more established industries? Does the market overprice or underprice long term value of firms entering new industries? In addition, this study examines whether the stages in an industry IPO life cycle differ in terms of the distribution of firm quality and long term returns.

A longitudinal approach allows us to analyze IPOs of firms relative to other IPOs within the same industry that occurred before or after. By performing such a longitudinal study, we were able to examine issues which would not have been possible to analyze using a cross section of IPOs from a single time period. These issues include: Do IPOs in new industries perform better or worse than IPOs in more established industries? Or in other words, how would the investor fare if they bought a portfolio of IPOs from new industries versus buying a portfolio of IPOs from established industries? Additionally, does the quality of firms conducting IPOs improve or deteriorate over the life of the industry? By chronologically examining IPOs within the same industry, this study can reveal how the quality of IPOs, in terms of firm earnings and performance, is related to the stage of the industry's life cycle.

Previous studies of IPOs have evaluated long term performance and underwriter practices, such as underpricing. This study is unique in that it analyzes these issues by distinguishing between IPOs in new industries and IPOs in established industries. Although new industries differ among each other, they share important commonalties that distinguish them from established industries. For instance, firms conducting an IPO in a new industry may be faced with less competition than a firm conducting an IPO in a more established industry. These differences in competition should lead to differences in performance. Firms conducting IPOs in new industries have often seen rapid price increases. Examples include the internet stocks of the late 1990's and the biotech stocks of the 1980's. Additionally, firms in new industries should face fewer barriers to entry than firms in established industries. These barriers to entry such as minimum size and

profitability levels necessary for a firm to survive in the industry could affect the performance of firms trying to enter the market. Another issue which differentiates IPOs in new industries from IPOs in established industries is the availability and reliability of information regarding the future prospects of firms within the industry. All of these issues could lead to differences in performance between IPOs in new and established industries.

This study evaluates two main research questions regarding IPOs. The first research question addresses underwriting pricing practices and market performance. This study analyzes the stock price performance for firms conducting IPOs in new industries relative to that of firms conducting IPOs in established industries. It is possible that the holding period returns between these two groups may differ for reasons such as fewer barriers to entry, less competition, and underpricing. If the underwriter of the issue overprices the IPO, returns will tend to underperform returns of comparable firms. Brav and Gompers (1997) conclude that small, non-venture-backed firms account for the majority of underperformance in returns for IPOs. Given that less is known about IPOs in new industries, there should be greater underpricing of these new issues to compensate investors for taking on extra risk. It should be noted that this extra risk comes from the level of uncertainty regarding a new industry, regardless of what the actual risk of the industry eventually turns out to be. Conversely, some underwriters may see the increased uncertainty as an opportunity to overprice the shares of IPOs in new industries.

The second part of this study compares quality characteristics of the first firms that issue an IPO to the quality characteristics of firms that issue IPOs in latter periods

after the initial IPOs in the industry have been successfully sold. A longitudinal approach enables one to look at the differences in quality among the firms in terms of their order of entrance into the industry. This issue is well suited to the area of new industries as less is known about these industries. Thus, indicators of quality are less apparent. This study hypothesizes that the quality of firms entering the industry will differ, specifically that the quality of early entrants will be higher than that of latter entrants. It is possible that the early firms entering the industry are more knowledgeable given that they were the pioneers of the industry, whereas latter firms may contain a larger percentage of imitator firms. In addition, the latter firms entering an industry may face more entrenched competition. In other words, the latter entrants in a new industry may perform similar to firms in established industries. The usefulness of this study is that provides new information to the investor when selecting between IPO in terms of whether to choose a between an IPO in a new or established industry. Moreover, it offers the investor valuable information regarding the performance of firms entering an industry at various stages of that industry's market cycle.

Literature review

Past studies conclude that, in general, returns on shares of initial public offerings (IPOs) are inferior to returns on comparable risk seasoned shares. Stern and Bornstein (1985) showed that of new issues that went public in the period 1975-1985, an investor would have fared better by purchasing an index fund rather than an IPO. Ritter (1991) examined the long-run performance of IPOs using time and industry related dependencies and found that they underperformed matched firms in a 3-year holding period.

Furthermore, Loughran and Ritter (1995) examined the long run performance of IPOs using both a 3 year and a 5 year time frame and found that after controlling for size and book-to-market effects, issuing firms had lower returns than non-issuing firms.

Brav and Gompers (1997) investigated the sources of long-run underperformance of recent IPO firms by distinguishing between venture-backed IPOs and non-venture-backed IPOs. Their study found that small, non-venture-backed firms were responsible for the underperformance of IPOs. In the tradition of Fama-French (1993), Brav and Gompers adjusted for size and book-to-market and found that these could not explain the underperformance of small, non-venture-backed firms.

Some theories of underpricing have hinged upon asymmetric information arguments (Baron, 1982, and Rock, 1986). Rock's explanation for the underpricing of IPOs is based on the existence of a group of informed investors with information superior to that of both the firm and all other investors. The uninformed investors purchase underperforming securities more often. Underpricing occurs when the investment banker must price the shares at a discount to ensure that the uninformed investors will purchase the issues, and thereby generate commissions for the investment banker.

Baron (1982) focuses on asymmetric information between the issuer and the investment banker. The theory assumes that the investment banker is better informed about the capital market than is the issuer. Underpricing occurs as the issuer must compensate the investment banker for their superior knowledge by letting them offer securities at a discount to their customers. The greater their uncertainty about market demand for their unseasoned issues, the lower the price they will be willing to accept. This may be especially meaningful to issuers in new industries, as there will likely be

greater uncertainty about market demand. Thus, IPOs in new industries may be underpriced more than those in established industries.

Tinic (1988) debunked popular theories of underpricing, such as the risk averse underwriter hypothesis which states that investment bankers underprice to reduce the risk of selling the issue. Tinic disproved this theory by showing that best effort and firm commitment offers are both underpriced equally. He also cast doubt on the monopsony power explanation for underpricing which claims that investment bankers underprice IPOs to their best customers as compensation for paying high commissions. He pointed out that if this were the case, other investment bankers would enter the market and eliminate the benefit. Tinic's primary contribution to the literature is to look at underpricing from a legal perspective. He contends that the underpricing of IPOs serves as an efficient form of insurance against potential legal liability after the Securities Act of 1933.

Recent research in the area of quality of firms conducting IPOs focuses on the likelihood of IPO survival. Jain and Kini (1999) studied the evolution of issuing firms and classified them into three post IPO states: survival, merger, or failure. They developed a multinomial logit model that uses information prior to the IPO to predict the probability of transition to the three post IPO states. They found that lower risk, larger firm size, higher investment banker prestige, higher operating performance and higher intensity in an industry's research and development increase the probability of survival relative to failure. An alternative approach to measuring quality is to use ex-post data. Kringman, Shaw and Womack (1999) found that first-day winners continue to be winners

over the first year, and first-day dogs continue to be relative dogs.

Theories:

Pricing and Performance

This study examines whether IPOs in new industries outperform IPOs in established industries and whether new industry issues are underpriced more often than established industry issues. When an investor is considering investing in a new industry, less information is available regarding the potential profitability of the industry. Less information means less certainty and a greater divergence in opinions regarding potential returns. Additionally, the financial statements of IPOs in new industries are difficult to evaluate. Such uncertainty should result in greater underpricing of these issues to compensate investors for taking on extra risk. It should be noted that this extra risk comes from the level of uncertainty regarding a new industry, regardless of what the actual risk of the industry eventually turns out to be.

This study will test the research hypothesis that shares of IPOs in new industries should be underpriced more than shares of IPOs in established industries. To determine whether IPOs in new industries outperform IPOs in established industries, the holding period returns for firms conducting IPOs in new industries will be compared to firms conducting IPOs in established industries. In addition, the study will examine the differences in characteristics between IPOs in new industries and IPOs in established industries. Characteristics to be examined include size, profitability, leverage and underwriter rankings. In this part of the study, we assume that there are greater barriers

to entry for firms conducting IPOs in established industries than firms conducting IPOs in new industries. Explanatory variables, such as financial characteristics and underwriter data, will be used to examine differences between IPOs in new industries and IPOs in established industries.

Quality

The second issue to be studied relates to whether there is a difference in quality between the first firms in the industry conducting an IPO and those conducting an IPO later in the market cycle. Quality is measured ex-ante and ex-post. A high quality firm is defined as a firm which outperforms other firms in a given time period. This study hypothesizes that the quality of entrants will differ between the initial entrants and the latter entrants within each industry.

The issue of quality differences among IPOs is important for two reasons. First, it provides useful information to individuals who may consider investing in an IPO of a new industry. If the earlier entrants are of higher quality, they may opt to only purchase the first few IPOs in an industry and scrutinize more closely purchases of IPOs later in the industry cycle. Second, as the market begins to discern the good firms in the industry from the bad firms, this increase in supply of lower quality firms may eventually cause a decline in price for some IPOs that were initially highly received. Essentially, the initial excitement about a new industry causes the returns of the first IPOs in a new industry to be high. These high returns cause an increase in demand which pushes the price up further. This increase in price leads to an increase in supply and an eventual decline in prices.

Quality can be measured ex-ante and ex-post. It can be measured ex-ante by looking at financial data. Examples of ex-ante data include any information that investors would have available for decision making before purchasing an IPO, such as revenues, earnings, leverage, and underwriter ranking. The financial data of the companies can be used to determine if earlier issuers are of better quality and latter entrants are of poorer quality. Lower quality firms will have lower quality earnings, revenues, net income after taxes and earnings before interest and taxes.

Quality can be measured ex-post by looking at stock price performance. Ex-post data is used to proxy for information that would eventually reveal whether IPOs are of higher or lower quality. Lower quality firms will ultimately reveal themselves as such when the market realizes their poor performance and adjusts prices accordingly.

Why would investors purchase IPOs when they know little about the quality of the firm? Barberis, Shleifer and Vishny (1998) reported that less sophisticated investors tend to put higher weight on less important information. This higher weighting of less important information leads to certain investors purchasing stocks in a new industry solely because it is a stock in a new industry in which other investors have made significant profits. Thus, in the case of new industries, where less is known and understood about the industry, investors group companies together and ignore other information. This explains why investors purchase IPOs when they know little about the quality.

Data and Methodology:

Data in this study comes from two sources. The University of Chicago's Center for Research in Securities Prices (CRSP) provides the stock price data, trading histories and delisting data. Data from the Securities Data Corporation (SDC) has been gathered for all IPOs during the period from January 1970 to April 1999. The SDC data set includes financial data, amendment history data, industry classification, percentage change in price data, and underwriter information.

The sample of all IPOs from 1970 to 1999 was divided into those in new industries and those in established industries. The process for dividing the firms is as follows. Industry classification codes were obtained from SDC. The firms were divided into industry categories and ranked chronologically. A new industry is formed when the first industry classification appears. If an industry was in existence prior to 1970, it is categorized as an established industry. The number of IPOs in established industries and in new industries in each year can be found in table 1. During the 28-year period studied, the total number of IPOs in established industries was 7227, whereas the total number of IPOs in new industries was 2732.

The main categories of new industries include biotechnology, computers, telecommunications, electronics, and software, as well as some other smaller categories. A list of industries classified as new can be seen in table 2. These main categories can be further subdivided by the industry classification code given by SDC. For the portion of the study where quality comparisons are done between early, middle and latter entrants, only industries that contained 50 or more firms were used. This is to ensure a large enough sample size of firms at various stages in the industry's life cycle.

Underpricing and Underperformance

This study will compare the performance of IPOs of new industries to all other IPOs to determine if these stocks exhibit better performance in the long run. The analysis of the long run IPO returns will be based on average holding period returns from one to ten year time intervals. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t} \quad (1)$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a benchmark portfolio holding period return for t days. The benchmarks used for this study are the Nasdaq Composite Index, as well as the CRSP equally weighted and value weighted return comprised of stocks from the NYSE, American and Nasdaq. The benchmark portfolio has its holding period return calculated for the same time period as the holding period return calculated for the IPO firm. Serving as the benchmark portfolio, the benchmark index is re-weighted everyday, resulting in a rebalanced return. Abnormal holding period returns are calculated by subtracting the benchmark portfolio compounded, rebalanced return from an IPOs holding period return, as shown in equation (1). For the IPO firms, the securities holding period return is calculated by compounding monthly returns obtained from CRSP as shown in equation (2).

$$R_{jT} = [\prod_{t=start}^{T} (1 + r_{jt}) - 1] \quad (2)$$

where start is the CRSP listed closing price on the day of the IPO, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. Excess returns will not be

adjusted for risk given that it is not possible to determine the risk of a security that has no price history. This approach is standard for all IPO research (Ritter (1991), Loughran and Ritter (1995)). Selection bias is corrected for by assigning the benchmark return to the IPOs return if a firm stops trading. The portfolio is re-weighted at the beginning of every year.

The holding period return for IPOs in new industries will be compared to that of all other IPOs. If the holding period return for these stocks is greater than that of all other IPOs it would indicate that IPOs in new industries outperform IPOs in established industries. The testable hypothesis is whether or not the performance of IPOs in new industries is significantly different from that of IPOs in established industries.

Ho: There is no difference in performance between IPOs of new industries and established industries.
Ha: IPOs of new industries outperform IPOs in established industries.

Differences between new and established industries.

The study will examine the differences between IPOs in new industries and IPOs in established industries at the time of issuance. It is assumed that there are greater barriers to entry for firms conducting IPOs in established industries than firms conducting IPOs in new industries. Explanatory variables, such as financial characteristics and underwriter data, are used to examine differences between IPOs in new industries and IPOs in established industries.

This test utilizes a logit model to test whether various explanatory variables, such as financial data, size, venture backed status, leverage and underwriter data, explain differences between IPOs in new industries and IPOs in established industries at the time of issuance (equation 3).

$$Y_{it} = \beta_1 x_{i1} + \ldots\ldots + \beta_k x_{ik} + \varepsilon \qquad (3)$$

where

$Y_{it} = 1$ IPO in New Industry

$Y_{it} = 0$ IPO in Existing Industry

$\beta_1 - \beta_k$ = coefficient on kth explanatory variable

$X_{i1} - X_{ik}$ = explanatory variables

ε = error term

The regressors in the above model will be variables that discriminate between the two types of offers. A comparison shows that firms conducting IPOs in new industries are smaller than firms conducting IPOs in more established industries in terms of revenues, assets, capitalization and number of employees (Table 3). It is possible that there are lower barriers to entry in a new industry. Therefore, one would predict that firms entering a new industry would be smaller than firms in an established industry where barriers to entry, such as size, are greater.

One would also expect that if there were greater barriers to entry in an established industry, entering firms would be more profitable than issuing firms in a new industry. The pre-offer comparison indicates that firms conducting an IPO in an established industry are more profitable at the time of issuance than firms conducting an IPO in a new industry (Table 3).

If a firm conducting an IPO is highly profitable at the time of issuance, it may serve as an indicator that the future performance of the stock will be superior. If a company has high profitability at issuance, investors may predict that it will do well in the future which could lead to an increase in demand for that stock. Measures of profitability to be used as regressors will include return on assets, return on equity, and net income after taxes.

The debt to equity ratio of firms conducting an IPO in an established industry is higher than that of firms conducting an IPO in a new industry at the time of issuance. If there were greater barriers to entry for firms in established industries, then one would predict that firms entering would have less leverage, as more debt may make the firm vulnerable to competition. The debt to equity ratio will be used as a measure of leverage in the logit regression.

The pre-offer comparisons between established and new industries indicate that the age of a company at IPO in days, is less for firms conducting an IPO in a new industry (Table 3). Age of a company can be measured by subtracting the year a company was founded from the year it was offered. If a company goes public in haste to benefit from a strong market or positive perceptions about the industry, its price pattern may exhibit an increase in demand. The company may have prematurely gone public and thus not have been a mature enough company to withstand market scrutiny.

Quality

The second issue concerning IPOs in new industries relates to whether there is a difference in quality between the first firms in the industry conducting an IPO and the

firms that conduct an IPO later in the industry's market cycle. This study hypothesizes that the quality of entrants will differ between the initial entrants and the latter entrants, specifically that the quality of early entrants will be higher than the latter entrants. The rationale for this hypothesis is that the early entrants into the industry are more knowledgeable given that they were the pioneers of the industry, whereas latter firms may contain a larger percentage of firms which are imitating the original entrants. The methodology consists of ranking the IPOs in new industries chronologically from the first entrants to the last entrants within each industry. These IPOs will be divided into thirds and comparisons will be made between the earlier entrants and the latter entrants based on two categories of quality measures: ex-ante and ex-post.

Ex-ante measures of quality include firm financial data and other information that an investor can use as a gauge of quality at the time of purchase. Specific firm financial data include return on assets, return on equity, net income after taxes, and earnings before interest and taxes. Higher returns indicate higher quality. Other specific ex-ante measures of quality include rank of underwriters, venture backed status, size of the company and age of the company.

IPOs that are venture backed are assumed to be of higher quality because the underwriters are putting their own money at stake. Higher quality IPOs are more likely to have underwriters with better reputations. Therefore, underwriter quality, in terms of lead manager and co-managers, will be examined to determine differences in quality between early and latter entrants into an industry.

Other measures of quality that will be looked at are size measured by number of employees and age of the company measured by the difference between year founded and

IPO year. It is assumed that larger companies that have been in operation longer are more likely to be of higher quality. Thus, the number of employees and age of the company at issuance will be used to determine differences in quality between early and latter entrants into an industry.

Price performance will be used as an ex-post measure of quality. By looking at the future return to IPOs over time, we can predict that the higher quality firms will have higher performance in the long run. Specific measures of performance will include holding period returns for one to ten years. Higher quality firms should have greater long term returns.

Ho: There is no difference in quality between the early entrants and latter entrants.
Ha: The earlier entrants are of higher quality than the latter entrants.

Results:

Pricing and Performance

This study examines whether IPOs in new industries outperform IPOs in established industries and if these issues are underpriced more often than IPOs in established industries. When an investor is considering investing in a new industry, less information is available regarding the potential profitability of the industry. Less information means less certainty and a greater divergence in opinions regarding potential returns. Additionally, the financial statements of IPOs in new industries are difficult to evaluate. These combined increases in uncertainty should result in greater underpricing of these issues to compensate investors for taking on extra risk. It should be noted that

this extra risk comes from the level of uncertainty regarding a new industry, regardless of what the actual risk of the industry eventually turns out to be.

By comparing holding period returns between new and established industries, the study finds that firms conducting IPOs in new industries outperform firms conducting IPOs in established industries. The holding period return of IPOs in new industries is greater than that of IPOs in established industries. The five year abnormal holding period return for IPOs in new industries using a nasdaq benchmark is 17.46% (Table 4). Firms conducting an IPO in an established industry fared worse. The five year abnormal holding period return for IPOs in established industries using a nasdaq benchmark is 0.18% (Table 5). The difference between these two HPRs are statistically significant (t=2.53). The one year, two year, three year and four year holding period returns are all positive for the IPOs of firms in new industries. In contrast, the same period's holding period returns are negative for the IPOs of firms in established industries. Results are similar using a CRSP value weighted index and CRSP equally weighted index. It should be noted that the holding period returns for IPOs in established industries are consistent with the findings of previous studies which found that IPOs underperform the market during the first five years (Ritter, 1991).

Intuitively, the finding that firms conducting IPOs in new industries outperform firms conducting IPOs in established industries makes sense. Firms in new industries have less competition than firms in established industries, whereas firms conducting IPOs in established industries are competing against entrenched competitors. Moreover, firms in established industries, given their greater certainty regarding prospects for future earnings, would be less risky than firms in newer industries. The capital asset pricing

model implies that less risky investments will generate lower returns than more risky investments. Pre-offer comparisons indicate firms conducting an IPO in a new industry are less profitable at the time of issuance in terms of return on assets and return on equity (Table 3), even though their performances are superior.

These results are not due to the clustering of IPOs in hot markets for two reasons. First, neither clustering nor hot markets could explain the high returns to the first few firms. Second, they may explain some of the later stage offerings, but they do show that these IPOs yield poor long term returns.

Could IPOs be in itself a process of selection, in which less successful startups in the new industries may not even reach the IPO stage? Our results indicate that this is not the case. First, since we are comparing IPOs in new industries with IPOs from established industries, such selection is also present if not more so, as the latter would have to have a proven record of profit and higher minimum size. Second, we also demonstrate that in later stages, the self selection process had become less of a factor as more inferior IPOs were able to be offered.

Could the observed result be due to higher demand for new states of the world payoff introduced by the new industries, and a desire to add to one's portfolio to complete the market? In order to test whether this is the case, we take out the first three earliest firms in each industry, where the value of new states is greatest from the sample and calculate the cumulative mean abnormal return for this subsample. We find that the results are similar to the original new industry sample. New industries, even without the first few firms in an industry, outperform the established industries sample (table 6). The five year cumulative holding period return is 25.74%, which is significantly higher than

the established firms. Thus, we show that the superior long term performance is not due to a new industry's state spanning property.

The key to understanding the outperformance of the new industry sample may lie in the following result. It could be the case that the IPOs in new industries outperform IPOs in established industries due to a few extremely successful firms. Within the new industry sample, we removed the top three performing firms based upon their first year performance. We find that this subsample of new industries only produces significant outperformance in years four and five (table 7). The performance in the remaining years is not significantly different.

To add further strength to this finding, a sub-sample of the first five firms in every new industry is examined using the same methodology. This approach is to intentionally bias the study to give more weight to industries that do not have very many entrants, and thereby to provide robustness to the results mentioned above. The results indicate that the holding period returns for the first five IPOs in new industries are greater than the holding period return of IPOs in established industries during the first seven years. The five year abnormal holding period return for the first five IPOs in new industries using an equally weighted index is 21.70%, which is only one point higher than that of all IPOs in new industries (Table 8). The first five firms in a new industry conducting an IPO have higher price performance in the earlier year. Possibly this is due to strategic benefits from being the first firms in a new industry. These benefits may come from less competition in the beginning or from being pioneers of the technology. During the eighth, ninth, and tenth years the holding period returns for the first five IPOs in a new industry are less than the holding period return of IPOs in established industries.

Could these IPOs intentionally be underpriced, as all firms in a growth industry anticipate future financing? This is unlikely given that the desire to seek more financing, along with other factors such as greater uncertainty, may cause an initial underpricing at most, but it could not explain the superior long term performance we have found. In addition, the short term underpricing at the IPOs in new industries are higher than that of IPOs in more established industries, but not by a significant amount. We shall address this issue next.

The amount of underpricing and short term price movements are compared between new industries and established industries (Table 9). IPOs in new industries show a larger amount of underpricing. Underpricing is measured as the amount of first day price increase. The percentage change from the offer price to the closing price on the day of the IPO is 52.19% for IPOs in new industries. This is compared to 41.95% for IPOs in established industries. This difference is statistically significant (t=3.57). An explanation for the difference may be the lack of information available on the potential profitability of the new industry. Less information means less certainty and a greater divergence in opinions regarding potential returns. Additionally, the financial statements of IPOs in new industries are difficult to evaluate. These combined increases in uncertainty result in greater underpricing of these issues to compensate investors for taking on extra risk. The first day price increases are larger than those found by Ritter. The time period studied by Ritter was 1975-1984, whereas this study looks at the period from 1970 – 1998. First day price increases have risen into the range of 50% in the 1990s (*WSJ*, 2000).

The short term price movements of the IPOs are measured as the percentage change from the closing price on the offer day to the closing price a few weeks after the IPO. The results show that firms conducting IPOs in new industries have a price movement 90 days after the IPO of 1.29%, while firms conducting IPOs in established industries have a price movement 90 days after the IPO of -1.05% (Table 9). However, it should be noted that the difference in means is not statistically significant (t=1.34).

Differences between new and established industries

The study examines the differences between IPOs in new industries and IPOs in established industries at the time of issuance. It is assumed that there are greater barriers to entry for firms conducting IPOs in established industries than for firms conducting IPOs in new industries. Explanatory variables, such as financial characteristics and underwriter data, will be used to examine differences between IPOs in new industries and IPOs in established industries. This test consists of a logit model to examine differences between IPOs in new industries and IPOs in established industries. The logit regression is run with the binary classification of IPOs in new industries = 0, and IPOs in established industries = 1. A logit model is used given that stock return data does not follow a normal distribution.

The results of the logit regression indicate that IPOs in new industries have smaller return on equity at the time of issuance (Table 10). A possible explanation is that since there are lower barriers to entry in a new industry, one would predict that firms entering a new industry would be smaller than firms in an established industry where

barriers to entry are greater. It should be noted that the regressors of return on assets and net income after taxes were not significant. The findings indicate that IPOs in new industries have smaller capitalization and smaller principal amounts (Table 10). The number of employees as a size measure is not significant. The debt to equity variable is not significant.

The results indicate that IPOs in new industries are more likely to be venture backed than IPOs in established industries. The finding that IPOs in new industries are more likely to be venture backed is especially interesting given that Brav and Gompers (1997) found that non-venture-backed firms account for the majority of underperformance in returns for IPOs. It may be the case that IPOs in established industries are partly responsible for the underperformance attributable to IPOs. In summary, the results of the logit regression indicate that at the time of issuance, IPOs in new industries have smaller return on equity, smaller capitalization, smaller principal amounts, and are more likely to be venture backed (Table 10).

Quality differences between IPOs in New Industries and Established Industries

One way of examining the quality of IPOs between new and established industries is to examine the trading history of firms in each category. The trading history of IPOs in new industries is examined to determine whether firms in new industries merge, declare bankruptcy or violate SEC regulations more often. Out of a total of 2,416 firms conducting an IPO in a new industry, 530 merged (21%), 21 declared bankruptcy (0.87%), and 389 delisted due to violation of an SEC regulation (16%), leaving 1,476 still trading (61%) after 20 years (Table 11). For firms conducting an IPO in an established

industry, out of a total of 3,907 firms, 1,103 merged (28%), 77 declared bankruptcy (1.97%), and 1,010 delisted due to violation of an SEC regulation (26%), leaving 1717 still trading (44%) after 20 years (Table 12). This study shows that IPOs in new industries tend to merge less often than firms in established industries, they declare bankruptcy less often and delist due to violation of SEC regulations less often than firms conducting an IPO in established industries. These results indicate that IPOs in new industries are not 'rogue' firms.

Another way of examining differences in quality between new and established industries is to look at the sub-sample of firms that eventually merge and compare the merger price to the IPO price. If the merger price is higher than the IPO price, the firm is designated as a good firm or higher quality firm. If the merger price is lower than the IPO price, the firm is designated as a bad firm or lower quality firm. In the new industries sample, 527 mergers occurred, out of which 289 (54.8%) occurred at a price lower than the IPO price (Table 13). In the established industries sample, 1100 mergers occurred, out of which 721 (65.5%) occurred at a price lower than the IPO price (Table 14). These results indicate that of those firms that eventually merge, there is a greater likelihood that the merger price will be lower than the IPO price for established industries than for new industries. In other words, of those firms that eventually merge, firms in established industries are more likely to be lower quality firms.

Quality differences among early, middle, and latter entrants in an industry

The next issue relates to whether there is a difference in quality between the first firms in the industry conducting an IPO and those that conduct an IPO later in the market

cycle. The results indicate that the quality of entrants differs between the initial entrants, middle entrants and the latter entrants. This issue is important because it provides new information to the investor when selecting between IPOs in terms of whether to choose an early, middle or latter entrant into a new industry.

Quality differences are examined using both ex-ante and ex-post data. Financial data is used as the ex-ante data. Stock price performance is used as the ex-post data. Accounting information and underwriter data at the time of issuance is used to proxy for the quality level of the firm and comparisons are made between the three groups (Table 15). Underwriter ranking indicates that the early entrants are of higher quality than the latter entrants. The rank of the lead managers monotonically declines from 1.55 for the early entrants, 1.91 for the middle entrants and 2.45 for the latter entrants. These numbers are significant at the .01 level. This study finds that the middle and latter entrants period is characterized by an increase in the standard deviation of many quality indicators which documents an increase in mix of higher and lower quality entrants. For example, the standard deviation of both return on assets and return on equity is greater in the middle and latter periods.

It should be noted, however, that some of the accounting data does not support the hypothesis that the earlier firms are of higher quality than the latter firms. An explanation for this finding could be that these numbers reflect data available at issuance. Data available at issuance could be subject to earnings management. A low quality firm may not appear as such until numerous earnings reports have come out and the firm is subject to market scrutiny. For this reason, ex-post data is examined as well, and paints a much different picture of the latter entrants into an industry.

Stock price performance is used to determine differences in quality between the early, middle and latter entrants from an ex-post standpoint (Table 16). Holding period returns are calculated for one to ten years for each of the three groups. The early entrants show no negative abnormal returns for any of the years. The middle entrants show only one negative abnormal return in the first year of -8%, after which the abnormal returns are all positive. The stock returns of the latter entrants differ sharply from those of the early and middle entrants. Abnormal returns for the latter entrants group are negative for all ten years. The differences between the early entrants and latter entrants are all statistically significant. Thus, the quality of the latter entrants is lower than that of the early and middle entrants when measured by stock price performance.

Conclusion:

This study provides a unique approach in examining issues related to initial public offerings. It differentiates between IPOs in new and established industries and finds that there are significant differences in stock price performance between these groups. During holding periods of one to ten years, IPOs in new industries outperform IPOs in established industries. Pre-offer comparisons indicate that firms conducting IPOs in new industries are less profitable at the time of issuance than IPOs in established industries in terms of return on assets and return on equity, although their performances are superior.

The results of the logit regression indicate that IPOs in new industries have smaller return on equity, smaller capitalization, smaller principal amounts, and are more likely to be venture backed. This finding is especially interesting given that Brav and Gompers (1997) found that non-venture-backed firms account for the majority of

underperformance in returns for IPOs. It may be the case that IPOs in established industries are partly responsible for the underperformance found when investing in IPOs.

This study shows that IPOs in new industries tend to merge less often than firms in established industries, they declare bankruptcy less often and delist due to violation of SEC regulations less often than firms conducting an IPO in established industries. In other words, the majority of IPOs in new industries are not rogue firms. By chronologically tracing firms within an industry, this study shows that the quality of entrants differs throughout the history of the industry.

The usefulness of this study is that it provides new information to the investor when selecting between IPOs in new or established industries, and also when selecting among IPOs of firms entering a new industry in the early, middle or latter stage of its market cycle. One particular new industry that is receiving much attention is the e-commerce industry. This study provides timely implications for e-commerce firms. Specifically, that the first few firms in an industry are likely to be of higher quality than the latter firms entering the industry. However, the returns of the IPOs in the internet industry are likely to be higher than a given IPO in an established industry.

Table 1
Data Description
The number of IPOs in Established vs. New industries, by year.

Year	IPOs in Established Industries	IPOs in New Industries
1970	202	20
1971	225	13
1972	415	35
1973	78	17
1974	26	10
1975	14	12
1976	25	14
1977	22	11
1978	19	25
1979	125	33
1980	274	84
1981	437	182
1982	156	48
1983	297	197
1984	257	176
1985	254	68
1986	566	132
1987	417	104
1988	216	52
1989	182	58
1990	157	50
1991	252	125
1992	397	149
1993	549	165
1994	383	151
1995	290	206
1996	448	294
1997	323	186
1998	221	115
Total	7227	2732

Table 2

Number of New Industries by Industry New Industry	Cumulative Number in Industry by 1998	Year of First Recorded IPO	SIC Code
BIOTECHNOLOGY			
Drug Delivery	17	1987	2834
Pharmaceuticals	158	1970	2834
Invivo Diagnostics	49	1981	2835
Blood Derivatives	14	1979	2836
Genetically engineered Products	18	1986	2834
Biological Chemical Products	27	1972	2836
Vaccines	32	1986	2836
Rehabilitation Equipment	29	1980	3841
Artificial Limbs	3	1970	3842
Medical Instruments	39	1979	3842
Biotech Instruments	112	1970	3845
Medical Imaging Systems	23	1980	3845
Medical Lasers	18	1970	3845
Medical Monitoring	24	1980	3845
Surgical Equipment	112	1970	3845
COMPUTERS			
Robotics	22	1972	3569
Micro computers PCs	93	1971	3571
Disk Drives	44	1971	3572
Supercomputers	30	1983	3573
Monitor	11	1971	3575
Printers	21	1979	3577
Scanning Devices	24	1972	3579
Alarm Systems	2	1981	3585
TELECOMMUNICATIONS			
Data Communications	16	1972	3661
Messaging Systems	22	1988	3662
Microwave communications	16	1983	3663
Modem	9	1990	3661
Telecommunications Interconnect Eqpt.	56	1979	3661
Satellite Communications	29	1972	3663
Telecommunications Equipment	146	1973	3669
Cellular Communications	56	1981	4812
ELECTRONICS			
Printed Circuit Boards	28	1971	3672
Semiconductors	141	1972	3674
Superconductors	14	1983	3674
Advanced Manufacturing Systems	8	1993	3699
Defense Electronics	12	1970	3812
Search Detection Navigation	36	1970	3812
Lab Equipment	21	1980	3826
Lasers	14	1982	3827
Precision measuring test equipme	93	1970	3829
Process Control Systems	25	1972	3829
SOFTWARE			
Database Software	93	1981	7370
Programming Services	42	1976	7371
Communication Network Software	57	1983	7372
Miscellaneous Software	181	1971	7373
Computerized equipment	13	1983	7374
Internet Services and Software	115	1984	7375
Utilities Software	23	1983	7372
Operating Systems	26	1983	7372
Networking Systems	67	1972	7373
Computer Consulting Services	25	1986	7379
Computer Systems	158	1983	7389
Cad Cam	29	1981	7373
Data Processing Services	85	1971	7374
OTHER			
Healthcare Services	46	1981	8011
Nuclear Medicine	18	1986	8731
Research and Development	82	1973	8734
Turnkey Systems	6	1999	8373
Pet care services	2	1993	2047

Table 3.

Pre offer comparisons: Established versus New

Data listed below is from reporting prior to IPO for IPOs in established and new industries. Data comes from Securities Data Corporation. Return data (90 day and 1 year) comes from University of Chicago's Center for Research in Securities Prices (CRSP).

	Established	New
Size		
Revenue	$481,110, 000	$29,360,000
Assets	$87,662,570,000	$851,540,000
Capitalization	$1,056,290,000	$113,840,000
Number of Employees	1094	347
Prior Performance		
ROA%	-0.0004	-1.73
ROE%	-0.03	-12.94
Net income after taxes	-$350,000	-$14,730,000
Earnings before interest and taxes	$52,560,000	-$11,460,000
Risk		
Debt/Equity ratio	0.65	0.30
Age of company at IPO in days	4771	3194
Venture Capital Backed	0.23	0.62
Underwriting and Pricing		
Price/Earnings ratio	116.95	97.29
Expense%	2.72	2.30
Gross spread %	6.72	6.94
Reallowance fee %	0.89	0.81
Underwriters fee %	1.39	1.46
Number of Amendments	4.06	4.38
Rank of Co-Leads	3.45	3.42
Principal Amount of IPO	$156,200,000	$113,910,000
Post Issue Performance		
First Day Raw Return %	41.95	52.19
90 Day Abnormal Return %	-1.05	1.29
1 Year Abnormal Return %	-1.67	0.24

Table 4

New Industries Holding Period Returns Using Nasdaq Index

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year. The t-test measures the level of significance.

Years Held	Number of Observations	Cumulative Mean Abnormal Return % From Closing Price on IPO date	New versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	2239	-2.72	1.14	74.279	-2.59
2	2020	0.16	2.92**	141.57	0.14
3	1598	6.01	3.43**	199.18	5.19
4	1330	18.36	4.05**	289.95	15.10
5	1113	17.46	2.53**	335.59	13.68
6	930	28.26	1.63*	500.06	21.08
7	763	59.94	1.81*	712.14	42.59
8	639	88.37	1.39	799.13	59.81
9	563	99.17	1.01	784.39	63.92
10	497	121.77	0.05	1140.87	74.75

* indicates significance at the .05 level

** indicates significance at the .01 level

Table 5

Established Industries Holding Period Returns Using Nasdaq Index

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year. The t-test measures the level of significance.

Years Held	Number of Observations	Cumulative Mean Abnormal Return % From Closing Price on IPO date	New versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	3730	-4.93	1.14	71.03	-4.69
2	3547	-10.07	2.92**	115.72	-9.13
3	2937	-12.22	3.43**	153.57	-10.55
4	2477	-14.17	4.05**	200.73	-11.65
5	2010	-10.11	2.53**	263.96	-7.92
6	1562	0.18	1.63*	354.60	0.13
7	1260	15.24	1.81*	392.05	10.83
8	1059	43.01	1.39	542.09	29.11
9	917	61.65	1.01	634.54	39.74
10	789	125.05	0.05	1022.46	76.77

* indicates significance at the .05 level

** indicates significance at the .01 level

Table 6

New Industry sample with the removal of the first 3 entrants in each industry

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year. The t-test measures the level of significance.

Years Held	Number of Observations	Cumulative Mean Abnormal Return % From Closing Price on IPO date	New versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	1527	-4.91	1.51	73.71	-4.67
2	1378	-2.51	0.54	132.82	-2.16
3	1086	4.059	1.69*	162.53	3.50
4	909	17.09	2.15**	320.51	14.06
5	777	25.74	1.74*	437.11	20.17
6	650	46.39	1.48	490.87	34.61
7	529	68.08	1.77*	688.70	48.38
8	438	100.12	1.57	706.73	67.78
9	381	167.57	2.02**	1159.30	108.03
10	326	262.78	1.72*	1627.89	161.41

* indicates significance at the .05 level

** indicates significance at the .01 level

Table 7

New Industry sample with the removal of the top 3 one-year performing entrants in each industry

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year. The t-test measures the level of significance.

Years Held	Number of Observations	Cumulative Mean Abnormal Return % From Closing Price on IPO date	New versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	1645	-8.92	-3.54**	69.18	-8.49
2	1558	-6.82	-0.62	132.50	-6.18
3	1300	0.51	1.03	197.97	0.44
4	1077	14.73	2.06**	294.53	12.11
5	912	18.79	1.64*	342.79	14.72
6	773	22.59	0.21	500.24	17.69
7	636	37.58	0.64	640.07	26.71
8	534	68.16	0.63	775.01	43.93
9	472	82.40	0.40	909.03	53.11
10	419	121.66	-0.02	1145.16	71.13

* indicates significance at the .05 level

** indicates significance at the .01 level

Table 8

First Five IPOs in a New Industry Holding Period Returns

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year. The t-test measures the level of significance.

Years Held	Number of Observations	Value Weighted Cumulative Mean Abnormal Return % From Closing Price on IPO date	First Five versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	240	17.42	4.39 **	84.6	16.59
2	202	32.17	4.65 **	151.5	29.17
3	197	44.17	4.41 **	242.6	38.15
4	192	37.31	2.91 **	254.4	30.69
5	184	21.70	1.15	248.2	17.00
6	170	14.38	0.14	252.0	10.73
7	157	35.33	0.25	380.5	25.10
8	141	34.81	0.45	457.2	23.56
9	133	23.85	0.95	413.9	15.37
10	124	57.26	0.92	563.6	35.15

Years Held	Number of Observations	Equally Weighted Cumulative Mean Abnormal Return % From Closing Price on IPO date	First Five versus Established t-test	Standard Deviation	Present Value Adjusted Abnormal Return %
1	240	12.27	2.99 **	82.5	11.68
2	202	21.22	3.08 **	149.2	19.24
3	197	28.01	2.83 **	237.1	24.19
4	192	20.09	1.50	244.3	16.52
5	184	0.577	0.07	242.4	0.45
6	170	5.904	0.46	244.9	3.59
7	157	11.52	0.33	363.4	8.18
8	141	10.16	0.77	458.8	6.87
9	133	14.71	0.89	414.8	9.48
10	124	24.54	1.04	563.9	15.06

* indicates significance at the .05 level

** indicates significance at the .01 level

Table 9

Underpricing and Short Term Price Movements

The amount of underpricing is calculated as the percentage change in price from the IPO offer price to the closing price on the day of the IPO. For the short term price movements, the Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The number of observations indicates the number of IPOs in the sample.

	% change from Offer Price to Closing Price on IPO date	% change from close on offer date to 1 week After IPO	% change from close on offer date to 2 weeks After IPO	% change from close on offer date to 90 days After IPO
IPO's in New Industries (n= 2239)	52.19%	-0.4%	1.08%	1.29%
IPO's in Established Industries (n= 3730)	41.95%	0.05%	0.16%	-1.05%
Difference in Means between IPO's in New Industries And IPO's in Established Industries	t=3.57*	t=0.97	t=2.16*	t=1.34

* indicates significance at .05 level

Table 10

Logit Regression

New industries = 0, Established industries = 1. ROA: Return on Assets (Net Income After Taxes/ Assets after IPO), ROE: Return on Equity (Net Income After Taxes/ Equity after IPO), NIAT: Net Income after Taxes (millions). ASSETS: Total Assets before Offering ($ mil) , CAP: Total Capitalization ($mil), PRIN: Principal Amount., EMP: # of employee at time of IPO, DE: Long Term Debt to Equity ratio, AGE: # of days between founding of company and IPO date, RANKCL: Rank of CoLead, VEN: Venture backed Status yes=1 no=0. (Financial Data is from most recent financial period closest to IPO date).

Variable	DF	Estimate	Std Err	ChiSquare	Pr>Chi
INTERCPT	1	1.33468	0.50775	6.90968	0.0086
ROA	1	0.0296	0.02109	1.98212	0.1592
ROE	1	0.03001	0.01806	2.76085	0.0966*
NIAT	1	0.01168	0.05016	0.05422	0.8159
ASSET	1	0.00265	0.00446	0.35414	0.5518
CAP	1	0.01446	0.00671	4.64651	0.0311**
PRIN	1	0.0249	0.00886	7.94775	0.0048**
EMP	1	0.00007	0.00059	0.01679	0.8969
DE	1	0.00070	0.00255	0.07549	0.7835
AGE	1	0.00001	0.00002	0.44889	0.5029
RANKCL	1	0.2007	0.23278	0.74373	0.3885
VEN	1	-1.4695	0.30090	23.8503	0.0001**

* * = significance at alpha = .05

* = significance at alpha = .10

Table 11
Qualitative Risk of New Industries

Years traded refers to the number of years in which a firm traded on an exchange. It is found by subtracting the IPO date from either the delisting date or 12/31/98 if the security was still trading. The sample was then subdivided into those firms still trading, and those firms which merged, declared bankruptcy, or were delisted for violation of SEC regulations. Examples of violations of SEC regulations include: insufficient number of market makers, insufficient number of shareholders, price fell below acceptable level, insufficient capital, insufficient assets, delinquent in filing, non-payment of fees, protection of investors and the public interest, corporate governance violation. The delisting reason was acquired from CRSP.

Years Traded	Still Trading	Merge Above IPO Price	Merge Below IPO Price	Bankruptcy	Delisted	Total
<1	153	1	1	0	3	158
1	181	20	26	1	47	275
2	251	38	56	3	70	418
3	141	27	46	2	55	271
4	102	22	36	3	49	214
5	99	20	23	4	34	181
6	90	13	21	5	33	162
7	66	15	16	0	25	122
8	29	12	13	3	17	74
9	30	20	14	0	13	77
10	20	15	3	0	8	46
11	34	6	6	0	7	53
12	52	3	7	0	4	66
13	16	4	3	0	3	26
14	19	5	5	0	11	40
15	46	5	7	0	1	59
16	10	5	4	0	3	22
17	63	4	2	0	4	73
18	35	3	0	0	2	40
19	21	0	0	0	0	16
20+	16	0	0	0	0	16
Total	1476 (61%)	238 (10%)	289 (11%)	21 (1%)	389 (16%)	2416

Table 12

Qualitative Risk of Established Industries

Years traded refers to the number of years in which a firm traded on an exchange. It is found by subtracting the IPO date from either the delisting date or 12/31/98 if the security was still trading. The sample was then subdivided into those firms still trading, and those firms which merged, declared bankruptcy, or were delisted for violation of SEC regulations. Examples of violations of SEC regulations include: insufficient number of market makers, insufficient number of shareholders, price fell below acceptable level, insufficient capital, insufficient assets, delinquent in filing, non-payment of fees, protection of investors and the public interest, corporate governance violation. The delisting reason was acquired from CRSP.

Years Traded	Still Trading	Merge Above IPO Price	Merge Below IPO Price	Bankruptcy	Delisted	Total
<1	110	1	8	1	7	127
1	225	28	72	4	107	436
2	258	61	132	14	203	668
3	144	57	94	14	166	475
4	150	46	92	15	128	433
5	191	39	66	10	126	432
6	114	31	49	7	73	275
7	79	23	35	5	55	197
8	29	19	40	2	37	127
9	27	21	34	0	28	110
10	25	15	20	0	19	79
11	62	8	29	2	14	115
12	79	6	17	1	14	117
13	31	10	9	1	13	64
14	21	1	7	1	2	32
15	48	5	7	0	7	67
16	7	3	3	0	5	18
17	56	3	6	0	1	66
18	34	0	1	0	2	37
19	20	1	0	0	0	20
20+	7	1	0	0	3	12
Total	1717 (44%)	379 (10%)	721 (18%)	77 (1.97%)	1010 (26%)	3907

Table 13
New Industries
Price above or below IPO issue price

The sample of firms consists of IPO's in new industries which eventually merged. Years traded refers to the number of years in which a firm traded on an exchange. It is found by subtracting the IPO date from either the delisting date or 12/31/98 if the security was still trading. The IPO price of a firm is compared to the delisting price of a firm at the time of merger. If the merger price is higher than the IPO price, the firm is designated as a good firm. If the merger price is lower than the IPO price, the firm is designated as a bad firm.

Merged Firms Sample

Years Traded	Bad Firm	Good Firm	Total
<1	1	1	2
1	26	20	46
2	56	38	94
3	46	27	73
4	36	22	58
5	23	20	43
6	21	13	34
7	16	15	31
8	13	12	25
9	14	20	34
10	3	15	18
11	6	6	12
12	7	3	10
13	3	4	7
14	5	5	10
15	7	5	12
16	4	5	9
17	2	4	6
18	0	3	3
Total	289	238	527

Table 14
Established Industries
Price above or below IPO issue price

The sample of firms consists of IPO's in new industries which eventually merged. Years traded refers to the number of years in which a firm traded on an exchange. It is found by subtracting the IPO date from either the delisting date or 12/31/98 if the security was still trading. The IPO price of a firm is compared to the delisting price of a firm at the time of merger. If the merger price is higher than the IPO price, the firm is designated as a good firm. If the merger price is lower than the IPO price, the firm is designated as a bad firm.

Merged Firms Sample

Years Traded	Bad Firm	Good Firm	Total
<1	8	1	9
1	72	28	100
2	132	61	193
3	94	57	151
4	92	46	138
5	66	39	105
6	49	31	80
7	35	23	58
8	40	19	59
9	34	21	55
10	20	15	35
11	29	8	37
12	17	6	23
13	9	10	19
14	7	1	8
15	7	5	12
16	3	3	6
17	6	3	9
18	1	0	1
19	0	1	1
20	0	1	1
Total	721	379	1100

Table 15

Quality Differences using Financial Data

The table below represents the 17 industries broken up into 3 categories: early, middle and latter entrants based upon time of entrances into that particular industry. Only industries which contained 50 or more entrants were included in this sample in order to only include industries which contained early, middle and latter entrants.

ROA: Return on Assets (Net Income After Taxes/ Assets after IPO), ROE: Return on Equity (Net Income After Taxes/ Equity after IPO), PE: Price to earnings ratio, ASSETS: Total Assets before Offering ($ mil) , CAP: Total Capitalization ($mil), REV: Revenues ($ mil), EPS: 5 year EPS growth (EPS for 5 year period following IPO), DE: Long Term Debt to Equity ratio, RANKCL: Rank of CoLead, EBIT: Earnings before income and taxes (millions), NIAT: Net income after taxes (millions), FEE: Underwriting fee as a % of principal, PRICE: IPO price, NUMAMEN: # of amendments filed, VEN: Venture backed Statues yes=1 no=0, EMPLOYEE: # of employee at time of IPO, PER1Y: % change in price one year later, PER 90D: % change in price 90 days later, DAYS: # of days between founding of company and IPO date, (Financial Data is from most recent financial period closest to IPO date).

		EARLY ENTRANTS		Early/Middle
Variable	**N**	**Mean**	**Std Dev**	**t-test**
ROA	70	13.68	9.11	1.27
ROE	120	10.22	6.10	1.59
PE	134	69.32	73.76	0.61
ASSETS	173	24.12	48.29	1.67*
CAP	280	27.66	40.64	3.56**
REV	247	19.91	32.21	2.95**
EPS	35	56.31	41.44	2.19**
DE	167	60.46	148.56	1.71*
RANKCL	392	1.55	0.62	7.83**
EBIT	155	2.72	7.34	2.39**
NIAT	331	2.52	6.41	0.93
FEE	275	1.71	0.37	1.05
PRICE	384	10.04	6.22	0.23
NUMAMEN	74	0.86	0.40	4.86**
EMPLOYEE	70	1889.62	1933.79	0.65
PER1Y	123	80.74	94.96	2.17*
PER90D	129	38.96	47.60	1.31
DAYS	63	2868	2149	1.73*

		MIDDLE ENTRANTS		Middle/Latter
Variable	**N**	**Mean**	**Std Dev**	**t-test**
ROA	199	18.47	30.95	1.64*
ROE	254	11.79	9.87	0.97
PE	241	75.13	93.59	0.89
ASSETS	368	33.65	67.18	3.36**
CAP	489	42.92	64.61	4.51**
REV	456	33.04	65.56	1.24
EPS	49	40.89	21.30	0.32
DE	315	38.03	128.85	0.84
RANKCL	489	1.91	0.72	9.48**
EBIT	380	6.42	18.60	1.43
NIAT	470	3.15	11.01	4.41**
FEE	414	1.68	0.36	3.84**
PRICE	462	10.13	4.89	3.65**
NUMAMEN	207	1.19	0.53	17.56**
EMPLOYEE	120	1665	2441	1.34
PER1Y	280	62.64	67.18	1.70
PER90D	302	46.49	56.72	0.42
DAYS	111	2313	1944	2.49**

Table 15
continued

		LATTER ENTRANT		
Variable	**N**	**Mean**	**Std Dev**	**Latter/Early t-test**
ROA	222	14.54	16.36	0.42
ROE	218	13.36	23.26	1.44
PE	169	67.50	70.17	0.21
ASSETS	508	52.02	87.68	3.97**
CAP	506	65.58	90.76	6.62**
REV	463	38.38	64.21	4.23**
EPS	33	42.63	26.04	1.59
DE	311	31.16	64.22	2.98**
RANKCL	488	2.45	0.88	17.10**
EBIT	443	8.19	16.85	3.90**
NIAT	502	6.62	13.28	5.22**
FEE	449	1.58	0.40	4.35**
PRICE	525	11.28	4.97	3.33**
NUMAMEN	340	3.14	1.54	12.61**
EMPLOYEE	242	1179	3564	1.59
PER1Y	318	72.14	68.29	1.05
PER90D	355	48.23	49.19	1.84*
DAYS	201	3077	2875	0.53

* indicates significance at the .05 level
** indicates significance at the .01 level

Table 16

Quality Differences using Price Data

The table below represents 17 new industries broken up into 3 categories: early, middle and latter entrants based upon time of entrances into that particular industry. Only industries which contained 50 or more entrants were included in this sample in order to only include industries which contained early, middle and latter entrants. Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as $R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The t-test measures the level of significance.

EARLY ENTRANTS

Years Held	N	Mean Abnormal Return %	P-value	Standard Deviation	Early/Middle t-test
1	339	2.195	0.5626	69.11	2.96**
2	333	6.577	0.7272	112.36	0.52
3	315	12.88	0.0354	160.73	0.08
4	302	15.44	0.0891	222.12	2.42**
5	292	20.28	0.2475	299.18	2.83**
6	267	22.69	0.0768	307.69	2.16*
7	243	37.54	0.2058	461.34	2.52**
8	214	66.07	0.0698	530.35	2.18*
9	188	123.30	0.0287	766.95	3.55**
10	170	136.97	0.0538	941.06	5.70**

MIDDLE ENTRANTS

Years Held	N	Mean Abnormal Return %	P-value	Standard Deviation	Middle/Latter t-test
1	372	-8.43	0.0197	69.43	1.37
2	352	3.41	0.7802	229.39	2.44**
3	295	13.66	0.4360	300.86	2.43**
4	246	49.82	0.1017	475.69	1.71*
5	180	83.56	0.2499	968.60	1.13
6	124	82.62	0.3415	963.43	1.08
7	83	166.06	0.2587	1330.2	1.18
8	54	224.10	0.1134	1023.0	1.93*
9	44	535.89	0.1262	2279.3	1.52
10	32	1091.69	0.1682	4377.1	1.29

LATTER ENTRANTS

Years Held	N	Mean Abnormal Return %	P-value	Standard Deviation	Early/Latter t-test
1	324	-13.76	0.0011	75.219	3.89**
2	239	-32.93	0.0001	117.086	6.14**
3	120	-53.35	0.0003	154.964	7.56**
4	56	-59.32	0.0096	165.409	7.82**
5	42	-87.13	0.0102	209.640	8.72**
6	32	-103.66	0.0011	163.226	12.58**
7	23	-166.53	0.0001	101.596	30.85**
8	21	-214.07	0.0001	104.706	38.47**
9	20	-254.52	0.0001	104.333	48.20**
10	17	-306.90	0.0001	78.304	68.71**

* indicates significance at the .05 level

** indicates significance at the .01 level

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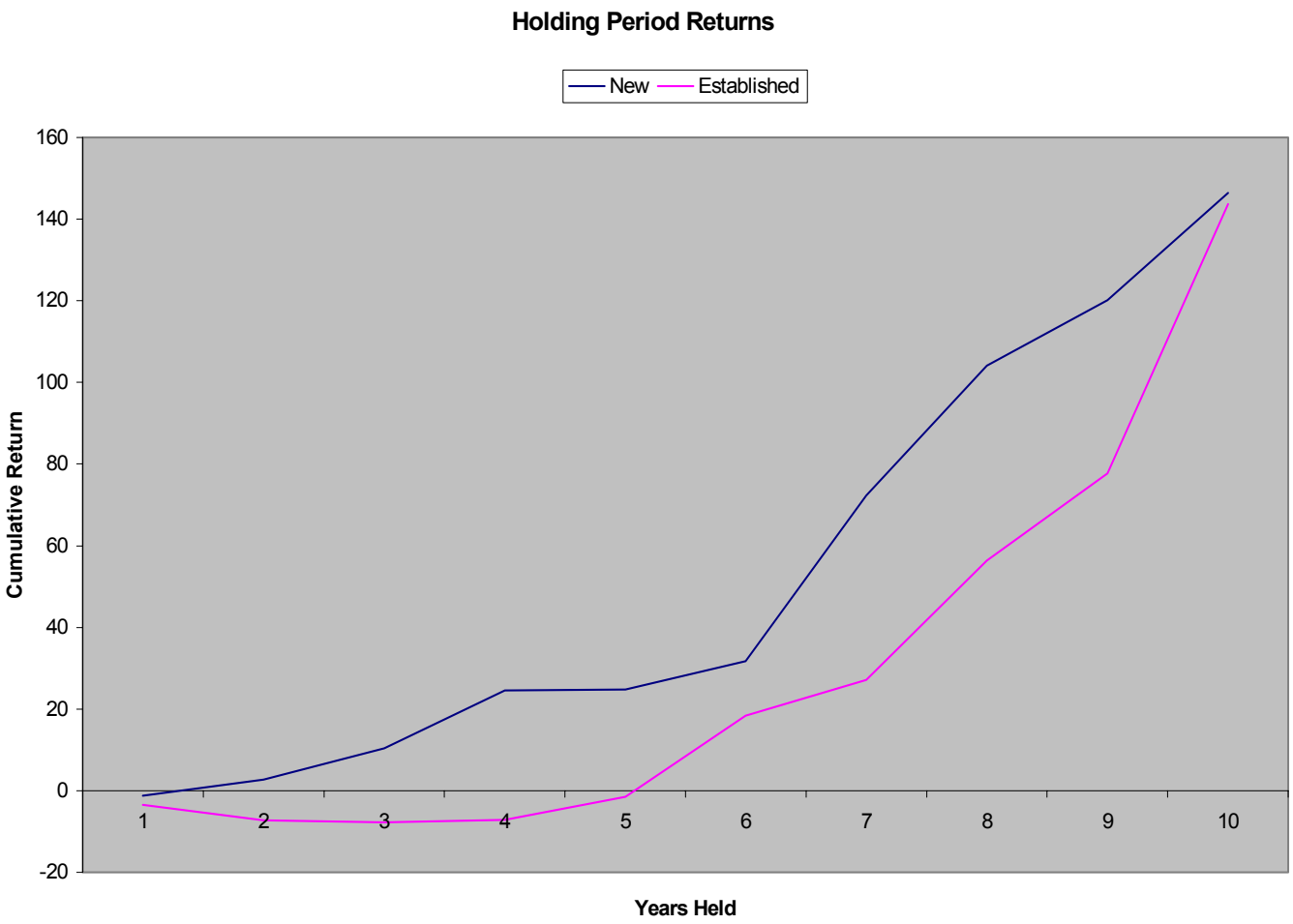
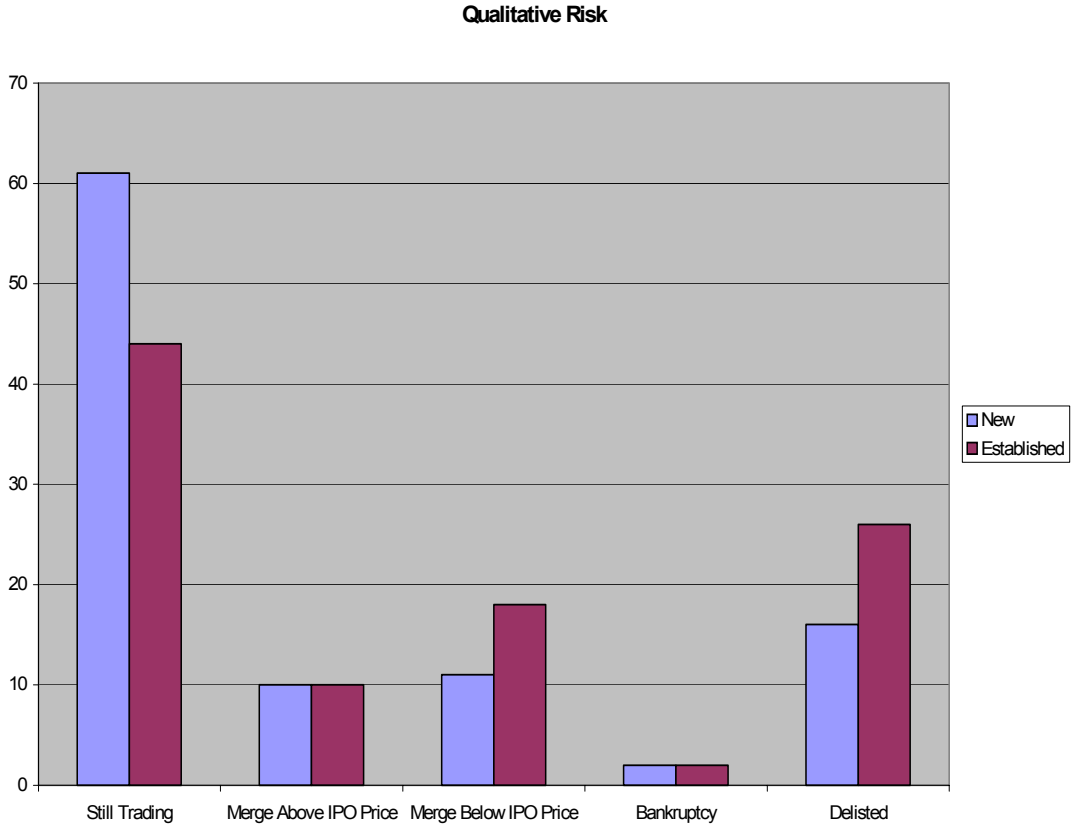
Appendix 1
Holding Period Returns for IPO's in New versus Established Industries

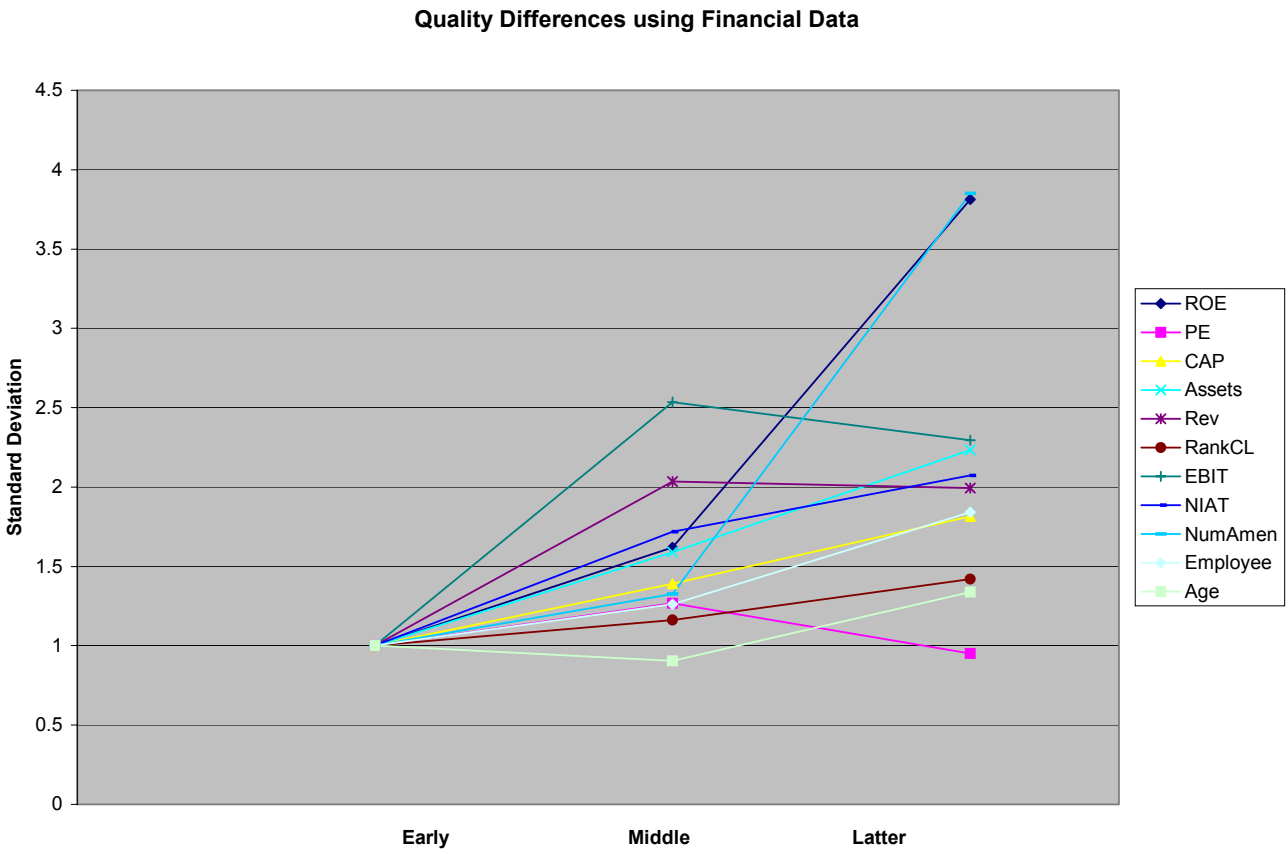


Plot of Cumulative mean abnormal return, from closing price, traced up to available year, from years 1 to 10.

Appendix 2
Qualitative Risk



Appendix 3
Quality Differences using Financial Data



Appendix 4

IPOs in a New Industry bought 5 years AFTER IPO date using Nasdaq Index

Years held refers to the number of years in which the IPO is owned before being sold. The number of observations indicates the number of IPOs used to calculate the mean abnormal return. The Mean Return is calculated as

$$R_{jT} = [\prod_{t=start}^{T}(1 + r_{jt}) - 1]$$

where start is the date of the first post-issue CRSP listed closing price, T is the end of the holding period window, and r_{jt} is the return for firm j on date t. The abnormal holding period return for security j for t days ($AHPR_{j,t}$) is defined as:

$$AHPR_{j,t} = r_{j,t} - r_{b,t}$$

where $r_{j,t}$ is the holding period return for security j for t days and $r_{b,t}$ is a nasdaq index return for t days. The benchmark portfolio has its holding period return calculated for the same time period that the holding period return is calculated for the IPO firm. Selection bias is corrected for by assigning the benchmark return to the IPO's return if a firm stops trading. The portfolio is re-weighted at the beginning of every year.

Years Held after buying in year five	N	Value Weighted Cumulative Mean Abnormal Return % From Closing Price on IPO date	p-value	Standard Deviation
1	899	-4.45	0.0908	78.85
2	730	11.69	0.0492	160.31
3	609	37.12	0.0006	265.09
4	535	54.76	0.0015	396.32
5	471	120.38	0.0001	649.19
6	418	169.62	0.0001	802.45
7	370	253.66	0.0017	1541.85
8	304	298.66	0.0033	1759.89
9	274	268.61	0.0016	1397.95
10	236	296.13	0.0092	1733.04