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Three essays on IPO, liquidity, and corporate governance

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ABSTRACT

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The first essay looks at the issue of long run performance of initial public offerings (IPOs). We provide a liquidity based explanation for why certain IPOs underperform in the long run. By separating IPOs into sub-samples based on excess liquidity, considered relative to benchmarks based on size, we find that IPO underperformance from 1993 to 2005 differs significantly based on the excess liquidity of an IPO. In general, positive excess liquidity portfolios tend to underperform compared to negative excess liquidity portfolios one to two years after the initial post IPO portfolio formation period. A potential explanation of the magnitude and extent of IPO underperformance is the liquidity profile of IPOs. More specifically, if there are more IPO firms characterized by positive excess liquidity in a given year, then the subsequent future returns could show underperformance.

The second essay relates corporate governance to firm's productivity growth. Given technological constraints, some firms are very efficient whereas others are not and some firms have much faster rates of innovation and productivity growth than others. Are these differences due to chance or are there some factors contributing to higher total factor productivity growth? In this paper, we find that firms with stronger shareholder rights have higher total productivity growth. By employing the governance index compiled by Gompers, Ishii, and Metrick (2003), we determine that the effect of governance on productivity varies positively with the quality of corporate governance. Furthermore, this relationship is strongest among firms which have the strongest shareholder rights.

The third essay serves as a connecting link between the first two essays. It looks at the differences in the long term performance of IPOs with strong and weak shareholder rights. We find that performance of IPOs is stronger for the larger firms. We also find that governance does play a part in how an IPO will perform in the long run. IPOs having stronger shareholder rights in most of our results perform better then IPOs with weak shareholder rights. There is also some evidence of underperformance for smaller firms that are less democratic even though our sample consists of relatively large IPOs.

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I alone remain responsible for the content of the following, including any errors or omissions which may unwittingly remain.

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Set your heart upon your work, but never on its reward. Work not for a reward; but never cease to do your work.

-BHAGAVAD GITA (about 500 B.C.)

You are never given a wish without also being given the power to make it true. You may have to work for it, however.

-RICHARD BACH (*Illusions*, 1977.)

CHAPTER 1

Three Essays on IPO, Liquidity, and Corporate Governance: An Introduction

CHAPTER 1

Three Essays on IPO, Liquidity, and Corporate Governance: An Introduction

The three essays in this dissertation address two contemporary areas of research in finance: initial public offerings (IPOs) and corporate governance. The first essay addresses the issue of IPO underperformance using a liquidity approach. The second essay digresses to the issue of corporate governance and its relation to productivity growth and innovation. The third essay ties together IPOs and corporate governance by looking at the issue of long run performance of IPOs in the context of corporate governance of IPOs.

A. The Liquidity Effect and Long Term Performance of Initial Public Offerings.

Investors caught up in the latest fad frenzy, salivating over the next skyrocketing initial public offering by a hot Krispy Kreme, Fashionmall, or Priceline have learnt a hard lesson. By the end of 2000, roughly two thirds of all the highflying IPOs of 1999 were trading at or under their offer prices. Moreover, at least 20% of IPOs debuting in 2000 ended the year 90% or more below their first day close[1]. Given no prior trading history and limited financial information, the opinion about a firm's subsequent performance ranges from "this is the next Microsoft" to "this one will not see its first birthday." While some IPO investors may experience outstanding long-term returns, the poor aftermarket performance of the average issue is widely documented by Ritter (1991) and Loughran and Ritter (1995), among others. If investors are doomed to lose, should they refrain from investing in IPOs and bring the primary markets to a grinding halt? Is there any way for them to participate in these markets and still receive a return on their investment? An

[1] According to the Securities Data Corporation (SDC).

exploration of the performance of IPOs finds that the tortoise seems to win more often than hare.

The results show that these tortoises or hares can be proxied by their liquidity profile. The growing literature on liquidity and stock returns from Amihud and Mendelson (1986) to Acharya and Pederson (2004) suggests an inverse relationship between liquidity and expected stock returns. Specifically, portfolios of IPOs with positive and negative excess liquidity during the first year after an IPO issuance, where excess liquidity is defined relative to a size benchmark are constructed. Overall, IPO underperformance in the long run differs significantly for positive or negative excess liquidity IPO portfolios. In general, positive excess liquidity portfolios tend to underperform compared to negative excess liquidity portfolios one to two years after the initial post IPO portfolio formation period. A potential explanation of the magnitude and extent of IPO underperformance is the liquidity profile of IPOs. More specifically, if there are more IPO firms characterized by positive excess liquidity in a given year, then the subsequent future returns could show underperformance. The results have significant implications about the role of observed liquidity as an indicator of future returns.

B. Corporate Innovation and Corporate Governance: A Study of US firms.

In response to a series of failures in governance mechanisms at Enron, Worldcom, Adelphia and Tyco, the issue of corporate governance has gained importance in recent years. The magnitude of the crisis dwarfed any precedence in US corporate history by the sheer amount of money involved. Monks and Minow (2004), who were prompt to bring out the third edition of their popular book, "Corporate Governance," comment,

> All of a sudden, everyone was interested in corporate governance. The term was even mentioned for the first time in the president's annual State of the Union address...………………Corporate governance is now and forever will be properly understood as an element of risk for investors, whose interests may not be protected by ineffectual or corrupt managers and directors, and risk for employees, communities, lenders, suppliers, and customers as well. (pp. 17)

In the span of a few years, the Securities and Exchange Commission has been busy enacting rules in pursuant to the famous Sarbanes-Oxley[2] act of 2002.

In finance, research was quick to follow up on the craze of corporate governance. Gompers, Ishii, and Metrick (2003) wrote a widely cited and highly influential paper finding that a zero investment strategy which was long on a portfolio of firms having the strongest shareholder rights and short on a portfolio having the weakest shareholder rights, yields a risk adjusted annual abnormal return of 8.5% from 1990 to 1999. They created a widely used broad-based index "G" (for governance, not Gompers) as a measure of the strength of shareholder rights. This "G" index is used as a proxy for the quality of governance in the analysis here to study the effect of corporate governance on productivity and innovation.

A related literature with roots in the writing of Nobel Laureate Robert Solow explains that some 80% of the rise in output per worker in the United States over the preceding half-century was explained by a mysterious residual which he called the *measure of our ignorance*. This residual, or total factor productivity (TFP), is the difference between the rates of growth of an index of input and an index of output. The

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[2] The Act covers issues such as establishing a public company accounting oversight board, auditor independence, corporate responsibility and enhanced financial disclosure. It was designed to review the dated legislative audit requirements, and is considered one of the most significant changes to United States securities laws since the New Deal in the 1930s. Named after sponsors Senator Paul Sarbanes (D–Md.) and Representative Michael G. Oxley (R–Oh.), the Act was approved by the House by a vote of 423-3 and by the Senate by a vote of 97-0.

novel thing about TFP is that it can be applied to compare countries, industries, or even firms on a micro level.

Taking the constraints of technology into account, some firms are very efficient whereas others are not. Additionally, some firms have much faster rates of innovation than others. Are these differences due to chance or are there some factors that contribute to higher total factor productivity growth, which may determine this difference among firms? Bartelsman and Doms (2000) point out that managerial ability, management/ownership changes, technology, human capital, and regulation are factors that have been discussed recently as factors influencing productivity growth. Such factors can substantially differentiate two firms with otherwise identical amounts of capital and labor in place and lead to very different levels of profits. The concept of TFP at the firm level is applied to isolate such factors and is named corporate innovation[3]. We argue that the productivity difference between the firms is ultimately due to how well they innovate and how effectively they use available resources and technology. One of the most important factors that determine corporate innovation is the quality of corporate governance of the firm.

More specifically, the relationship between the level of corporate governance and total factor productivity (TFP) growth is analyzed here. In the process, controls for most of the conceivable (and quantifiable) factors that may influence the level and growth of TFP, such as the effect of intangibles, the economies of scale effect due to asset size, and industry effects which result in different production technologies, are employed. The

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[3] The term "Corporate Innovation" in the context of TFP was first used by Maria Vassalou, a finance professor at Columbia University. Our version of corporate innovation separates other factors like industry specific productivity differences and economies of scale to narrow it down to managerial effectiveness.

results show that there is positive relationship between the quality of corporate governance and firm productivity, strongest among firms that have the strongest shareholder rights. As the governance quality becomes worse, the strength of the effect diminishes.

C. IPO underperformance and Corporate Governance: An Evidence from the US Stock Market.

The third essay links IPO performance and corporate governance. It analyzes the differences in the long term performance of IPOs with strong and weak shareholder rights. In this context it is important to consider the IPOs because the literature suggests that IPOs under perform in the long run (Ritter, 1991; Loughran and Ritter, 1995). It seems that managers in IPO firms are unable to attain the goal of long term shareholder wealth maximization, on average. The long run underperformance of IPOs could be, among other things, a corporate governance issue.

The burst of the IPO bubble in 2000 and the string of corporate scandals in the early years of 2000 have seen stringent corporate governance compliance requirements for companies filing for their public offering. In particular, private companies that anticipate a public stock offering will need to comply with Sarbanes-Oxley well in advance of the IPO filing, to ensure that auditors and investment bankers can complete due diligence and issue positive opinions. CEO/CFO certifications in post-IPO reports filed with the SEC will cover pre-IPO periods, and corporate officers will face personal liability if controls and reporting are non-compliant for those periods.

A sample of IPO firms[4] shows that IPOs on average have stronger shareholder rights. Considering recent evidence, firms with strong shareholder rights should outperform the firms with weak shareholder rights (Gompers, Ishii, and Metrick (GIM), 2003). The result is puzzling because IPOs are found to under perform in the long run and are more democratic. For both the results to be correct, it must be that the IPO firms from the GIM sample are not the representative IPO firms or since most IPO firms included in the GIM dataset are large IPO firms, the phenomenon of IPO underperformance may be restricted to smaller IPO firms. Evidence suggests that IPOs which have G-index reported do not under perform in the long run. The results support both ideas. Overall, there is evidence that IPOs with strong shareholder rights perform better than IPOs with weak shareholder rights but the strength of this phenomenon depends on the sample period used.

D. Summary

In summary, these essays contribute to the literature of IPO performance, productivity, and corporate governance in several important ways. First, regarding IPO performance, it is shown that the liquidity profile of an IPO in the post IPO period is an important determinant of how an IPO performs in the long run. This result is explained by creating positive and negative excess liquidity portfolios based on size and turnover. Second, in the area of productivity, there is evidence from the US market that better corporate governance is positively related to stronger productivity growth of the firm.

Third, concerning IPOs and corporate governance, IPO firms having stronger shareholder rights tend to perform better than firms having weaker shareholder rights.

[4] Obtained from the updated Gompers, Ishii, and Metrick (2003) compiled dataset available on Andrew Metrick's website.

The underperformance is limited to the small size category of the IPOs with more underperformance for IPO firms having weakest shareholder rights.

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Chapter 2

The Liquidity Effect and the Long Term Performance of Initial Public Offerings.

C H A P T E R 2

The Liquidity Effect and the Long Term Performance of Initial Public Offerings.

Introduction

Few ideas in finance have attracted more attention in recent years than Initial Public Offerings (IPOs). The two major issues concerning IPOs are underpricing in the short run and underperformance in the long run.[5] This paper focuses on the long run performance of IPOs and provides a liquidity based explanation for why some IPOs underperform in the long run.

I. Background and Motivation

A. Long term Performance of IPOs

Using data from 1975 to 1984, Ritter (1991) finds that the average three-year holding period return for IPOs (beginning with the closing price on the first trading day) was 34.5% whereas the average return for a sample of size matched firms was 61.9%. Furthermore, Welch and Ritter (2003) find that, from 1980 to 2001, an average IPO firm underperformed the CRSP value-weighted market index by 23.4% and underperformed seasoned companies with the same market capitalization and book-to-market ratio by 5.1%.

Although there appears to be evidence on the long run underperformance of IPOs, the source of this underperformance is unclear. Miller (1977) argues that short sell constraints and heterogeneous investor valuation are the reason for the poor performance of IPOs. Miller suggests that the most optimistic investors tend to buy IPOs. Then, as the

[5] See Ljungqvist (2006) for a survey.

variance of opinions decreases over time, the marginal investor's valuation will converge towards the mean valuation, causing the price to fall. Shiller (1990) emphasizes the influence of behavioral fads in the market leading to long run IPO underperformance. Ritter (1991) finds that younger firms and companies going public in heavy-volume years tend to under perform more than other firms. Teoh, Welch, and Wong (1998) attribute some of the poor post-IPO stock performance to optimistic accounting early in the life of a firm, suggesting that at least a part of the poor long-run performance is because of a market that is overly optimistic and unable to properly forecast rough times.

Jain and Kini (1994) and Mikkelson et al. (1997) find that the long run underperformance tends to be accompanied by poor operating performance. Heaton (2002), Daniel, Hirshleifer, and Subrahmanyam (1998) and Bernardo and Welch (2001) argue that overconfidence of managers, investors and entrepreneurs might be a reason for IPOs poor long run underperformance. Carter, Dark, and Singh (1998) find that underwriter reputation is an important factor determining long run performance in IPOs. Ljungqvist, Nanda and Singh (2005) suggest that the presence of a class of irrationally exuberant investor, coupled with short sale restrictions, leads to long run underperformance.

Some recent studies have challenged the idea that IPOs under perform, arguing that the results could be caused by a small sample effect or by the way that underperformance is measured. Brav and Gompers (1997) and Brav, Geczy, and Gompers (2000) use different benchmarks and methods of measuring performance and control for the impact of venture capitalists. They report that long run underperformance is mainly found in small, non-venture capital backed IPOs. Moreover, they argue that underperformance is not an IPO effect and that the underperformance found by Ritter (1991) is not unique to firms issuing equity because small, low book-to-market IPOs do not perform differently from small, low book-to-market non-IPO firms. Since the magnitude and sign of long-term abnormal returns are sensitive to alternative measurement methodologies, they question their existence and relevance. Loughran and Ritter (2000) suggest that the magnitude of abnormal returns should indeed differ because various methodologies use different weighting schemes, implying that they should differ in a predictable manner. Specifically, if there are significant misvaluations in the stock market, then abnormal returns should not have robust results in differing methodologies. They reexamine the long run performance of IPOs by implementing the Fama-French three-factor model with a reconstruction of size and value factors and excluding IPOs and SEOs. They find that new issues underperform on both a value-weighted and equal-weighted basis (by about 4% per year) and that the underperformance is most severe in high-volume periods, confirming Ritter's (1991) results.

A potential explanation of the long run underperformance of IPOs is based on the endogeneity of the number of new issues. Schultz (2003) presents a pseudo-market timing hypothesis, suggesting that more firms issue equity at higher stock prices even though they cannot predict future returns. Even when ex-ante expected abnormal returns are zero, median ex-post underperformance for equity issuers will be significantly negative when calculated in the event-time. This is because issuers time their IPOs when the stock market is high and coincide with periods of excessive optimism such that more companies go public when investor sentiment is high. Subsequently, the last large group of IPOs would underperform and be a relatively large fraction of the sample. Due to the clustering of events after periods of high abnormal returns in issues, ex post measures of average abnormal returns may be negative on average despite zero ex-ante abnormal returns. This could lead to incorrectly inferring underperformance.

However, Dahlquist and Jong (2004) claim it is unlikely that the endogeneity of the number of new issues explains long run underperformance. They find that the small sample bias is small and negligible for typical sample sizes and counters the contention of Schultz's pseudo market timing hypotheses. Similarly, Ang, et al. (2005) rejects the idea that a small sample effect is responsible for IPO underperformance. They also find robust evidence of IPOs underperforming in the long run, both in event and calendar time.

Nevertheless, all studies that refute underperformance when measuring against a multifactor framework find underperformance when the cumulative average excess returns method or the buy-and-hold return method is used. However, Eckbo and Norli (2005) show that the existence of underperformance disappears when controlling for differences in liquidity by including a liquidity factor in the standard multifactor Fama-French framework with Carhart's (1997) momentum factor. They claim that IPOs are more liquid than their style matched peer firms. Hence, the expected returns are lower for IPOs and should not under perform if correctly accounting for liquidity risk.

B. Liquidity

Amihud and Mendelson (1986, 1989) present the concept that more liquid firms have lower expected returns than other firms. They suggest this is because the more illiquid the stock of a firm, the more it will cost to trade. Although investors can always trade the stock, they may only do so by discounting the value of the stock according to its illiquidity. An investor will only be willing to purchase an illiquid stock if there is a premium to buying the stock. Similarly, investors pay a liquidity premium when purchasing a highly liquid stock to ensure the ability to liquidate a position immediately. The liquidity hypothesis suggests that holders of less liquid stocks will demand higher expected returns as a result of bearing more liquidity risk. Brennan and Subrahmanyam (1996), Brennan, Chordia, and Subrahmanyam (1998), Datar, Naik, and Radcliffe (1998), Chordia and Subrahmanyam (2001), all find a negative relationship between liquidity and subsequent returns.

C. Liquidity and IPOs

In recent years, new literature has related liquidity with IPO underpricing and long run performance. Booth and Chua (1996) suggest that underpricing is used to increase secondary market liquidity. Hahn and Ligon (2004) empirically test Booth and Chua's hypotheses using different measures of liquidity and find mixed results. Ellul and Pagano (2006) find that expected after-market liquidity and liquidity risk are important determinants of IPO underpricing. The more illiquid the IPOs are expected to be and the less predictable their liquidity is, the larger the risk premium needed to compensate the investor, resulting in more under pricing by issuers.

By constructing fully-rational symmetric information model of an IPO, Pritsker (2006) attempts to explain under pricing and underperformance of IPOs. He shows that, both anomalies can be explained by the extent to which the initial IPO shares are allocated to large investors. To maximize revenue and avoid unnecessary aftermarket sales, the underwriter distorts share allocations toward those investors who have market power and allocates shares at an IPO offer price that is below the trading price that will prevail shortly after the IPO. Investors who receive large share allocations at the IPO then unwind them slowly due to market illiquidity. This results in a reduction in the supply of shares that are available to small price-taking investors, causing the price to be bid up and the return to be bid down, which then results in poor long run performance.

D. Contribution

Pritsker (2006) also points out a conflict between Ellul and Pagano's (2006) theoretical model which suggests that IPOs are illiquid and Eckbo and Norli's (2005) contention that IPOs are very liquid. Both theories would be correct if liquidity conditions rapidly change in the IPO after market. This paper will contribute to this stream of literature by suggesting a liquidity based explanation of underperformance. Eckbo & Norli (2005) find that IPOs are more liquid on average. We find IPOs are not always more liquid if compared to size matched firms. Many IPOs have either similar liquidity or are less liquid than peer firms. The performance of IPO firms in the long run can be explained by their liquidity profiles during the first year of their equity issuance. The reason for this result is that there will be long run underperformance if an IPO's expected return in the short run is lower than its expected return in the long run. It appears that there is initial overpricing in the after market of an IPO during the short run which is coupled with high liquidity. If liquidity is priced appropriately and there is excess liquidity to begin with, the expected return on an IPO is lower in the short run. If the level of liquidity observed in the IPO after-market in the short run cannot be sustained in the long run, then as the liquidity declines the expected rate of return increases to its long run 'equilibrium' value. This causes underperformance in the long run.

In order to test this hypothesis, excess liquidity is measured as the difference between the liquidity of an IPO and the mean liquidity of a size matched firm. In particular, two sub-samples of IPOs are created based on their excess liquidity and are called positive excess liquidity IPOs and negative excess liquidity IPOs. Results suggest that the two portfolios created on excess liquidity perform very differently. The positive excess liquidity portfolio of firms performs worse than the negative excess liquidity portfolio one to two years after the initial one-year post IPO portfolio formation period.

Moreover, empirical evidence on the long term performance of IPOs during 1993 to 2005 is presented. If underperformance is measured in a multifactor asset pricing framework, then underperformance is found accounting for the market, size, value, and liquidity factors, but the existence of underperformance diminishes in significance if a momentum factor is included. Furthermore, when measuring underperformance in a multi factor framework, the existence of underperformance is sensitive to the sample period, which supports Loughran and Ritter (2000). Previously, when using a multi factor framework, some studies have found underperformance, such as Loughran and Ritter, (2000) while some have reported no underperformance, such as Brav and Gompers (1997) or Eckbo and Norli (2005). A potential explanation for this can be the fact that the extent of long run performance of IPOs in a sample period is determined by the liquidity profile of IPOs. More specifically, if there are many IPO firms characterized by positive excess liquidity, then subsequent future returns would show underperformance if measured above a period of one to three years.

The remainder of the paper is organized as follows. Section II discusses the choice of liquidity variable. Section III creates two sub-samples of IPOs based on positive and negative excess liquidity and section IV uses performance measures to evaluate the performance of the two liquidity portfolios. Section V creates a market wide liquidity factor. Section VI reports and analyzes the results and Section VII concludes.

II. Sample Selection and Descriptive Statistics

A. Data Description

The sample consists of 976,452 monthly observations spanning all listed securities for three equity markets (NYSE, AMEX, and NASDAQ) over the time period January, 1993 to December, 2005. This period was selected because the reporting of trading volume was standardized across the three equity markets only in June 1992. Prior to this date, the trading volume reported by NASDAQ was the aggregate of volume reported by all dealers in the security, leading to inflated counts as dealers/market makers reported each buy and sell transaction separately. Since the sample comprises an overwhelming majority of NASDAQ stocks and the key liquidity variable is volume based, the sample starts with 1993. Monthly trading volumes are used to avoid distortions introduced by infrequent trading in smaller value stocks. IPO listings are from Thomson Financial's SDC New Issues database. The corresponding closing price, trading volume, returns, shares outstanding, market capitalization, exchange and SIC code data from the CRSP database are from the Center for Research in Security Prices at the University of Chicago. The IPO listings and the issue dates were crosschecked with the dataset provided by Jay Ritter. The securities ineligible for continued listing (priced at less than one dollar per share, less than 750,000 shares outstanding, or number of shareholders fewer than 300), were deleted from the sample in order to avoid any delisting bias. Also excluded were closed-end funds, ADRs (American Depository Receipts, issues by foreign firms which have listings in at least one other market outside the US), REITs (real estate investment trusts), units, mutual-to-stock conversions, preferred stocks, penny stocks[6] (with offer price less than $5), and financial companies and IPOs which had less than 150 days of trading activity in the 250 trading days following the offer. Our IPO sample consisted of 3,373 firms, of which 503 firms were listed in NYSE, 104 firms in AMEX and 2,766 firms in NASDAQ. Figure 2.1 shows the number of IPOs issued from years 1992 to 2003. The highest period of IPO issuance in NYSE, NASDAQ and AMEX occurred in 1996. The new issue activity declined sharply after the year 2000 with the burst of the "dot com" bubble and the US economy moving into a recession in late 2001.

B. Liquidity Measure

To measure liquidity, *turnover*, which is the ratio of trading volume to the number of shares outstanding, is used as a proxy. This gives a direct measure of the asset trading frequency. Datar, et al. (1998) finds that cross section stock returns decline in turnover. Other measures based on bid-ask spreads and price impacts may not capture liquidity to the extent that large shareholders wish to make transactions. Turnover is a widely used proxy for liquidity (Chordia et al. ,2000b; Eckbo and Norli , 2005).

The monthly turnover (TVO) for the i^{th} stock is computed as:

$$TVO_{i,t} = \frac{1}{D_{i,t}} \sum_{d=1}^{D_{i,t}} tvo_{i,d,t}$$

where $tvo_{i,d,t}$ is the share turnover for stock i on day d in month t, and $D_{i,t}$ is the number of trading days for stock i in month t.

6 Including Penny stocks is likely to show a bias towards long run underperformance. Using a time period from 1990-1998, Bradley et al. (2006) found evidence that penny stock IPOs have higher initial returns than ordinary IPOs, but significantly worse long-run underperformance.

Figure 2.2 depicts the time series movement of IPO excess returns, measured by difference between monthly IPO return and the CRSP equal-weighted market return (NASDAQ/NYSE/AMEX), and the mean turnover of IPO stocks. Liquidity gradually increases from 1997 and tends to be the highest during the bubble period from 1999 to early 2000, when NASDAQ reached an all time high of 5080 in mid March 2000. The following years show a slump followed by a recovery in early 2003. This is consistent with the findings of Chordia, Roll, and Subrahmanyam (2001) that liquidity plummets significantly in down markets but increases weakly in up markets.

III. Portfolios based on Excess liquidity

A. Creating an Excess Liquidity Measure

Size, as measured by the market capitalization, is a standard criterion for sorting stocks in empirical investment studies. Data for each month is sorted based on the combined ranking by the size of the NYSE, AMEX and NASDAQ stocks. Table 2.1 reveals summary data for the aggregate sample as well as each size decile. As expected, smaller stocks have low turnover compared to larger stocks. Also, turnover shows a monotonic increase with the size of the firm[7], which is also reported by Pastor and Stambaugh (2003) among others. From 1993 to 2005, the firms in the smaller size deciles did not perform well compared to larger firms. Turnover and returns both increase almost monotonically with the size of a firm. The mean monthly turnover for our sample is 1.59% and the average monthly raw return is 0.97%.

[7] We find that turnover increases with size except for the largest size decile. This may be explained by increased institutional holdings for the largest firms.

In order to distinguish IPOs based on their liquidity profile, one option is to simply sort them by stock turnover. However, as Table 2.1 displays, turnover and size have a positive relationship, so it would be difficult to separate the 'size' effect of the IPOs if they are ranked by turnover alone. Even though IPO firms tend to be in the lower size deciles, it is still important to separate out any size effect. If IPO firms are first sorted on the basis of size, then within each size decile look at the turnover of the IPO stocks it is likely to mitigate the size effect if not totally eliminate it. In the data set, all IPOs are excluded and the non-IPO stocks are divided into deciles by ranking them according to size on the basis of the market capitalization of the NYSE, AMEX and NASDAQ stocks. The mean liquidity measured by turnover for the truncated sample is computed for each month and each size decile. Then, the IPO firms are matched by size and placed into the corresponding size deciles. The excess liquidity is calculated as the difference between the liquidity of the matched IPO firm and the mean liquidity of the size matched non-IPO firms for the corresponding decile for each month. This methodology shows that the excess liquidity varies with size for IPO firms. Excess liquidity is lowest for the smallest size decile and increases with size, but remains generally flat between the size deciles four and eight. Also, it rises sharply for the largest decile, whereas for the simple turnover measure the turnover actually falls for the largest size decile.

B. Forming Negative and Positive Excess Liquidity portfolios

The sample of IPOs is divided into two portfolios based on their excess liquidity. A portfolio HOT LIQ of IPOs is created that has a mean positive excess liquidity in the 11 months following the first month of an IPO and also a positive excess liquidity on the 12th month of an IPO. Similarly, a negative excess liquidity portfolio, COLD LIQ is created based on the mean negative excess liquidity in the 11 months following the first month of an IPO and also a negative excess liquidity on the 12th month of an IPO.

To differentiate between the short run and the long run, most IPO studies have categorized long run returns as returns for more than one year. Therefore, any firm from a portfolio is excluded if it has any of the intermediate months missing between the 24th and 36th month, or if the life of the IPO is less than 36 months. If a firm moved to a higher or lower size decile, the mean turnover for excess liquidity calculation of the base decile the firm was assigned to in the 2nd month of IPO is used. As a result, there are 1,376 IPOs that comprise the HOT LIQ portfolio and 1,348 IPOs belonging to the COLD LIQ portfolio. IPOs which had excess liquidity not significantly different from zero,[8] or do not qualify the twin criteria to be included in the HOT LIQ or COLD LIQ portfolio are excluded, resulting in a loss of about 20% of the IPO firms from the sample.

Figure 2.3 shows the distribution by size of the firms in the COLD LIQ and HOT LIQ portfolio. A careful look shows that COLD LIQ firms are smaller firms on average compared to the HOT LIQ firms and are also more dispersed. Table 2.2 shows the mean values of the average size of a firm in the respective portfolio. The mean market capitalization of a firm belonging to the COLD LIQ portfolio during the sample period was $49.93 million and for the corresponding HOT LIQ portfolio firm was $89.01 million. A simple comparison with the size deciles in Table 2.1 confirms the notion that the COLD LIQ and HOT LIQ firms tend to be small. The median values (not reported in the table) are much lower at $21.25 million and $27.73 million for the COLD LIQ and HOT LIQ portfolios respectively. Compared to the market capitalization of the more

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[8] If the difference between the mean turnover of the size decile and the turnover of the IPO firm was not significantly different at 5% level, it was not included in either the HOT LIQ or COLD LIQ portfolio.

seasoned firms the COLD LIQ and HOT LIQ firms are heavily centered on the second and third smallest size deciles.

Table 2.2 also reports the mean turnover of the firms in the two liquidity portfolios. The mean turnover for the COLD LIQ portfolio over a three year holding period is 0.0092 as compared to 0.0235 for the HOT LIQ portfolio. A comparison with the broad spectrum of stocks over the size deciles in Table 2.1 reveals that though the average size of a HOT LIQ firm would put it in the 5^{th} size decile (3^{rd} size decile if we consider median market capitalization), the mean turnover is much higher than the mean turnover value of all firms for the same size decile. In fact, the mean turnover values are close to the average turnover values of the 8^{th} and 9^{th} largest size deciles. In contrast, the NEG LIQ firms have a mean turnover value which corresponds to the mean turnover values of the entire market for similar size deciles.

C. Statistics of returns and turnover of HOT LIQ and COLD LIQ Portfolios

The return distribution for the two portfolios is shown in figure 2.4. They do not differ significantly from each other though the positive excess liquidity portfolio is more dispersed. Table 2.2 reveals the mean portfolio returns of the COLD LIQ and HOT LIQ portfolios in calendar time. Panel A of Table 2.2 reports the *ex-post* time-series mean returns for the two liquidity portfolios during the portfolio formation period of 2-12 months. The monthly raw return for the HOT LIQ portfolio is significantly high at 1.82%. The excess returns based on equal-weighted and value-weighted CRSP NYSE/AMEX/NASDAQ index returns are also positive. The mean turnover of the HOT LIQ firms is 2.56%, which is considerably higher than the mean turnover of all stocks at 1.6% (see Table 2.1). For the NEG LIQ portfolio, the corresponding values contrast.

Though the raw returns during the portfolio formation period was positive at 0.11% per month, the equal-weighted and value-weighted excess returns are both negative. The mean turnover of 0.7% is much lower than 2.56% for the HOT LIQ firms and 1.6% for all stocks in general.

For the analysis period which includes firms from the 13th to the 36th month of the IPO, the figures differ. Table 2.2, panel B shows these results. For the HOT LIQ Portfolio the time-series mean raw return is positive but has declined to 0.41%. The corresponding monthly raw return for the COLD LIQ portfolio has increased to 1.15%. The equal-weighted and value-weighted excess returns for COLD LIQ portfolio are now positive whereas for the HOT LIQ, the fortunes seemed to have reversed as both excess returns are negative. The mean turnover for COLD LIQ firms has increased to 1.19%. The turnover of the HOT LIQ firms has declined from 2.56% to 1.93%, but is still much higher than for the NEGLIQ firms. Notice then, that there is a reversal in returns for the HOT LIQ and COLD LIQ firms in the period between years one and three of the IPO. This is also accompanied by an increase in liquidity for COLD LIQ firms and a decline in liquidity for the HOT LIQ firms.

IV. Event time performance of the liquidity portfolios

A. Cumulative Average Excess Returns

To compare the performance of the positive and negative excess liquidity firms against broad based market indices, a standard procedure of computing cumulative average returns in event time is employed. Following Ritter (1991) and Ang, et al. (2005), the cumulative average excess return of a portfolio of IPO firms from event month τ to month T is given as :

$$\overline{CAR} = \sum_{t=\tau}^{T} ER_t$$

where the excess return ER_t for event month t is

$$ER_t = \omega_t \sum_{i=1}^{N_t} \left(R_{it} - R_{Bt}\right)$$

The $\overline{CAR}$ statistic cumulates the average excess IPO returns across various horizons T, where the averaging is done across all IPO firms from the event month *t*. The average ER_t is either equal-weighted or value-weighted. R_{Bt} is the monthly return on a benchmark index used to calculate excess return each month. Equal-weighted and value-weighted CRSP NYSE/AMEX/NASDAQ returns are used as benchmark index returns. To compute the equal-weighted excess return ER_t, the weight ω_t is $1/N_t$ where N_t is the number of IPOs forming in the IPO portfolio in the event month t. For the value–weighted excess return ER_t, the weight ω_t for the excess negative liquidity portfolio equals MV_i / MV_{N_t} where MV_i is the market capitalization of the i^{th} stock and MV_{N_t} is the total market capitalization of all the IPO stocks forming the portfolio at event month *t*.

The cumulative average excess returns for the two portfolios are listed in Table 2.3. If the any IPO firms get delisted before the holding period of 36 months the CRSP delisted returns are used.[9] The t-statistics show the result of a paired t-test for the significance of two means. In the portfolio formation period of 12 months, the HOTLIQ portfolio outperforms the COLDLIQ portfolio in terms of excess returns[10] (both equal-

[9] An alternative delisting return of 35% for NYSE/AMEX firms and 55% for NASDAQ firms for delisting codes 500 and 500-584 are also used as recommended in Shumway (1997) and Shumway and Warther (1999) and our results remain qualitatively unchanged.
[10] We use CRSP NYSE/AMEX/NASDAQ equal weighted and value weighted returns to calculate excess returns.

weighted and value-weighted) and raw returns. For the HOTLIQ portfolio, the equal-weighted cumulative excess return for the portfolio formation period of 2-12 months is 8.63% as compared to -4.17% for the COLDLIQ portfolio. The comparable values for value weighted cumulative excess returns are 9.03% and -3.27% for the HOTLIQ and COLDLIQ portfolios respectively. For the cumulative raw returns, the difference is larger in magnitude. For the holding period of 13 to 36 months following the portfolio formation period, the results differ significantly. The HOTLIQ portfolio has an equal-weighted cumulative excess return of -7.67% over the 13th to 36th month of the IPO, and the COLDLIQ portfolio generates a return of 5.12% for the same period. The values for the value-weighted cumulative excess returns are -9.45% and 7.3% for the HOTLIQ and COLDLIQ portfolios respectively. The differences in means are statistically significant.

For robustness we exclude IPOs which are between 1 and 36 months old in the hot issue period of 1999 to mid 2000. The equal weighted cumulative excess returns for the HOTLIQ and COLDLIQ portfolios are 13.06% and 6.46% respectively for the portfolio formation period and the corresponding values for value-weighted returns are 11.39% and 7.81% respectively. For holding period of 13 to 36 months the equal weighted cumulative excess return for the HOTLIQ portfolio is -9.13% and that for the COLDLIQ portfolio is -2.95%. The value-weighted cumulative excess returns are -7.14% and -2.98% for HOTLIQ and COLDLIQ respectively. This suggests that both portfolios under perform on the broad based market indices but the underperformance of the positive excess liquidity portfolio is greater than the negative excess liquidity portfolio. Figure 2.5, panels A and B show the mean turnover and the raw returns for each IPO month.

The fact that HOTLIQ firms have positive excess liquidity in the short run supports the notion that liquidity is positively related to contemporaneous returns (Acharya and Pederson, 2003). Interestingly, Acharya and Pederson's theoretical model also provides some explanation for the good performance of the COLD LIQ firms in the long run. Their model predicts that positive shocks to *illiquidity* (in this case the negative liquidity of COLDLIQ firms) are associated with a low contemporaneous returns and high predicted future returns.

V. Liquidity risk in a multifactor model

The use of performance evaluation in event time is often criticized (Kothari and Warner, 2005) as it fails to explicitly control for temporal dependence in returns. It can still be possible that even though HOT LIQ IPOs perform poorly in event time, they may not under perform in a risk adjusted multi factor asset pricing framework. In other words, it can only be conclusively said that HOT LIQ firms under perform relative to COLD LIQ firms if the underperformance persists even after adjusting for the systematic risk factors. It is not aberrant to expect that HOT LIQ and COLD LIQ firms would be affected differently by changes in market wide liquidity.

A. Liquidity as a Priced Factor

Fama and French (1992) argue that liquidity is an important issue, but it does not need to be specifically measured and accounted for because it is subsumed by the combination of size and book-to-market factors. However, cross-sectional studies by Brennan and Subrahmanyam (1996) find that there is a statistically significant positive relationship between expected returns and illiquidity, even after taking the Fama and French (1993) risk factors of size and book-to-market factors into account. Other studies, such as Chordia, Subrahmanyam and Anshuman (2001), find that individual stock liquidity is very much an important factor in returns even after controlling for size, book-to-market factors, and other variables.

Chordia et al. (2000a) and Huberman and Halka (2001) examine the systematic nature of liquidity risk. Pastor and Stambaugh (2003) focus on systematic liquidity risk in returns and provide evidence that stocks that are highly sensitive to shifts in market liquidity (having high *liquidity beta*) have high expected returns. This liquidity factor appears to be distinct from SMB and HML, suggesting an independent source of risk. O'Hara (2003) argues that asset pricing models need to be recast in broader terms to incorporate the transaction costs of liquidity. Acharya and Pederson (2003) find that incorporating systematic liquidity risk in the standard CAPM model increases the explanatory power of CAPM. Eckbo and Norli (2005) create a liquidity factor using an algorithm similar to the Fama-French factor and find it to be comparable in significance to other priced factors. Addressing the recent literature on liquidity risk, liquidity is included in the Fama-French factor framework.

B. Creating the LIQ Factor

For calculating a market wide liquidity measure, our data set consists of 5,390 firms spanning NYSE, AMEX and NASDAQ stocks that are not new issues. Specifically, all firms that publicly issued new equity for cash during the prior five years or have been CRSP-listed for less than five years are excluded from the sample. The procedure is similar to Loughran and Ritter (2000), to create purged HML and SMB factors by excluding new issues[11].Their argument is that if IPOs in the universe of firms are used to

[11] Loughran and Ritter (2000) also exclude Seasoned Equity Offerings (SEOs) along with the IPOs.

create the Fama-French factors, there would be benchmark contamination if IPO returns are used as the dependent variable as the regressors themselves will be 'contaminated' with firms which are new issues. In the limit, the power of the test is lowest when the benchmark is composed of same firms with the same weights, as the sample being tested. Re-creating the factors devoid of IPO firms would increase the power of the test. To reduce this factor contamination bias documented in Loughran and Ritter (2000), the liquidity factor is created on a purged dataset.

The liquidity premium is calculated each month following an algorithm similar to the size premium created by Fama and French (1992, 1993). To construct the liquidity factor, three portfolios are formed based on a ranking of firms beginning in December, 1992, based on the market value of equity for the purged NYSE/AMEX/NASDAQ stocks (small, medium and big size firms) and three portfolios are formed using NYSE/AMEX/NASDAQ stocks ranked on turnover. Next, nine portfolios are constructed from the intersection of the three size and the three turnover portfolios. Monthly equal-weighted returns on these nine portfolios are calculated starting in January, 1993. Portfolios are reformed in July every year using firm rankings from December of the previous year. The return on the LIQ premium is the difference between the equal-weighted mean returns for the three lowest liquidity portfolios and three highest liquidity portfolios. The risk free rate R_f and the three Fama-French factors, market risk premium (MKT), size (SMB), value (HML), and momentum (UMD) for each month were obtained from Kenneth French site.[12]

[12] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

The LIQ factor is included with the market premium, SMB (size premium), and HML (value premium) factor data from Kenneth French web site to create a matrix of explanatory variables.

C. Summary Statistics of the Explanatory Factors

The liquidity factor, LIQ, differs from the LMH (Low minus high) factor created by Eckbo and Norli (2005) in two important respects. The primary difference is the LIQ factor does not include stocks which were IPOs in the prior 60 months. This would help to avoid the factor contamination problem discussed in Loughran and Ritter (2000). Secondly, Eckbo and Norli create six portfolios based on two size and three turnover portfolios and take the difference between the average monthly returns of two lowest liquidity portfolios and two highest liquidity portfolios to obtain the liquidity factor LMH. To calculate LIQ, the difference between the average monthly returns for the three lowest liquidity portfolios and three highest liquidity portfolios from a matrix of nine portfolios (three size and three turnover) is used. Eckbo and Norli (2005) use NYSE/AMEX stocks to sort firms into size and liquidity portfolios. An overwhelming majority of the IPO stocks are listed in NASDAQ, so both NASDAQ and NYSE/AMEX stocks are included for ranking purposes. Another reason to include NASDAQ is due to the fact that NASDAQ firms exhibit larger turnover than NYSE/AMEX stocks.

The time series average monthly return on LIQ is 0.10% against 0.14% for LMH during the overlapping period from January, 1993 to December, 2002. This difference in returns can be attributed to the inclusion of IPOs in creating the LMH factors. If the IPOs are mostly high liquidity stocks, they would fall under the ‘High’ turnover portfolios, given that the IPOs did not perform well compared to size matched firms[13], it is not surprising that the premium between low liquidity and high liquidity firms will be greater if the returns of IPO firms are include in creating the liquidity factor. Table 2.4, panel B shows that the correlation between LIQ and LMH is quite high at 82.6. Table 2.4, panel A reports the time series average values of the Fama and French three factors and the momentum factor along with the liquidity factors. The table also includes the size and value factors estimated by Loughran and Ritter (2000) from datasets which excludes new issues and seasoned equity offerings. Table 2.4, panel B reports the pair-wise correlation of the factors used in the multifactor regressions.

The average return on factors has changed over time. Using data from July, 1963 to December, 1991, Fama and French (1993), find the market premium to be 0.43%. Here, a market premium of 0.62% is found for the period from January, 1993 to December, 2005. The value premium HML has slightly increased from 0.40% per month (Fama and French, 1993) to 0.42% in the sample period used here. However, the size factor, SMB, declined from 0.27% (Fama and French, 1993) to about 0.17% for the time period 1993 to 2005. An explanation for this is the poor performance of small firms relative to big firms during 1990's. The momentum factor UMD, based on Carhart (1997), has the highest average return among the factors at 0.89% from 1993 to 2005. In the same period, the liquidity factor LIQ has a positive average return of 0.09%. For the size and value factors on the purged datasets, data up to December 2003 is used. The time series average of the purged size factor, pSMB, is 0.20% during that period. The premium on the purged value factor is widely different. For the time period 1993 to 2005,

[13] Ritter (1991), Ang et al.(2005), and Eckbo and Norli (2005) find lower returns for IPO firms compared to the size matched firms when they use buy-and-hold abnormal returns.

the pHML is 0.20% compared to 0.45% for the unpurged HML factor during the same period. This can be attributed to the fact that low Book-to-Market portfolios are usually intensive in recent issuers. Including IPOs in creating the Fama French factors would tend to have a higher HML premium than if IPO firms are excluded. The new issue firms are found to have lower returns on average than the size and value matched firms (Ritter, 1991).

VI. Results and Analysis

A. Multi Factor Asset Pricing framework

Time-series regressions have an advantage over traditional event-study procedures in that the regressions can explicitly control for temporal dependence in returns. The long run performance is measured in a multi-factor asset pricing framework (see Appendix A for a discussion). In each calendar month over the entire sample period, a portfolio is constructed comprising all IPO firms experiencing the event within the previous 36 months. Since the number of event firms is not uniformly distributed over the sample period, the number of firms included in a portfolio is not constant through time. As a result, some new firms are added each month and some firms exit each month. Accordingly, the portfolios are rebalanced each month and an equal-weighted portfolio excess return is calculated. The resulting time series of monthly excess returns is regressed on the three Fama-French (1993) factors, including the liquidity factor[14], the Carhart (1997) four-factor model, and the five factors. The regression equation is therefore:

$$R_{IPO,t} - R_{ft} = \alpha + bMKT_t + sSMB_t + hHML_t + cLIQ_t + u\,UMD_t + \varepsilon_t$$

[14] We are grateful to Eckbo and Norli for providing the LMH factor.

where $R_{IPO,t}$ is the return to IPO portfolio for month *t*, R_{ft} is the one month Treasury-Bill return for month *t*, and MKT_t is the excess market return to the CRSP value-weighted index for month *t*. The factor loading *b* on the market premium *MKT* gives the CAPM *beta* of the IPO portfolio. SMB_t is the realization on a size-based portfolio that buys small cap stocks and sells large cap stocks. Similarly, HML_t is the realization on a factor portfolio that buys high Book-to-Market stocks and sells low Book-to-Market stocks. The *s* and *h* coefficients measure the sensitivity of the portfolio's return to the small-minus-big and high-minus-low factors respectively. Portfolios of value stocks should have a high positive value for *h*, while growth portfolios should have a high negative *h*. The largest capitalization portfolio should have a negative value for *s*, and small capitalization portfolios should have a large positive factor loading on *SMB* (*s* should be positive).

A.1. Multifactor Regressions on All IPO firms.

Table 2.5 reports time series multifactor regressions on equal-weighted excess returns of a portfolio of all IPO firms in the sample which have issued equity for cash during the prior 36 months. The excess return is calculated each month by subtracting the 1-month Treasury bill rate from the calendar time IPO portfolio return for that month. Column (1) shows the result of the Fama-French model. The factor loading on the market premium is 1.39 and highly significant. This suggests that IPO firms have high market risk as measured by the beta. The coefficient on the size factor is 0.989 and is also highly significant. The high *s* signifies that, in general, IPO portfolios are small firms compared to the market. The loading on the value factor, HML, is significantly negative at -0.44 which is expected as IPO firms are usually growth firms. The Jensen's alpha which measures abnormal performance is negative at -0.274% and significant at 10%. This translates to an underperformance of 27 basis points per month or about 3.3% per year. Loughran and Ritter (1999) used a similar model for the time period from 1973 to 1996, and found Jensen's alpha to be -0.40% and significant at 1%. For the time period 1990 to 2000, Welch and Ritter (2002) find the underperformance of -0.48% with a marginally high t-statistic of -2.01.

Column (2) reports the regression results during the same sample period for the Carhart four factor model which includes the momentum factor UMD in addition to the Fama French factors. The factor loadings for the market, size, and value factors have the same sign and significance as in three the factor Fama French model. The UMD factor has negative and highly significant factor loading. The Jensen's alpha is negative again but not significant with a t-statistic of -1.86.

Column (3) reports the Fama French three factor augmented with our liquidity factor LIQ. The loading on the market declines from 1.39 to 1.23 but remains highly significant. The factor loading on the liquidity factor LIQ is -0.235 and significant at 10%. The product of this estimate and the average return on LIQ during the same period (0.09%) gives a reduction in the expected return of the IPO portfolio by 0.021% per month. The Jensen's alpha for this regression is -0.20% and significant at 10%, which implies less underperformance than in the Fama-French model. Following Eckbo and Norli (2005), this implies that if an IPO portfolio is more liquid than the market, the expected return is lower, as the IPO portfolio has a lower 'liquidity' risk.

However, the inclusion of a liquidity factor does not make the underperformance vanish. Column (4) reports the five factor regression which includes the momentum and the LIQ factor along with the regular Fama French factors. The alpha is still negative but is insignificant. Column (5) reports the five factor model regression replacing the previously used LIQ factor with Eckbo and Norli's LMH factor. The sample period for this regression is from 1993 to 2003 as the data for LMH is available only till December 2003. Though comparing the alpha coefficient is not directly comparable for different time periods, it is still negative but remains insignificant. The co-efficient on the LMH factor is -0.33 and significant at 5% which is greater than the coefficient of LIQ[15]. This difference in the liquidity coefficient could result because Eckbo & Norli's liquidity factor LMH contain returns of IPO firms whereas the LIQ does not.

Overall, IPO firms have negative abnormal return in the sample period from 1993 to early and mid 2000, though the significance is diminished the momentum factor or the augmented five factor model is used.

A.2. Different Sample Periods

Comparing Jensen's alpha coefficient when the IPO sample is broken into sub-periods is of interest. The first sub-period uses the starting year 1993, which is the year when the U.S. economy (and the stock market) began to recover from the 1992 recession. The ending year for the first sub-period is 1998 when the stock market started to receive warnings of "irrational exuberance" by Fed Chairman Alan Greenspan but still continued good performance. Since 1999 to early 2000 saw one of the greatest stock market increases in history with NASDAQ (reaching above 5000 points in March, 2000), the second sub-period is from January 1999 to December 2000. The third sub-period starts

[15] Separate unreported five factor regression with LIQ as the liquidity factor for the common sample period from 1993 to 2003 was also conducted. The coefficient on LIQ is -0.1565 and significant at 10% and alpha is -0.18 but insignificant.

with January, 2001, when the stock market was gradually declining. With the terrorist attack in U.S. soil in September, 2001, the market declined a bit but the sharpest decline started in early 2002 with the fall of Enron. Within a few months, NASDAQ had fallen to levels of 1200. The sub-period of IPO firms stops at year 2002 though the estimation period is till 2005 since firms which have less than 3 years of post issue performance are not included.

Table 2.6 reports the results for different sub-periods. For the first sub-period, the alpha is negative and significant at 10%. For the Fama French model, the alpha is -0.31% and for the five factor model with LIQ the alpha is -0.25 and also significant. The coefficient on LIQ is -0.134 and significant at 10%. For the second sub-period, the alpha is also negative and large at -0.96% for the Fama French and -0.73% for the five factors though the alphas are not significant. The loading on LIQ is -0.21% but not significant.

For the third sub-period, the results are significantly different. The alpha is positive at 0.64% for the three factor Fama French model but is insignificant with a t-statistic of 1.32. For the five factor model the alpha is 0.45 but insignificant with a t-statistic of 0.93. This 'anomalous' result is similar to the results found by Welch and Ritter (2002) for the sample period January, 2000 to September, 2001, where the alpha co-efficient was an insignificant but positive 0.62% for the Fama French model. They attributed the result to the high negative market returns and concurrent collapse of technology stocks. Although during the same period they found IPOs under perform the

CRSP NYSE/AMEX/NASDAQ index returns by -34.3% if the underperformance is measured by the standard buy and hold method.[16]

The results show that the extent, to which IPOs underperform, as measured by Jensen's alpha, varies significantly across sub-periods. This is consistent with the findings of Loughran and Ritter (2000) and Welch and Ritter (2002). Baker and Wurgler (2006) find that in periods of high investor sentiment, stocks that are attractive to optimists and speculators and at the same time unattractive to arbitrageurs like IPOs, such as small stocks and extreme growth stocks, tend to earn relatively low subsequent returns. They measure market sentiment, among other things, by average stock turnover, frequency of IPO offerings in a year and average first day returns on IPOs. Conditional on low sentiment, they find that these cross-sectional patterns attenuate or completely reverse. If Baker and Wurgler's (2006) sentiment index[17] is considered, the underperformance is highest when the market sentiment was highest (2000) and lowest when the sentiment was lowest (2002 to 2004).

A.3. Long run Performance of IPOs across Exchanges

Table 2.7 reports the Fama French and the five factor regressions on the IPOs from the NYSE, AMEX and NASDAQ exchanges. There are 503 IPOs listed in NYSE in the sample. Columns (1) and (2) reports the regression results for NYSE IPOs. The Jensen's alpha is -0.13% for the Fama French and -0.14% for the five factor and are significant at 5%. The coefficient on LIQ is negative at -0.41% but not significant. The

[16] Welch and Ritter (2002) in the same paper comment that "[the Fama French regression results] indicate that the period during which the Internet bubble collapsed were great years for recent IPOs, even though an equally weighted portfolio of recent IPOs lost on average 355 basis points per month." (pp. 1823)

[17] The various sentiment index data is available at Jeffery Wurgler's website at Stern, NYU.

factor loading on size is 0.69 which is much lower than the high numbers of around 1 for the entire sample. Another interesting feature is the HML factor is positive and highly significant in contrast to the negative factor loadings for the entire sample. This implies that the firms listed in NYSE are on average "value" firms relative to the entire IPO sample or NASDAQ IPOs.

Columns (3) and (4) report the regression results for AMEX firms which has 104 firms in the sample. The alpha is negative but highly insignificant. The loading on the liquidity factor is -0.092% but not significant. The R-square for the AMEX sub-sample are in the range of 8.5% which is much lower compared to NYSE and NASDAQ regressions where the R-squares are in the nature of 85% to 89%.

The NASDAQ IPOs form the bulk of our sample comprising of 2,766 firms out of the total sample of 3,373 IPOs. The Jensen's alpha is -0.17% and significant for the Fama French model and -0.19% but insignificant for the five factor model. The loading on LIQ is significant and has a value of -0.47% which is little higher than the factor loading on LIQ for NYSE IPOs. The interesting difference is on the value factor. Here the loading on HML is significant and negative implying that the NASDAQ IPOs are high growth firms in general. The loading on the size factor is above 1% compared to 0.65% to 0.69% for NYSE firms. This is expected as NASDAQ firms are much smaller than NYSE firms.

The NASDAQ IPOs are also more sensitive to the momentum factor than the NYSE IPOs. Overall, in the sample period from January 1993 to December 2005, the IPO underperformance is robust across exchanges.

B. Performance of NEG LIQ and HOT LIQ IPOs

The focus will now turn to the two sub sample portfolios of IPOs created using the excess liquidity measure. The results will first show how the two portfolios performed in calendar time for a holding period of three years. It should be noted that the portfolio can only be formed by looking at the excess liquidity of the first year of IPOs, so the results are *ex-post* and only indicate how the two portfolios performed overall. The results presented here can only give some idea of how the factor loadings have changed from the portfolio formation period to the actual evaluation period.

B.1. All Periods

Table 2.8 reports the multi factor regression results. Columns (1) and (3) give the Fama French regression results for COLD LIQ and HOT LIQ portfolios respectively. Both the portfolios have a negative Jensen's alpha, but whereas the alpha -0.084% for COLD LIQ IPO is insignificant, the corresponding number for the HOT LIQ portfolio is significant with a value of -0.27%. The five factor regressions, as reported in column (2) and (4) for the respective portfolios, show the alpha for the COLD LIQ portfolio decreases to -0.1% but still remains insignificant. The magnitude of the underperformance for the HOT LIQ portfolio declines to -0.21% and becomes insignificant with a t-statistic of -1.33.

Additionally, the loading on the market factor is higher for the HOT LIQ portfolio than the COLD LIQ portfolio, possibly indicating that HOT LIQ stocks are more exposed to market risk. The loading on the size factor is not markedly different, though the COLD LIQ portfolio has slightly lower values. The discrepancy is higher for the value factor. For both liquidity portfolios it is negative but it is about three times higher in absolute magnitude for the HOT LIQ firms than the COLD LIQ firms. This indicates that the

COLD LIQ firms are low growth firms relative to the HOT LIQ firms. For the loadings on the liquidity factor, both the coefficients are negative but the HOT LIQ portfolio has a higher negative factor loading than the COLD LIQ portfolio.

B.2. The Evaluation Period Results for COLD LIQ and HOT LIQ portfolios

The COLD LIQ portfolio in the evaluation period consists of all negative excess liquidity firms which have issued equity more than 12 months before and which have not completed a three year anniversary of their initial public offering. The multi factor regression results in calendar time for the portfolio of COLD LIQ firms are reported.

The sample period for the regressions in the first four columns is from January 1994 to December 2005. Column (1) of Table 2.9 shows the Fama French three factor results. The Jensen's alpha is 0.19% and significant at 5% level which shows a significant departure from the negative alphas seen in the earlier regressions. This translates to a 2.3% abnormal performance per year for the COLD LIQ portfolio. For the Carhart model regression, reported in column (2), the alpha is still positive and significant at 10% but the magnitude of over performance has declined to 0.15% per month. For the four factor model with liquidity, the loading on the liquidity factor LIQ is -0.24% and is significant at 10%.

Column (4) reports the five factor regression results. The factor loading on liquidity is now -0.13% due to the inclusion of the momentum factor. The alpha is positive at 0.19% but insignificant. For the sample period from January 1994 to December 2002, the five factor regression with Eckbo and Norli's (2005) liquidity factor gives an insignificant alpha of 0.22%. The loading on the LMH is -0.33% and is significant at 10%.

Table 2.10 displays the corresponding results for the HOT LIQ portfolio. The alphas are significantly negative for the Fama French model and the Fama French model with liquidity. The magnitude of underperformance for Fama French is -0.37% which equals a negative abnormal annual return of -4.45%. The corresponding value of alpha for Fama French with liquidity is -0.33%. The alpha is positive but not significant at 10% for the other three regressions. The magnitude of Jensen's alpha ranges from -0.44% for the five factor model with LMH to -0.26% for the Carhart model.

The Tables 2.9 and 2.10 confirm that the findings for cumulative average excess returns in even time (see Table 2.3). The COLD LIQ portfolio performs better than the HOT LIQ portfolio even in calendar time.

C. Zero-Investment Returns Tested in a Multifactor Framework.

To evaluate the Zero-investment strategy returns in the Fama French framework augmented by momentum and liquidity factors, the five factor model can be rewritten:

$$R_{nt} - R_{pt} = (\alpha_n - \alpha_p) + (b_n - b_p)MKT_t + (s_n - s_p)SMB_t + (h_n - h_p)HML_t + (l_n - l_p)LIQ_t + (u_n - u_p)UMD_t + \xi_t$$

this can be re-written as:

$$R_{np,t} = \alpha_{np} + b_{np}MKT_t + s_{np}SMB_t + h_{np}HML_t + c_{np}LIQ_t + u_{np}\,UMD_t + \varepsilon_t$$

where $R_{np,t}$ is the difference between monthly returns on the negative excess liquidity and positive excess liquidity portfolios. The alpha ($\alpha_{np,t} = \alpha_{nt} - \alpha_{pt}$)in the regression is the abnormal return on a zero-investment strategy that buys the negative excess liquidity portfolio and sells short the positive excess liquidity portfolio. If there is no perceivable difference in risk-adjusted returns between the two portfolios, the alpha coefficient should be close to zero and insignificant. The results in Table 2.11 suggest this is not true.. $\alpha_{np,t}$ is positive and significant for the Fama-French three factor model, the Fama-French model with liquidity factor and the five factor model with LIQ. It is positive but not significant in the Carhart (1997) model and the five factor model with LMH. The monthly return on the zero investment strategy $\alpha_{np,t}$ for the Fama-French model is 0.56% per month which translates into a more than 6.7% annual return. The returns for the other models are modest, range from 0.67% per month for the four factors with liquidity to 0.4% for Carhart (1997) model. The coefficient on market premium is negative, confirming the result in the previous section that positive liquidity stocks are high beta stocks and are more exposed to market risk.

The liquidity betas are significant and have positive sign due to the fact that the HOT LIQ portfolio has a greater negative factor loading on the liquidity factor than the NEG LIQ portfolio. For the five factor model with LMH, the estimated coefficient on LMH is 0.17 and significant at 10%. The product of this estimate and the average return on the LMH portfolio, as seen in Table 2.4, is about 0.024% per month. This increase in expected return for the zero investment portfolio is beyond the effect of LMH on the expected return of the HOT LIQ portfolio. The coefficient on the size factor is marginally negative but insignificant, suggesting that there is no significant impact of size that would drive the difference in returns. The coefficient on HML is positive and significant in all the factor regressions. This supports previous findings that the HOT LIQ firms are higher growth firms than the COLD LIQ firms.

D. Robustness Tests

D.1. Purged Factors

As discussed earlier, one of the criticisms against using Fama-French factors for testing abnormal performance of IPOs is benchmark contamination. In the multifactor regressions the liquidity factor LIQ was created using a purged dataset which excludes IPOs. However, the size, value, market, LMH and momentum factors are all created using a dataset which also contains IPO firms. In particular, when abnormal returns are being calculated using buy-and-hold returns, it is common practice to calculate the benchmark buy-and-hold returns by matching characteristics such as size and book-to-market factors after excluding event firms. Loughran and Ritter (1999) recommend that the same purging of the benchmarks should be done when multifactor models are being used. If the benchmark is composed of the same firms, with the same weights, as the sample being tested, the intercept will be biased towards zero and there will be no abnormal performance. They create size and value factors on a purged dataset of firms which excludes IPOs and SEOs which have issued equity for cash in the prior five years. The updated dataset is obtained from Jay Ritter's website, however the data runs only till December 2003.

Regressions on the HOT LIQ and COLD LIQ portfolios over the second and third year of IPO on the sample period from January 1993 to December 2003 using the modified Fama French model with purged SMB and purged HML factors are displayed in Table 2.12. For the COLD LIQ portfolio, there is significant overperformance of 0.22% at a 5% level of significance. The comparable value for the unpurged regression in Table 2.9 is 0.19%. For the HOT LIQ portfolio the alpha coefficient is still negative (-0.36%) and significant for the Fama French model. The level of significance declines to above 10% for both the portfolios if we use a five factor model.

Overall, there is stronger evidence that the COLD LIQ portfolio over performs during the sample period if the Fama French model with purged value and size factors is used. There is also significant evidence that the HOT LIQ firms under perform if the "decontaminated factors" in Fama French regression are included.

D.2. Different Time periods

Welch and Ritter (2002) reported that the Jensen's alpha is sensitive to different time periods. The results in Table 2.6 find a positive but insignificant alpha for IPO firms during the 2001 to 2005 period. How the HOT LIQ and COLD LIQ portfolios performed during different time periods are compared in Tables 2.13 and 2.14. All regressions are on the portfolio of HOT LIQ and COLD LIQ firms which have completed their first year anniversary but have not exceeded the three year age limit. The regression results for different sample periods are tabulated in Table 2.13 for the COLD LIQ portfolio and Table 2.14 for the HOT LIQ portfolio. For the three sub-periods, the Jensen's alpha is positive and significant at 10% level for the COLD LIQ portfolio. For the HOT LIQ portfolio, Table 2.14 shows that the sub-periods from 1993 to 1998 and from 1999 to 2000 yielded negative abnormal returns. For the period from January 2001 to December 2005, the alpha intercept is positive but insignificant. These results are similar to the positive alpha obtained for the same sub period for all IPO firms, as is seen in Table 2.6. A potential explanation for the strong underperformance of the HOT LIQ stocks during periods of high sentiment of 1999-2000 can be attributed to Baker and Wurgler (2006). They find that in periods of high investor sentiment, stocks that are attractive to optimists and speculators and at the same time unattractive to arbitrageurs like IPOs, such as small stocks and extreme growth stocks, tend to earn relatively low subsequent returns. The

HOT LIQ IPOs are extreme growth stocks and have significantly high growth parameter than COLD LIQ IPOs which is evident from the high negative factor loading on the value factor and significantly positive loading on the value factor for the hedge portfolio (Table 2.11).

The change in factor loadings on the liquidity factor LIQ over time is also shown. During the sub-period from 1993 to 1998, the factor loadings on LIQ for both the liquidity portfolios are roughly similar. Since 1999, the negative loadings on the HOT LIQ portfolio have exceeded that of the COLD LIQ portfolio. The loadings on the momentum factor are always much higher for the HOT LIQ portfolio.

Overall, the COLD LIQ firms have above average risk adjusted returns over all the sample periods in two to three year of their IPO. The HOT LIQ firms have significantly negative performance from 1993 to 2000, and the performance becomes marginally positive but insignificant for the period 2001 to 2005. The fact that underperformance of IPOs using Fama French factors might be widely underestimated is mentioned in Welch and Ritter (2002). They comment,

> Unless one is comfortable concluding that IPOs with –64.7 percent returns offered investors positive risk-adjusted returns, one should be wary of considering the Fama-French factors to be equilibrium risk factors and using them as controls. (pp. 1820)

D.3. Equally Weighing by Number of Firms Verses Equal Weighing the Time Period

In all the regressions thus far, each time period is equal-weighted rather than equal-weighing each firm. The standard procedure in calendar time regression is valuing each time series equally as it avoids the clustering problem in time series. Loughran and

Ritter (2000) suggest that if there are time varying misvaluations that firms capitalize on by taking some action (a supply response), there will be more events involving larger misvaluations in some periods than in others. They provide examples of include junk bond issuance, equity-financed acquisitions, equity issues, and share repurchases. They mention that, in general, tests that weigh firms equally should have more power than tests that weigh time periods equally.

A valid criticism against weighing by number of firms equally is due to pseudo-market timing hypotheses of Schultz (2003). Schultz speculates that issuers time their IPOs when the stock market is high and coincides with periods of excessive optimism such that more companies go public. Subsequently, the last large groups of IPOs underperform and comprise a relatively large fraction of the sample.

Thus, as a robustness check, a panel data cross section regression which weighs each firm equally is shown in Table 2.15. The standard errors are heteroskedastic and autocorrelation consistent Huber-White sandwich estimators. For the COLD LIQ portfolio during the evaluation period of second and third years of IPOs, the negative excess liquidity portfolio significantly over performs in the Fama French three factor model as well as in the five factor liquidity models. For the HOT LIQ portfolio, the reverse occurs with significantly high underperformance. The factor loadings on all the factors are significant.

D.4. Bid-Ask Adjusted Portfolio Returns

The HOT LIQ IPOs should generally have low transaction costs to trade as measured by the bid-ask spread. Conversely, the COLD LIQ IPOs should have a higher transaction cost to trade as they are more illiquid stocks. If the size of this transaction cost is sizeable, it may mitigate any observable excess return. This is a valid concern and deserves some consideration. The returns for the IPOs are obtained from Center for Research in Security Prices (CRSP) CRSP measures the return in time period t is calculated as $R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}}$. CRSP generally uses the closing price at period $t-1$ and t for P_{t-1} and P_t, which will be either a bid price or an ask price to calculate the rate of return. Since trades occur randomly at either the bid or the ask price, the measured rate of return will vary depending upon whether the price movement was from a bid price to an ask price or from one ask (bid) to another ask (bid) price. If the latter takes place, the absolute value of the CRSP measured return would be lower than in the case when the price movement was from a bid price to an ask price. This results in a measurement bias.

The second source of bias can arise from infrequent trading. Most illiquid stocks are less likely to trade on a given day. For these stocks, CRSP uses the average of the bid and ask price to measure returns. The mid price is not likely to be the price at which an investor trades the stock. To address both these issues[18] we take the ask price at the beginning of the month and the bid price at the end of the month for P_{t-1} and P_t to measure monthly stock return. The adjusted return is calculated as $R^A{}_{it} = \frac{Bid_t - Ask_{t-1}}{Ask_{t-1}}$.

The bid-ask adjusted returns for IPOs are run on Fama –French and five factor (with LIQ) regressions for the COLD-LIQ, HOT LIQ and the zero-investment portfolios. The results are presented in Table 2.16. For the Fama French framework, the COLD LIQ portfolio has a significant (10%) positive alpha of 0.16% per month which is slightly lower than 0.19% alpha for similar regression using CRSP monthly return (see Table

[18] In general the size of the bias is larger if the returns are measured daily.

2.9). For the HOT LIQ portfolio the alpha of -0.37% is almost similar to the result with CRSP monthly returns (see Table 2.10). The columns (5) and (6) of Table 2.16 reveals the result of the zero investment portfolio. For the Fama French model the intercept is 0.53% which translates to an excess return of 6.4% per annum. This compares to 0.56% monthly excess return or 6.7% annual return for the zero investment portfolio created using CRSP monthly returns (see Table 2.11). The results for alpha for the five factor model for COLD LIQ and zero-investment portfolio is positive but not significant and for HOT LIQ it is negative but insignificant.

VII. Conclusions

The relationship between current liquidity and future returns is negative but a positive contemporaneous relationship exists between liquidity and returns. This has significant implications about the role of observed liquidity as an indicator of future returns. Early excess liquidity seems to be an indicator of IPO underperformance in the long run. It appears to us that there is initial overpricing in the after market of IPO during short run which is coupled with high liquidity. If there is positive excess liquidity to begin with, the expected return on the IPO is lower in the short run. If the level of liquidity observed at the IPO after-market in the short run cannot be sustained over the long run, then as the liquidity declines, the expected rate of return will rise towards its long run 'equilibrium' value causing underperformance.

Two sub-samples of IPOs based on their excess liquidity show that the positive excess liquidity portfolio of firms under performs compared to the negative excess liquidity portfolio in the long run of one to two years after the initial one year portfolio formation period following the IPO.

Empirical evidence on the long term performance of IPOs from 1993 to 2005 shows that if the long term performance is measured by cumulative average excess returns, IPOs underperform a standard benchmark index. If the measure of underperformance in a multifactor asset pricing framework is used, there is underperformance when the market, size value, and liquidity factors are considered. However, the underperformance diminishes in significance if a momentum factor is included. The underperformance measured in the factor framework is sensitive to the sample period which supports the findings of Loughran and Ritter (2000).

If the multi- factor framework is considered, some studies find underperformance and some have reported no underperformance either in identical sample periods or different sample periods. A potential explanation for this can be the fact that the extent of long run performance of IPOs in a sample period is determined by the liquidity profile of the IPOs. More specifically, if there are more IPO firms which are characterized by positive excess liquidity, the subsequent future returns would show underperformance if measured above a period of one to three years.

Furthermore, the liquidity of the positive excess liquid IPOs declines on average and that negative excess liquid IPOs increase over time. The statistical event period of three years is too small to indicate a mean reversion in liquidity; however, this analysis is an area for future research.

Changes in liquidity can act as early warning signal for market moves. This is an interesting avenue that may be worth pursuing for security analysts. Creating high and low excess liquidity portfolios could be used as suitable hedging portfolios for fund managers. In general, our results suggest that future research should explore in more detail what role liquidity risk plays in various event studies as well as in pricing irregularities in asset markets.

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FIGURE 2.1

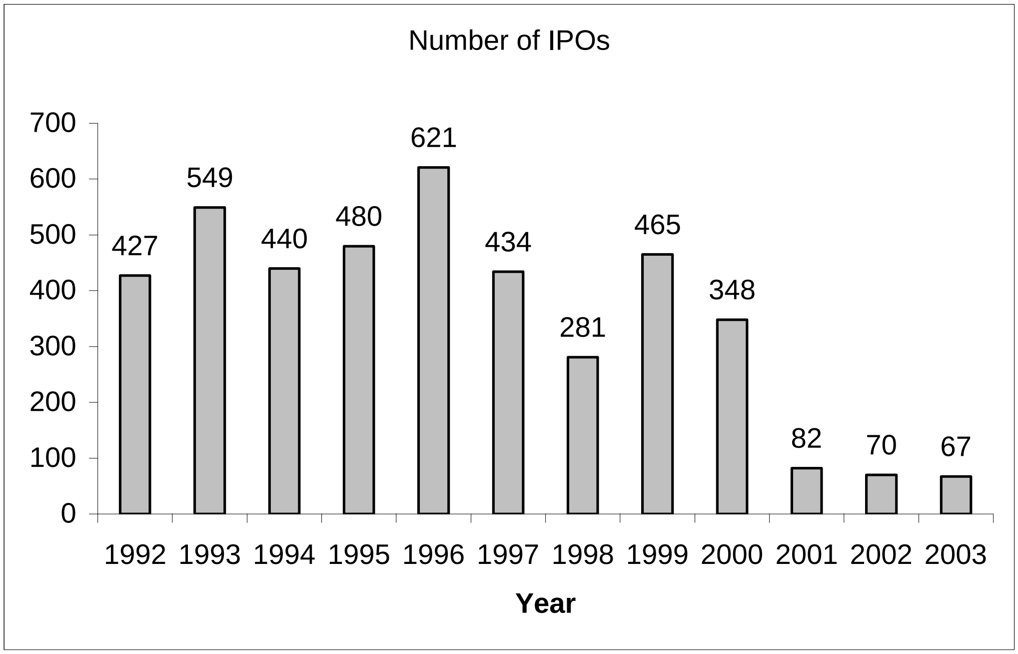


FIGURE 2.2

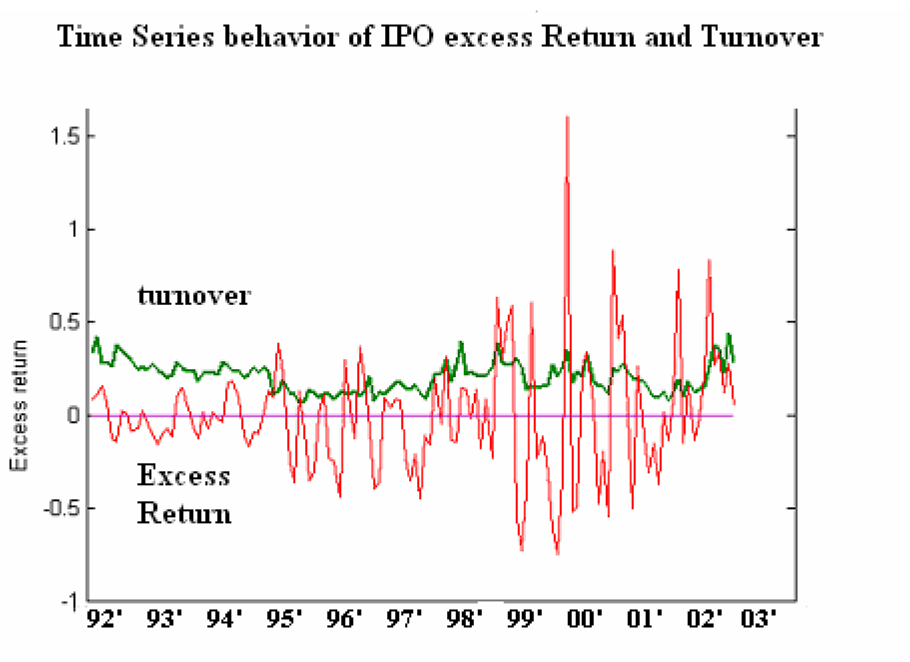
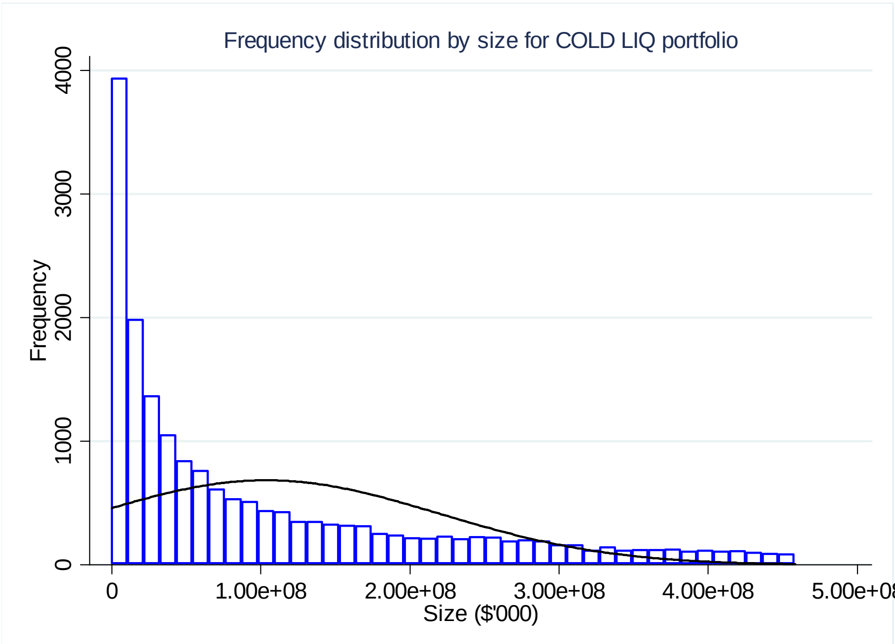


Figure 2.3

Panel A



Panel B

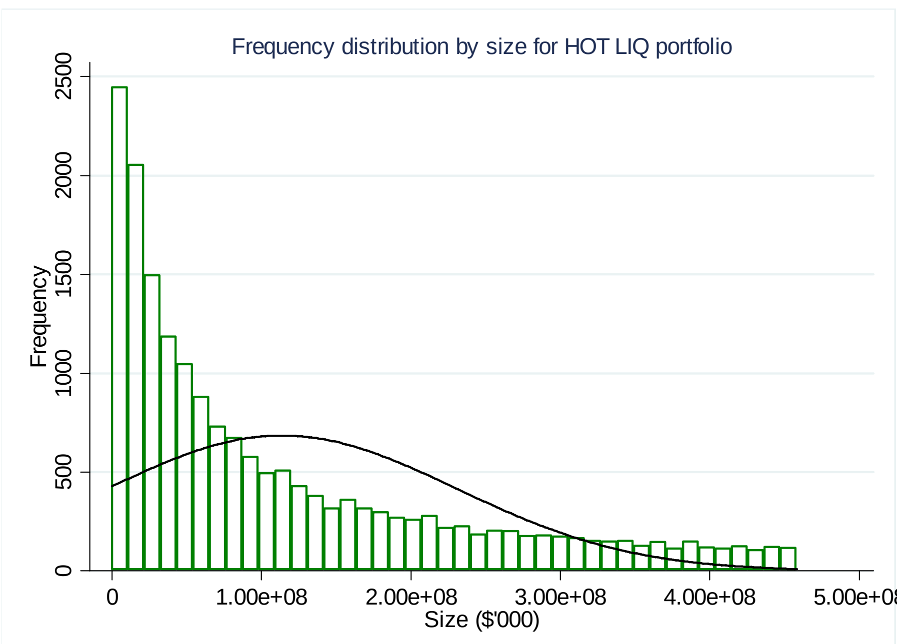
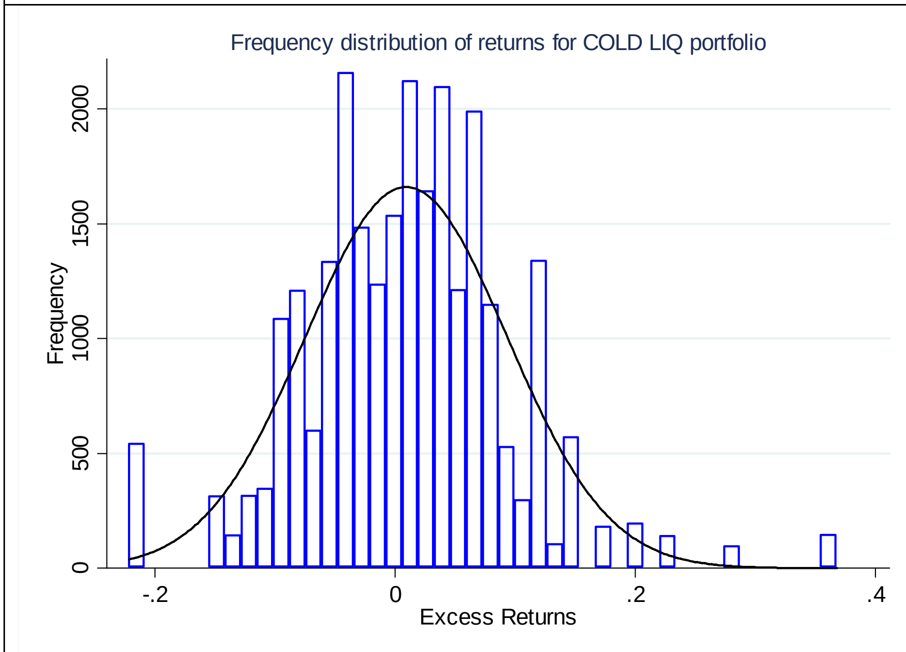


Figure 2.4

Panel A



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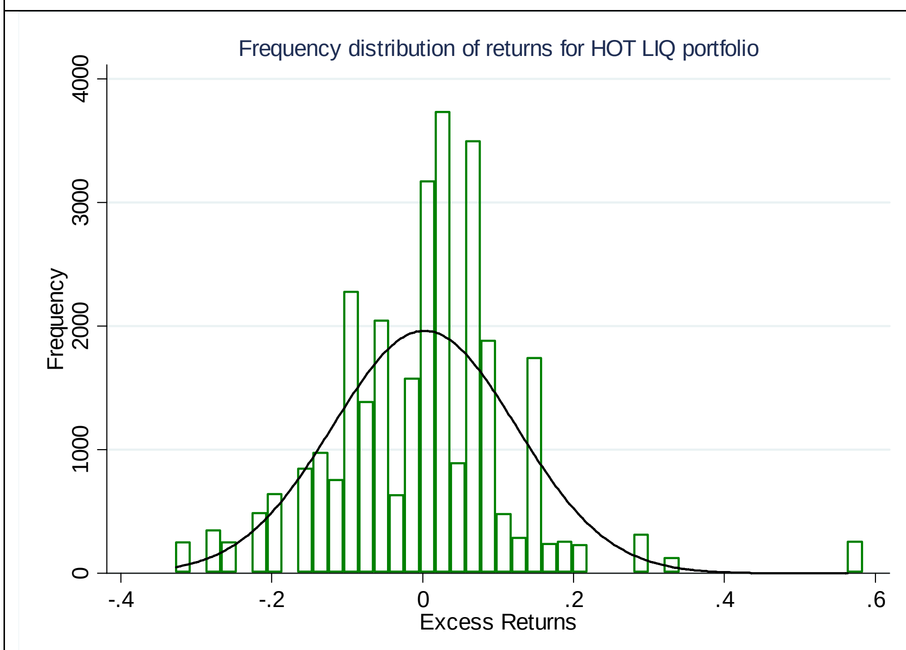
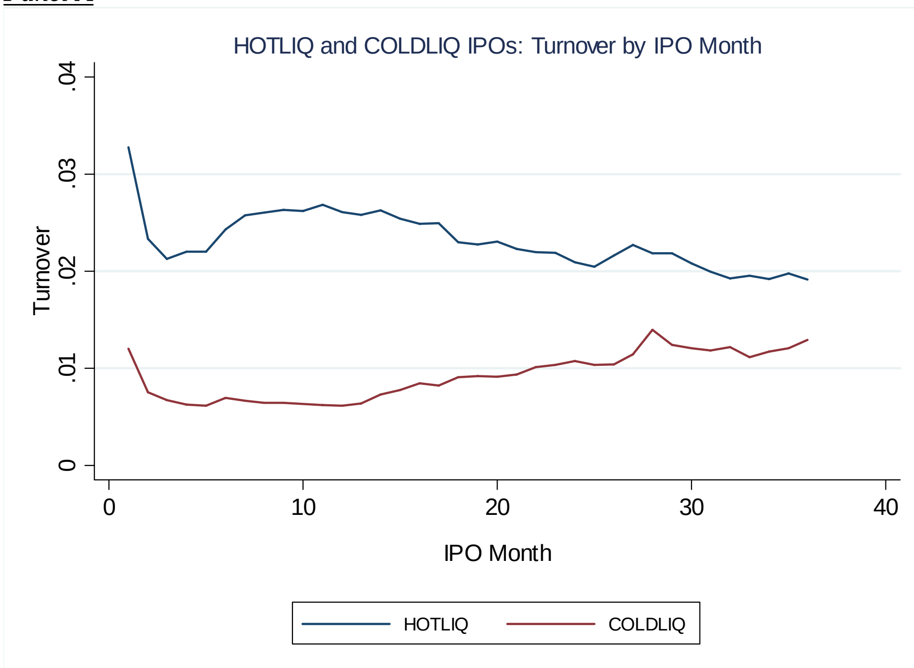


Figure 2.5

Panel A



Panel B

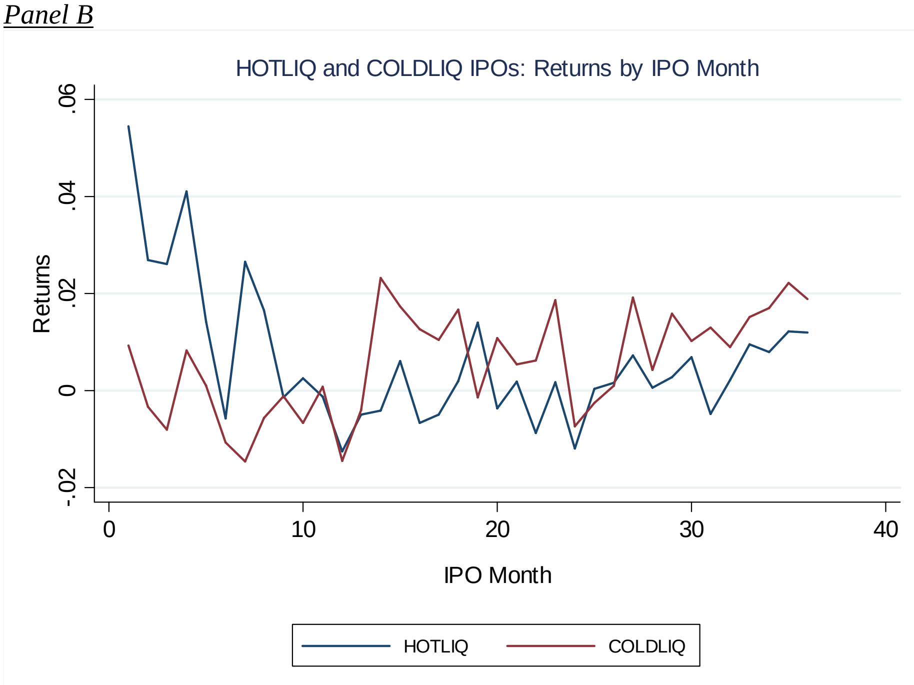


Table 2.1

The sample consists of CRSP-Compustat consistent NYSE, AMEX and NASDAQ data from January, 1993 to December, 2005. Excluded are closed-end funds, ADRs (American Depository Receipts, issued by foreign firms which have listings in at least one other market outside the US), REITs (real estate investment trusts), units, mutual-to-stock conversions, preferred stocks, penny stocks (with offer price less than $5), and the securities ineligible for continued listing. The data set is partitioned by size deciles by ranking all stocks each month by market capitalization and assigning a capital rank. The mean market raw monthly returns and percentage stock turnover are reported below.

Capital size deciles	Mean Market Capitalization (in $000,000)	Mean Monthly turnover	Mean Monthly returns
1	$8.98	0.0041	-1.33%
2	$14.23	0.0072	-0.65%
3	$31.59	0.0094	0.18%
4	$61.25	0.0112	0.70%
5	$114.51	0.0135	1.25%
6	$213.60	0.0161	1.36%
7	$420.43	0.0189	1.72%
8	$893.78	0.0225	2.07%
9	$1,235.79	0.0284	2.31%
10	$13,207.10	0.0276	2.11%
Total Sample	$1,520,994.54	0.0159	0.97%

Table 2.2: COLD and HOT Liquidity Portfolios

This table reports summary statistics for the COLD LIQ and HOT LIQ portfolios held in calendar time. The HOT LIQ portfolio consists of IPOs that have a mean positive excess liquidity in the 11 months following the first month of its IPO and also a positive excess liquidity on the 12th month of its IPO. The negative excess liquidity portfolio COLD LIQ is created based on the mean negative excess liquidity in the 11 months following the first month of its IPO and also a negative excess liquidity on the 12th month of its IPO. The sample period is from January, 1993 to December, 2005. The monthly equal-weighted and value-weighted excess returns are created against a benchmark of equal-weighted and value-weighted CRSP NYSE/NASDAQ index returns.

Panel A:	Portfolio formation period: 2-12 month of IPO					
	COLD LIQ Portfolio			HOT LIQ Portfolio		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Size ($'000,000)	$15.8	2.395	12342	$37.1	39.21	14054
Raw returns	0.11	2.53	12341	1.82	2.697	14052
Excess returns (Equal weighted)	-0.76	1.917	12341	1.08	2.55	14052
Excess returns (Value weighted)	-0.93	1.966	12341	0.58	2.02	14055
Stock turnover	0.0070	0.0060	12342	0.0256	0.0287	14054

Panel B:	Analysis period:13-36 month of IPO					
	COLD LIQ Portfolio			HOT LIQ Portfolio		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Size ($'000,000)	$57.2	678.9	27118	$94.4	874.4	30602
Raw returns	1.153	2.845	26982	0.41	2.951	30592
Excess returns (Equal weighted)	0.41	2.732	26982	-0.12	2.782	30592
Excess returns (Value weighted)	0.42	2.775	26982	-0.07	2.232	30592
Stock turnover	0.0119	0.0360	27118	0.01927	0.0701	30602

Panel C:	Entire period:2-36 month of IPO					
	COLD LIQ Portfolio			HOT LIQ Portfolio		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Size ($'000,000)	$49.93	557.1	39323	$89.01	831.7	44555
Raw returns	0.85	2.419	39323	1.07	2.834	44555
Excess returns (Equal weighted)	0.24	2.298	39323	-0.06	2.667	44555
Excess returns (Value weighted)	0.31	2.344	39323	0.01	2.139	44694
Stock turnover	0.0092	0.0227	39460	0.0235	0.0472	44749

Table 2.3: Cumulative Average Excess returns on COLD and HOT Liquidity Portfolios

This table reports the cumulative average excess returns for the COLD LIQ and HOT LIQ portfolios in event time. The HOT LIQ portfolio consists of IPOs that have a mean positive excess liquidity in the 11 months following the first month of its IPO and also a positive excess liquidity on the 12th month of its IPO. The negative excess liquidity portfolio COLD LIQ is created based on the mean negative excess liquidity in the 11 months following the first month of its IPO and also a negative excess liquidity on the 12th month of its IPO. The sample period is from January, 1993 to December, 2005. The monthly equal-weighted and value-weighted excess returns are created against a benchmark of equal-weighted and value-weighted CRSP NYSE/NASDAQ index returns. The t-statistics in parentheses gives the result of a paired t-test for significance of two means.

Excess Liquidity Portfolios	Cumulative Average Excess Returns, Equally Weighted	Cumulative Average Excess Returns, Value Weighted	Cumulative Raw Returns
HOTLIQ (2-12 months)	8.63	9.03	13
COLDLIQ (2-12 months)	-4.17	-3.27	0.73
	(-4.31)	*(-4.22)*	*(-4.34)*
HOTLIQ (13-36 months)	-7.67	-9.45	2.36
COLDLIQ (13-36 months)	5.12	7.3	9.32
	(2.67)	*(2.93)*	*(3.19)*
(*Without years 1999-2000*)			
HOTLIQ (2-12 months)	13.06	11.39	13.17
COLDLIQ (2-12 months)	6.46	7.81	9.18
	(-4.74)	*(-4.36)*	*(-4.76)*
HOTLIQ (13-36 months)	-9.13	-7.14	3.01
COLDLIQ (13-36 months)	-2.95	-2.98	7.24
	(2.90)	*(2.94)*	*(2.72)*

Table 2.4: Descriptive Statistics

MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. LMH (low minus high) liquidity factor is supplied by Eckbo and Norli. pSMB and the pHML are the size and value factors created on a dataset purged of new issues and IPOs. The purged factors are obtained from Jay Ritter's web site. The sample period is from January, 1993 to December, 2005. The data on LMH factor is only available till December 2002 and the purged factors till December 2003.

Panel A:

	Mean	Std. Dev.	No. of months
Excess return on the market, *MKT*	0.6167	4.2569	156
Difference in returns between small and big firms, *SMB*	0.1706	3.9179	156
Difference in returns between value and growth firms, *HML*	0.4241	3.6076	156
Difference in returns between winner and loser firms, *UMD*	0.8933	5.1542	156
Difference in returns between low liquidity and high liquidity firms, *LIQ*	0.0903	5.2840	156
Eckbo & Norli (2005) liquidity factor based on the difference in returns between firms with low and high turnover, *LMH*	0.1442	3.2528	120
Difference in returns between small and big firms purged of new issues, *pSMB*	0.2021	3.4763	132
Difference in returns between value and growth firms purged of new issues, *pHML*	0.2040	3.2197	132

Panel B:

	MKT	*SMB*	*pSMB*	*HML*	*pHML*	*UMD*	*LIQ*	*LMH*
MKT	1							
SMB	0.1533	1						
pSMB	0.02	0.9565	1					
HML	-0.5649	-0.5255	-0.3727	1				
pHML	-0.5454	-0.4237	-0.3067	0.9453	1			
UMD	-0.1865	0.186	0.1839	-0.0589	-0.0326	1		
LIQ	-0.5639	-0.5112	-0.4401	0.6134	0.5605	0.0999	1	
LMH	-0.6887	-0.5237	-0.4265	0.6081	0.5747	0.21	0.8267	1

Table 2.5: ALL IPO firms

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. $R_{IPO} - R_f$ is the excess return over the risk-free rate on an IPO portfolio in time period *t*, MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. LMH ((low minus high) is the liquidity factor supplied by Eckbo and Norli. The sample period for the first four regressions is from January, 1993 to December, 2005. For the regression with the LMH factor, the sample period is from January, 1993 to December, 2002. The standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

	All Firms				
	(1)	(2)	(3)	(4)	(5)
	FF-3 factor	Carhart(1997)	FF + LIQ	5-Factor (LIQ)	5-Factor (LMH)
α	-0.274*	-0.155	-0.2044*	-0.156	-0.215
	(0.1142)	(0.0833)	(0.0978)	(0.0857)	(0.1356)
MKT	1.388***	1.202***	1.228***	1.103***	1.021***
	(0.1677)	(0.0882)	(0.1639)	(0.1004)	(0.0806)
SMB	.989***	1.106***	.8558***	1.006***	.9453***
	(0.131)	(0.0967)	(0.1516)	(0.103)	(0.0709)
HML	-.4438***	-.5284***	-.4472***	-.5767***	-.5877***
	(0.096)	(0.1355)	(0.0762)	(0.1216)	(0.1213)
LIQ			-0.235*	-.1213*	
			(0.1178)	(0.0563)	
UMD		-.5152***		-.505***	-.4779***
		(0.0744)		(0.0779)	(0.0781)
LMH					-.3482**
					(0.1233)
R-squared	0.8104	0.8768	0.8263	0.8904	0.8917
No. of Observations	156	156	156	156	120

Table 2.6: By different sample periods

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. $R_{IPO} - R_f$ is the excess return over the risk-free rate on a IPO portfolio in time period *t*, MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

IPO performance: by Sample Period

	alpha	*MKT*	*SMB*	*HML*	*LIQ*	*UMD*	R-squared
Jan 1993 -Dec 1998							
Fama-French	-0.308*	1.612***	.851***	-.4752***			0.8803
	(0.1322)	(0.0969)	(0.1107)	(0.0875)			
5-Factor model	-0.255*	1.011***	1.114***	-0.2636	-.1336*	-0.0492	0.8871
	(0.1220)	(0.063)	(0.1017)	(0.194)	(0.0617)	(0.1139)	
Jan 1999 - Dec 2000							
Fama-French	-0.961	1.013***	0.484*	-.8612**			0.8939
	(0.5167)	(0.2477)	(0.1873)	(0.2513)			
5-Factor model	-0.726	.9342*	.5136*	-.9185**	-0.2005	-0.2062	0.9008
	(0.4595)	(0.3477)	(0.1941)	(0.235)	(0.2741)	(0.1719)	
Jan 2001 - Dec 2005							
Fama-French	0.643	1.614***	1.297***	-.7707***			0.8366
	(0.4835)	(0.1092)	(0.2574)	(0.1619)			
5-Factor model	0.45	1.082***	1.244***	-0.126	-0.37032	-.79***	0.9569
	(0.4823)	(0.1542)	(0.1164)	(0.1122)	(0.2569)	(0.1482)	

Table 2.7: By different exchanges

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. $R_{IPO} - R_f$ is the excess return over the risk-free rate on a IPO portfolio in time period *t*, MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. There are 503 firms in NYSE, 104 firms in AMEX and 2,766 firms in NASDAQ in the IPO sample. Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	NYSE		AMEX		NASDAQ	
	(1)	(2)	(3)	(4)	(5)	(6)
	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)
α	-.133**	-.138**	-0.0114	-0.0188	-0.169*	-0.178
	(0.0482)	(0.0829)	(0.016)	(0.016)	(0.074)	(0.119)
MKT	1.057***	1.049***	.379***	.3597***	1.106***	1.093***
	(0.05)	(0.052)	(0.0547)	(0.0551)	(0.034)	(0.034)
SMB	0.6567***	.6887***	.4684***	.436***	1.074***	1.056***
	(0.065)	(0.067)	(0.0499)	(0.0506)	(0.042)	(0.043)
HML	.4509***	.4707***	.1507*	.1865*	-.8474***	-.8317***
	(0.0071)	(0.073)	(0.0737)	(0.077)	(0.053)	(0.055)
LIQ		-.4113		-.09224		-.4686*
		(0.242)		(0.0651)		(0.213)
UMD	-.2839***	-.28***	.1168***	.1264***	-.538***	-.5365***
	(0.048)	(0.048)	(0.0324)	(0.0328)	(0.05)	(0.051)
R-squared	0.8484	0.8522	0.0851	0.0882	0.8807	0.8829
No. of Observations	156	156	156	156	156	156

Table 2.8: COLD and HOT LIQ IPOs all months

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variables are the equal-weighted monthly percentage return on a portfolio of HOT LIQ and COLD LIQ IPOs that have gone public during the prior 36 months. The HOT LIQ and COLD LIQ portfolios are created using a measure of excess liquidity discussed in the paper. $R_{IPO} - R_f$ is the excess return over the risk-free rate on a portfolio in time period *t*, MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. LMH ((low minus high) is the liquidity factor supplied by Eckbo and Norli. The sample period for the first four regressions is from January, 1993 to December, 2005. For the regression with the LMH factor the sample period is from January, 1993 to December, 2002. The standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	Negative Excess Liquidity IPOs		Positive Excess Liquidity IPOs	
	(1)	(2)	(3)	(4)
	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)
α	-0.084	-0.103	-0.2958*	-0.2156
	(0.0502)	(0.0551)	(0.1402)	(0.1621)
MKT	1.227***	1.016***	1.57***	1.25***
	(0.1502)	(0.0766)	(0.1841)	(0.1201)
SMB	.9343***	.9761***	1.061***	1.077***
	(0.0767)	(0.0541)	(0.1702)	(0.154)
HML	-.173**	-.2505***	-.6455***	-.7872***
	(0.0649)	(0.0731)	(0.1266)	(0.1628)
LIQ		-.0839*		-.1553*
		(0.0329)		(0.074)
UMD		-.4057***		-.5913***
		(0.0666)		(0.0996)
R-squared	0.79	0.8777	0.7995	0.8797
No. of Observations	156	156	156	156

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Table 2.9: COLD LIQ IPOs

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return of negative excess liquidity IPOs (COLD LIQ) for two years after the portfolio formation period of one year. The COLD LIQ portfolio is created using a measure of excess liquidity discussed in the paper. MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997). LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity and three highest liquidity portfolios formed at the end of *t-1*. LMH (low minus high) is the liquidity factor supplied by Eckbo and Norli. The sample period for the first four regressions is from January, 1994 to December, 2005. The last regression includes the LMH is from January, 1993 to December, 2002. The standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	Negative Excess Liquidity IPOs				
	(1)	(2)	(3)	(4)	(5)
	FF-3 factor	Carhart(1997)	FF + LIQ	5-Factor (LIQ)	5-Factor (LMH)
α	0.1876**	0.148*	0.178*	0.188	0.222
	(0.0724)	(0.0671)	(0.0825)	(0.1241)	(0.1190)
MKT	1.239***	1.017***	1.096***	.9439***	.8744***
	(0.165)	(0.051)	(0.1537)	(0.0656)	(0.0543)
SMB	.9296***	1.047***	.819***	.9582***	.9103***
	(0.083)	(0.0765)	(0.1082)	(0.0614)	(0.0531)
HML	-0.05256	-.1773*	-0.01016	-0.1747	-.1882*
	(0.072)	(0.0795)	(0.089)	(0.0881)	(0.0778)
LIQ			-0.2426*	-0.1315	
			(0.1125)	(0.1022)	
UMD		-.5642***		-.5184***	-.4945***
		(0.0919)		(0.0934)	(0.0869)
LMH					-.3255*
					(0.1517)
R-squared	0.7384	0.8488	0.7638	0.8606	0.8623
No. of Observations	144	144	144	144	112

Table 2.10: HOT LIQ IPOs

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return of positive excess liquidity IPOs (HOT LIQ) for two years after the portfolio formation period of one year. The HOT LIQ portfolio is created using a measure of excess liquidity discussed in the paper. $R_{IPO} - R_f$ is the excess return over the risk-free rate on a portfolio in time period *t*, MKT is the realization of the market risk premium in period t, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios formed at the end of *t-1*. The sample period for the first four regressions is from January, 1994 to December, 2005. The last regression includes the LMH is from January, 1993 to December, 2002. Standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

Positive Excess Liquidity IPOs

	(1)	(2)	(3)	(4)	(5)
	FF-3 factor	Carhart(1997)	FF + LIQ	5-Factor (LIQ)	5-Factor (LMH)
α	-0.373*	-0.258	-0.334*	-0.277	-0.443
	(0.1601)	(0.1344)	(0.1583)	(0.1481)	(0.2669)
MKT	1.605***	1.282***	1.373***	1.123***	.9924***
	(0.2059)	(0.1089)	(0.2142)	(0.1085)	(0.0847)
SMB	1.003***	1.174***	.7847***	1.013***	.9139***
	(0.1771)	(0.1437)	(0.2257)	(0.1311)	(0.1121)
HML	-.4755*	-.6573**	-.5316***	-.802***	-.8059***
	(0.1822)	(0.2117)	(0.1488)	(0.1209)	(0.1162)
LIQ			-0.3234**	-0.1409	
			(0.1282)	(0.1265)	
UMD		-.8225***		-.8052***	-.8098***
		(0.1706)		(0.2016)	(0.1012)
LMH					-.4962***
					(0.1111)
R-squared	0.7278	0.8510	0.7502	0.8649	0.8686
No. of Observations	144	144	144	144	112

Table 2.11: Zero Investment Strategy on COLD and HOT Liquidity portfolios.

The table reports the results of time series regression use the Newey-West method. The dependent variable is the monthly portfolios return are on a zero investment portfolio formed by an investment strategy which is long on negative excess liquidity IPOs (COLD LIQ) and short on positive excess liquidity IPOs (HOT LIQ). The portfolio includes IPOs which have completed their first anniversary of IPO but are less than three years of age. $R_{nt} - R_{pt}$ is return on the zero investment portfolio in time period *t*, MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. LMH (low minus high) liquidity factor is supplied by Eckbo and Norli. The sample period for the first four regressions is from January, 1994 to December, 2005. The last regression includes the LMH is from January, 1993 to December, 2002. Standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively. The model is:

$$R_{nt} - R_{pt} = (\alpha_n - \alpha_p) + (b_n - b_p)MKT_t + (s_n - s_p)SMB_t + (h_n - h_p)HML_t + (l_n - l_p)LIQ_t + (u_n - u_p)UMD_t + \xi_t$$

Zero investment

	(1)	(2)	(3)	(4)	(5)
	FF-3 factor	Carhart(1997)	FF + LIQ	5-Factor (LIQ)	5-Factor (LMH)
α	0.5606*	0.4061	0.5127*	0.4653*	0.6651
	(0.2664)	(0.2393)	(0.2540)	(0.2158)	(0.3602)
MKT	-.3659***	-.2644**	-.2772***	-.1793**	-.118*
	(0.0646)	(0.0844)	(0.0779)	(0.0669)	(0.047)
SMB	-0.07329	-0.1272	-0.03428	-0.0553	-0.00361
	(0.1229)	(0.0998)	(0.1302)	(0.0879)	(0.0875)
HML	.4229*	.48*	.5214***	.6273***	.6177***
	(0.1697)	(0.1897)	(0.1272)	(0.1144)	(0.1175)
LIQ			0.08296*	0.00942	
			(0.04097)	(0.0667)	
UMD		.2583**		.3336***	.3153***
		(0.0851)		(0.0318)	(0.0344)
LMH					.1707*
					(0.0837)
R-squared	.3879	.4655	.4414	.5678	.5718
No. of Observations	144	144	144	144	108

Table 2.12: COLD LIQ and HOT LIQ portfolios on Purged Fama French factors

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variables are the equal-weighted monthly percentage return on a portfolio of HOT LIQ and COLD LIQ IPOs for two years after the portfolio formation period of one year. The HOT LIQ and COLD LIQ portfolios are created using a measure of excess liquidity discussed in the paper. MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. The SMB and HML factors are created by Loughran and Ritter (1999) using a dataset purged of IPOs and Seasoned Equity Offerings (SEOs). UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. LMH (low minus high) is the liquidity factor supplied by Eckbo and Norli. The sample period for the regressions is January, 1994 to December, 2003. The standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	Negative Excess Liquidity IPOs		Positive Excess Liquidity IPOs	
	(1)	(2)	(3)	(4)
	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)
α	0.2156**	0.1528	-0.357*	-0.262
	(0.0842)	(0.0868)	(-0.1601)	(-0.1401)
MKT	1.325***	.9914***	1.7***	1.227***
	(0.2026)	(0.0836)	(0.2415)	(0.1179)
pSMB	1.01***	.9734***	1.129***	1.135***
	(0.0684)	(0.074)	(0.1572)	(0.1695)
pHML	-0.1927	-.3536**	-.7228***	-.9948***
	(0.0988)	(0.1078)	(0.1996)	(0.1052)
LIQ		-0.1799*		-0.2038*
		(0.0882)		(0.0858)
UMD		-.4845***		-.8053***
		(0.1118)		(0.1292)
R-squared	0.7167	0.8251	0.7159	0.8433
No. of Observations	120	120	120	120

Table 2.13: Performance of COLD LIQ IPOs over different sample periods

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return of negative excess liquidity IPOs (COLD LIQ) for two years after the portfolio formation period of one year. The COLD LIQ portfolios are created using a measure of excess liquidity discussed in the paper. MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997). The factor returns are obtained from Kenneth French's web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. Standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

Negative Liquidity Portfolio performance: by Sample Period (13-36)

	alpha	*MKT*	*SMB*	*HML*	*LIQ*	*UMD*	R-squared
Jan 1993 -Dec 1998							
Fama-French	0.353*	.9707***	1.023***	-0.1481			0.8437
	(0.1502)	(0.0528)	(0.0362)	(0.0818)			
5-Factor model	0.295	.9515***	.9625***	-0.06761	-0.1767*	-0.053	0.8478
	(0.1667)	(0.0701)	(0.1263)	(0.1941)	(0.0843)	(0.1359)	
Jan 1999 - Dec 2000							
Fama-French	0.026*	.7603**	.6346**	-0.2479			0.8106
	(0.0112)	(0.2515)	(0.1957)	(0.3023)			
5-Factor model	0.064	0.5656	.594*	-0.2599	-0.4031	-0.180	0.8244
	(0.0512)	(0.2951)	(0.2294)	(0.3473)	(0.4107)	(0.1773)	
Jan 2001 - Dec 2005							
Fama-French	0.526*	1.491***	1.145***	-.4675**			0.7772
	(0.2055)	(0.1457)	(0.2977)	(0.1503)			
5-Factor model	0.698	.8403***	1.09***	0.1493	-0.2134	-.963***	0.8865
	(0.5966)	(0.1137)	(0.1493)	(0.3228)	(0.2187)	(0.1121)	

Table 2.14: Performance of HOT LIQ IPOs by different sample periods

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable is the equal-weighted monthly percentage return of negative excess liquidity IPOs (HOT LIQ) for two years after the portfolio formation period of one year. The HOT LIQ portfolios are created using a measure of excess liquidity discussed in the paper. MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. Standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

Positive Liquidity Portfolio performance: by Sample Period (13-36)

	alpha	*MKT*	*SMB*	*HML*	*LIQ*	*UMD*	R-squared
Jan 1993 -Dec 1998							
Fama-French	-0.566*	1.226***	1.1***	-0.5302***			0.8237
	(0.2429)	(0.0862)	(0.1762)	(0.111)			
5-Factor model	-0.437*	1.196***	0.9651***	-0.4744	-0.18435*	-0.3065*	0.8332
	(0.2091)	(0.1404)	(0.1661)	(0.2617)	(0.0832)	(0.1442)	
Jan 1999 - Dec 2000							
Fama-French	-0.836*	1.033*	0.3264	-0.9672			0.8131
	(0.4000)	(0.402)	(0.2819)	(0.4996)			
5-Factor model	-0.818	0.6718	0.2821	-1.025	-0.7719	-0.4225	0.8442
	(-0.4173)	(0.4212)	(0.2767)	(0.491)	(0.4865)	(0.2629)	
Jan 2001 - Dec 2005							
Fama-French	0.0835	1.823*	1.674***	-1.108***			0.8009
	(0.0576)	(0.2014)	(0.3516)	(0.2587)			
5-Factor model	0.055	1.008***	1.605***	-0.1184	-0.336*	-1.206***	0.9156
	(0.0618)	(0.2101)	(0.2308)	(0.2034)	(0.1368)	(0.2277)	

Table 2.15: Equally Weighing by Number of Firms verses equally weighing time periods

All regressions use White-Huber Sandwich estimator for cross sectional regressions. The dependent variable is the equal-weighted monthly percentage return of COLD LIQ or HOT LIQ portfolio for two years after the portfolio formation period of one year. The HOT LIQ portfolios are created using a measure of excess liquidity discussed in the paper. *MKT* is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French web site. LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity portfolios (as measured by turnover) and three highest liquidity portfolios. The sample period for the first four regressions is from January, 1994 to December, 2005. The last regression includes the LMH is from January, 1993 to December, 2002. Standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	Negative Excess Liquidity IPOs			Positive Excess Liquidity IPOs		
Variable	FF-3 factor	5-Factor (LIQ)	5-Factor (LMH)	FF-3 factor	5-Factor (LIQ)	5-Factor (LMH)
α	0.586***	.721***	.68***	-.621**	-.689**	-.651*
	(0.095)	(0.151)	(0.13)	(0.2128)	(0.2657)	(0.2847)
MKT+	1.149***	.956***	.869***	1.422***	1.084***	.916***
	(0.064)	(0.056)	(0.081)	(0.082)	(0.023)	(0.0107)
SMB	.942***	.9715***	.885***	.982***	1.037***	.899***
	(0.085)	(0.009)	(0.003)	(0.122)	(0.081)	(0.087)
HML	-.0541***	-.256**	-.247***	-.638***	-.903***	-.886***
	(0.098)	(0.101)	(0.095)	(0.137)	(0.129)	(0.125)
LIQ		-.0203***			-.0543*	
		(0.028)			(0.025)	
UMD		-.492***	-.442***		-.863***	-.804***
		(0.0080)	(0.0073)		(0.112)	(0.097)
LMH			-.239***			-.4725**
			(0.0952)			(0.174)
R-squared	0.7678	0.8499	0.8531	0.7397	0.8753	0.8804

Table 2.16: Bid-Ask Adjusted Portfolio returns

All regressions are calendar time portfolio regressions using the Newey-West method. The dependent variable in columns (1) and (2) is the equal-weighted monthly percentage return of negative excess liquidity IPOs for two years after the portfolio formation period of one year. The dependent variable in Columns (3) and (4) is the equal-weighted monthly percentage return of positive excess liquidity IPOs for similar duration The dependent variable in columns (5) and (6) is the monthly portfolios return are on a zero investment portfolio formed by an investment strategy which is long on negative excess liquidity IPOs and short on positive excess liquidity IPOs. The monthly returns on individual IPOs are computed using "Ask" price at the beginning of the month and the "Bid" price at the end of the month MKT is the realization of the market risk premium in period *t*, SMB is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and HML is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997). LIQ (low minus high) is the liquidity risk premium calculated as the difference between the mean returns for the three lowest liquidity and three highest liquidity portfolios formed at the end of *t-1*. LMH (low minus high) is the liquidity factor supplied by Eckbo and Norli. The sample period for the first four regressions is from January, 1994 to December, 2005. The last regression includes the LMH is from January, 1993 to December, 2002. The standard errors are in parentheses. ***,**,* denote significance at 10%,5% and 1% levels respectively.

	Negative Excess Liquidity		Positive Excess Liquidity		Zero-Investment	
	(1)	(2)	(3)	(4)	(5)	(6)
	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)	FF-3 factor	5-Factor (LIQ)
α	0.1645*	0.1723	-0.3685*	-0.2736	0.5329*	0.4332
	(0.0759)	(0.1379)	(0.1651)	(0.1532)	(0.2474)	(0.2851)
MKT	1.238***	.9439***	1.605***	1.123***	-.3673***	-.1791**
	(0.1653)	(0.0732)	(0.2063)	(0.1092)	(0.0646)	-0.0669
SMB	.9295***	.9582***	1.002***	1.0133***	-0.0726	-0.0552
	(0.0832)	(0.0617)	(0.1773)	(0.1313)	(0.1229)	(0.0879)
HML	-0.0526	-0.1743	-0.4755*	-.802***	.4229*	.6285***
	(0.0717)	(0.0863)	(0.1831)	(0.1209)	(0.1701)	(0.1265)
LIQ		-0.1329		-0.1511		0.0182
		(0.1022)		(0.1257)		(0.0597)
UMD		-0.5184***		-.8052***		.2963***
		(0.0933)		(0.2017)		(0.0433)
R-squared	0.7236	0.8602	0.7232	0.8589	0.3401	0.5558
No. of Observations	144	144	144	144	144	144

CHAPTER 3

Corporate Innovation and Corporate Governance: A Study of U.S. Firms

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Corporate Innovation and Corporate Governance: A Study of U.S. Firms

Introduction

American workers are currently about seven times as productive as they were a century ago. Real wages and average family income are also roughly seven times higher than the corresponding levels in 1900. This increase in labor productivity has not been simply the result of endowing labor with more capital; it has also been the outcome of improved technology and efficiency. In Paul Samuelson's (1999) words, "it is the result of inspiration as well as perspiration" (pp. 28). This "inspiration" is often measured by total factor productivity (TFP) and is calculated using a residual – the difference between the growth rates of an index of output and an index of input.

The importance of TFP cannot be over emphasized. In his pioneering paper, Solow (1957) finds that some 80 percent of the rise in output per worker in the United States over the preceding half-century was explained by this mysterious residual which he called the *measure of our ignorance*. Since, many researchers have confirmed that sustained high economic growth is consistent with high values of this Solow residual or TFP. The novel thing about TFP is that it can be applied to compare economies, industries, and on a micro level, firms.

Vassalou and Apedjinou (2005) use the concept of TFP at the firm level as corporate innovation. In their words,

> Most economists and strategists would agree that matching a firm's amount of labor and capital is not sufficient for replicating its performance in terms of market share and profits. Several other factors play a pivotal role including, but not limited to, the quality of its management, its commitment to

> innovation, marketing efforts, and brand name. Such factors can substantially differentiate two firms with otherwise identical amounts of capital and labor in place, and lead to very different levels of profits. In fact, such factors may contribute either positively or negatively to a firm's profits. For simplicity, we will refer to such non-capital and non-labor productivity factors as corporate innovation. (pp. 3)

A growing strand of literature, including Gompers, Ishii, and Metrick (GIM, 2003), Bebchuk and Cohen (2005), and Cremers and Nair (2005), has found that firms having better corporate governance have higher long-term stock returns, firm value, and operating performance. This paper attempts to add to this literature by suggesting that a part of a firm's TFP growth can be attributed to a better corporate governance system in the firm and stronger shareholder rights in particular.

This paper shows that firms with stronger shareholder rights also have higher TFP growth, controlling for the factors that may influence the TFP growth. These factors include the effect of intangibles, the scale effect due to size, and industry specific effects. The results are robust for the sample period from 1990-2004.

I. Background and Motivation

A. Corporate Governance

The single major challenge faced by corporate governance is to simultaneously grant the managers sufficient discretionary power over the conduct of a business and hold them accountable for the use of that power. However, as in a classic principal-agent problem, the best interest of the agent (manager) is not always aligned with that of the principal (owner).

The 1980's was a period of hostile takeovers and merger and acquisition (M&A) activities. This was brought about by the introduction of the junk bond market, which financed leverage buy-out and management buy-out deals that threatened even the largest public firms. As a direct response, many firms adopted takeover defenses. These defenses were comprised of provisions that restricted shareholder rights and the ability for shareholders to meet and act. Around the late 1980's, influenced by pressure groups, several states passed anti-takeover laws which helped the firms to strengthen defenses against hostile takeover bids. According to GIM (2003), the firms with weak shareholder rights are more likely to experience a wider divergence of ownership and control. Additionally, such firms are also more likely to have high agency costs and hence, poor corporate governance.

When does a firm become susceptible to takeover bids? When another company (or investor) finds that the target company is not generating enough wealth to the shareholders or the target company has the potential to generate higher value than what is possible under current management. There are other factors, like product market competition, vertical integration, or geographical consolidation, which influence takeover decisions. However, *ceteris paribus,* a firm is a potential target for a takeover if it is not generating *enough* shareholder value under the current management.

If a firm has strong shareholder rights and minimal takeover defenses then, a managers could be risk-averse and may only select low return-low risk projects. At the same time, if the company is not being innovative and is unable to generate high returns on projects, the market valuation of the firm is likely to go down in the future and become more susceptible to takeovers. So, the managers of a firm having strong shareholder rights would be more efficient (in the TFP sense) lest they might lose their job.[19] The justification for takeover threats (less anti-takeover provisions) is often seen as the strongest form of managerial discipline (Jensen, 1986). Lower agency costs due to stronger shareholder rights (GIM, 2003) create an environment that may foster managerial efficacy.

On the other extreme, there are firms where the shareholders have very few rights. If there are stiff anti-takeover provisions, so that the firm is impregnable to outside takeovers, managers feel more secure. In this case, such managers may engage in risky behavior because the fear of being "taken" over by some firm is small. Managers would be willing to take more calculated risks, and therefore, be innovative, which may translate into better future growth prospects, operating performance, and increased long term value of the firm. At the same time, with increased job security, managers may put in less effort, shirk, appropriate a part of the cash flows as high executive compensations, or invest in inefficient projects (Williamson, 1964). With weak shareholder rights, it is difficult or costly to replace managers, so managers may be more willing and able to extract private benefits (Jensen, 1986).

Empirical evidence supports the latter stream of reasoning (Blanchard, et al., 1994;, Lang, et al., 1991; Harford, et al., 2006). Those firms which have weak shareholder rights tend to make more acquisitions for empire building purposes, which destroy firm value (Masulis, et al., 2006). Similarly, Dittmar and Mahrt-Smith (2006) argue that poorly governed firms dissipate excess cash quickly in ways that significantly reduce operating

[19] Typically when there is a hostile takeover, many of the target company's middle level and senior level managers are laid off.

performance. They also find that the negative impact of large cash holdings on future operating performance is eliminated if the firm is well governed.

Thus, the existing literature reveals that managers in an environment of lower agency costs, characterized by stronger shareholder rights, are more disciplined and are less likely to indulge in activities which reduce firm value at the expense of their private benefits. In addition, this paper concludes that firms characterized by stronger shareholder rights and better governance have higher total factor productivity growth than the firms with weaker shareholder rights. Better corporate governance implies lower takeover defenses, more competition for the managers and hence more potential for corporate innovation.

B. Total Factor Productivity

Bartelsman and Doms (2000) point out that managerial ability, management/ownership changes, technology, human capital, and regulation are all factors that have been discussed in recent literature that influence productivity growth. The direct effect on the productivity growth of the firm emanates from the fact that managers make the choice of the firm's inputs, outputs, and technology. Lucas (1978) models labor productivity being the same across firms in equilibrium, due to diminishing returns to managerial skill. In contrast, according to Jovanovic's (1982) model, better managers have high efficiency parameters and higher productivity. Bartelsman and Doms (2000) comment,

> On a practical level, managerial quality may be an important factor behind productivity heterogeneity……………Testing the role of managerial quality is problematic because data on manger quality cannot be directly collected. (pp. 587)

This paper contributes to this literature on sources of productivity growth by including corporate governance as a factor contributing to the growth in total factor productivity. In this way, governance acts as a proxy of managerial quality or competence. This is the first such paper which uses the broad based and widely used governance index G, compiled by GIM (2003) to provide evidence that stronger shareholder rights have a greater positive effect on productivity growth and that the effect diminishes as the strength of the shareholder rights weaken.

II. Data and Methodology

A. Governance Data

Following GIM (2003), the recently developed and widely used governance index measures is used to measure the strength of shareholder rights.[20] GIM's governance index G is created on the basis of how many restrictive governance provisions are imposed on shareholder rights; the more restrictive the governance, the weaker the shareholder rights. Their primary data source is the Investor Responsibility Research Center (IRRC), which publishes detailed listings of corporate-governance provisions for individual firms in Corporate Takeover Defenses volumes (Rosenbaum, 1990, 1993, 1995, 1998, 2000, 2002 and 2004). The governance index is constructed as follows. For every firm, GIM adds one point for every provision that restricts shareholder rights and correspondingly increases managerial power; thus, the higher the score, the weaker the shareholder rights.

Each volume of Corporate Takeover Defenses includes about 1400 to 1500 firms, with some changes in the list of included firms from volume to volume. In any given year

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[20] We thank Andrew Metrick for making this data publicly available. The data is directly obtained from Metrick's website.

of publication, the firms covered by IRRC account for over 90% of the total market capitalization on NYSE, AMEX, and NASDAQ. Since the IRRC does not publish volumes for every year, missing years are filled by assuming that the governance provisions reported in any given year were also in place in two years preceding the volume's publication. In the event that there was a gap in reporting, for example, if a firm is reported in 1990 and again in 1998, the years 1991-1993 are filled assuming it did not change its governance value from 1990. For years 1995-1997 the value from 1998 is used. This procedure is consistent with all the major studies involving the G index. Using different filling methods do not change the results qualitatively. The major reason being that the G index is relatively sticky, as about 45% of the firms had some changes in its G level in the 15 years comprising the sample (1990-2004).

A simple linear transformation of the G index is $CORPG = 24 - G$. The G index is based on 24 corporate governance provisions. A firm can have a maximum G value of 24 (which would essentially make the firm fascist.). In the sample employed in this paper, the *CORPG* has a maximum value of 22 (there are no firms having zero, or one G index value) and a minimum value of 6 (which corresponds to value of 18 in the G index). Higher values of *CORPG* correspond to better shareholder rights.

B. Empirical Cobb-Douglas Model for Total Factor Productivity

The starting point of our empirical model of productivity growth is a Cobb-Douglas production function with two factor inputs. This specification, partly based on Nickell (1996), explicitly models the sources of total factor productivity. Specifically, the *level* of total factor productivity as a function of the firm's past corporate governance is modeled. In particular, it is assumed that firm's production function is given by[21]

$$Y_{it} = \Phi_{it} K_{it}^{\beta_{k,i}} L_{it}^{\beta_{l,i}} H_{it}^{\beta_{c,i}} \qquad (1)$$

where Y_{it} is value added, measured as sales minus the cost of goods sold, Φ_{it} is a measure of total factor productivity, K_{it} is the tangible capital stock, L_{it} is the labor input, and H_{it} is the stock of intangible capital for firm i in year t. Since value added, defined as total sales less materials costs, is used as an output measure, this specification implicitly allows for materials as the fourth input.

The issue though is accounting for the different growth rates of labor and capital for firms in different industries. In other words, it would be naïve to assume that the factor inputs of labor and tangible and intangible capital have similar coefficients across industries. Just using industry dummies does not solve the problem as it is not able to isolate the effect of individual factor inputs. Instead, an alternative formulation that is able to capture the industry specific component on the factor inputs of labor, tangible, and intangible capital is employed.

For a firm belonging to a particular industry, the coefficient on tangible capital $\beta_{k,i}$ is treated as $\beta_{k,i} = \beta_k + \beta_{k,j(i)}$, to capture the industry adjusted coefficient on tangible capital and the coefficient on intangible capital is treated as $\beta_{h,i} = \beta_h + \beta_{h,j(i)}$ to

[21] Results do not change qualitatively if a simpler specification without intangible capital is employed.

capture the industry adjusted coefficient on intangible capital. Similarly, the industry adjusted coefficient on labor $\beta_{l,i}$ is calculated as $\beta_{l,i} = \beta_l + \beta_{l,j(i)}$ where $j(i)$ denotes the industry of firm i. The regression terms for labor, tangible, and intangible capital factor inputs for firm i belonging to industry $j(i)$ are given by

$$\beta_l l_{i,t} + \beta_{l,j(i)}\left(l_{i,t} \times IND_{j(i)}\right), \beta_k k_{i,t} + \beta_{k,j(i)}\left(k_{i,t} \times IND_{j(i)}\right), \ \beta_h h_{i,t} + \beta_{h,j(i)}\left(h_{i,t} \times IND_{j(i)}\right)$$

where IND_j is the dummy variable for the j^{th} industry. Unlike Nickell (1996), the restriction that factor coefficients to sum to 1 is not used, i.e., constant returns to scale are not assumed. This gives the basic log-linear empirical production function with y_{it}, k_{it}, l_{it}, h_{it} and ϕ_{it} denoting the logs of Y_{it}, K_{it}, L_{it}, H_{it} and Φ_{it}, respectively

$$\begin{aligned} y_{it} = \ & \phi_{it} + \beta_k k_{it} + \beta_l l_{it} + \beta_h h_{it} \\ & + \beta_{k,j(i)}(k_{it} \times IND_{j(i)}) + \beta_{l,j(i)}(l_{it} \times IND_{j(i)}) \\ & + \beta_{h,j(i)}(h_{it} \times IND_{j(i)}) + \mu_i + \upsilon_{it} \end{aligned} \qquad (2)$$

Additionally, taking first differences eliminates the fixed firm effect μ_i which accounts for all unobserved company specific factors influencing the level of productivity. This gives the differenced growth version of the adjusted Cobb-Douglas production function

$$\begin{aligned} \Delta y_{it} = \ & \Delta\phi_{it} + \beta_k \Delta k_{it} + \beta_l \Delta l_{it} + \beta_h \Delta h_{it} \\ & + \beta_{k,j(i)}(\Delta k_{it} \times IND_{j(i)}) + \beta_{l,j(i)}(\Delta l_{it} \times IND_{j(i)}) \\ & + \beta_{h,j(i)}(\Delta h_{it} \times IND_{j(i)}) + \Delta\upsilon_{it} \end{aligned} \qquad (3)$$

Finally, the sources of productivity growth are specified by using the level of corporate governance in year *t-1*. The level of corporate governance is proxied by *CORPG*. To control for value added growth differences between younger firms and older firms, the logarithm of a firm's age in years, which is the difference between the foundation date of the firm and the current date, is used. The coefficient on the age variable should be negative in line with the view that younger firms are likely to have a faster growth than the older firms (Evans, 1987b). An alternative measure of firm age as the log of years listed does not qualitatively alter the results.

In addition, time and industry dummies are included to account for time effects that capture shocks common to all firms and industry effects that capture shocks specific to the particular industry which a firm belongs to. Thus, total factor productivity growth is specified as

$$\Delta\phi_{it} = \lambda_1 CORPG_{it-1} + \lambda_2 \ln(Age) + Year\,Effects + Industry\;Effects \qquad (4)$$

The above model specification defined by equations (3) and (4) is used for all regression results. The Industry dummy variable from equation (4) is excluded for the firm specific fixed effects model as industry dummies will be collinear with firm fixed effects.

C. Firm Specific Accounting Data

The inputs used to compute a firm's TFP are obtained from COMPUSTAT. In terms of data series used, a firm's gross profit or value added is defined as the difference between a firm's sales (SALES, COMPUSTAT industrial Annual data item 2) and its cost of goods sold (COGS, COMPUSTAT Annual data item 30). A firm's labor input is the number of its employees (EMP, COMPUSTAT industrial annual data item 29). The capital stock of a firm is measured using the Net Property, Plant, and Equipment (PPEN, COMPUSTAT industrial annual data item 8). PPEN is firm's net fixed assets. The book value of total assets is used to account for the size factor (ASSETS, COMPUSTAT industrial annual data item 6). Intangible is proxied by COMPUSTAT item 33 and represents the net value of intangible assets.[22] Long term liabilities (LTD, industrial annual data item 9) are taken as the value of debt. Also, EBITDA (earnings before interests, taxes, depreciation, and amortization) is taken from COMPUSTAT industrial annual data item 13) as a gross operating profit.

To capture industry wide differences across firms, we classify them into 10 industries (see Table 3.2 and Appendix B) based on Fama-French (1997) classification system using SIC codes.[23] Intangible intensity (*INTANI*), defined as the ratio of intangible assets to net fixed assets (PPEN), is used as a control variable in our regressions as a robustness check. This is because the intangible-intensity varies largely among industries (Claessens and Laev, 2003). It would also account for some industry level differences in productivity. Table 3.2 displays the average intangible-intensity benchmarks for U.S. firms in 10 different industries. The average intangible-intensity during the sample period (1990-2004) is 128%. But there is a wide variation of intangible-intensity across industries, ranging from as low as 4% for utilities and 12% for petroleum, natural gas and coal products to as high as 267 % for the telecommunications industry and 224% for the healthcare industry. The variation concurs with notions of what constitutes relatively capital intensive versus more knowledge intensive industries.

[22] Intangibles are assets that have no physical existence in themselves, but represent rights to enjoy some privilege. In COMPUSTAT, this item includes blueprints or building designs, patents, copyrights, trademarks, franchises, organizational costs, client lists, computer software patent costs, licenses, and goodwill.

[23] We thank Kenneth French for making this information available on his website.

D. Some Measurement Issues

The capital stock in a firm is difficult to measure with time series of investments required along with composition issues. However, Bailey, et al., (1992), find that in the productivity model, the use of sophisticated measures of capital instead of crude measures based on book values of capital stock do not change the results qualitatively. For labor input, there is no way to distinguish between "blue collar" and "white collar" workers and hence the measured employed assumes the same amount of labor productivity and ignores the composition issues.

All the variables in the Cobb-Douglas model are required to be either in nominal terms or real terms for consistency. We have nominal accounting values for all our variables except labor. The COMPUSTAT item “labor and related expenses” would have served the purpose, however COMPUSTAT does not report this data regularly and the labor and related expenses data amount to less than 5% of the sample. The widely used alternative is the number of employees as a measure of labor input, which is in real terms.

Since prices do not rise equally for all goods and services, finding the real values from the nominal book values is not simple. Rises in the price of oil are likely to affect the petroleum extraction industry much more than say consumer durables. Similarly, a decline in the prices of consumer durables may not result in similar decline in prices in the food industry. To convert nominal book values into real values, each firm’s output and costs must be deflated by sub-industry specific producer prices. Also applying price deflators based on industry is only acceptable under perfect competition where price per unit of quality adjusted output is identical across firms. Bartelsman and Doms (2003) suggest that persistent dispersion of productivity and costs across firms even in the same industry, disputes the empirical validity of perfect competition. Refraining from attempting to take on such a complicated endeavor, a generic and widely used consumer price index is instead used to compute the real values of the nominal variables.

The data on the consumer price index is obtained from Bureau of Labor Statistics (BLS) website[24] of the U.S. Department of labor. The broadest, most comprehensive CPI, the consumer price index for all urban consumers (CPI-U) for the U.S. city average for all items with base 1982-84=100, is used here. We calculate the real values from the nominal book values of capital, intangibles, assets, net sales and cost of goods sold by deflating each variable each year by the corresponding yearly CPI-U index.

D. Descriptive Statistics

Table 3.1 presents the median, mean and standard deviation of the regression variables. The median firm age is 37 years and the mean is 58 years with a standard deviation of 28 years. The governance index G has a median value of 9 and a mean value of 8.40 with a standard deviation of 4.59 representing almost a normal distribution. The growth in value added has a median growth rate of 5.16% and a mean growth rate of 7.93% with a standard deviation of 16.53%. This reflects a high growth rate of output for the sample period from 1990 to 2004. The tangible capital stock and labor both have median growth rates around 3.7% and little higher mean growth rates. Intangible capital stocks grew at a negative rate during the sample period and the standard deviation was 13%. The largest part of intangibles is often goodwill. Thus, this mean negative growth of intangibles stock could be due to a spate of high merger and acquisition (M&A) activities in late 1980s

[24] http://www.bls.gov

and a relative decline of the M&A activities in the 1990s. The intangible-intensity is also highly skewed with median of 54% and a mean of 128% with a standard deviation of 60%.

Table 3.2 presents the mean values of some firm statistics based on the 10 industries. The industries are categorized using 10 industry classifications from SIC codes by Fama-French (1997). The growth in value added during the period 1990-2004 is highest for the healthcare industry at 18.3%. This industry also has one of the highest intangible-intensities. The energy sector, which includes petroleum, natural gas, and coal products, had the second highest growth in value added at 17.8%. The EBMARGIN defined as EBIT/SALES, where EBIT is the earnings before interest and taxes, is highest for telecommunication industry at 33%, and lowest for wholesale and retail businesses at slightly over 9%. The gross profit margin (GPM) defined as the ratio of (Sales-COGS)/Sales follows a pattern similar to growth in value added. The average size of total assets varies from $1,676 million for consumer durables to $17,481 million for telecommunications industry. The leverage defined as the ratio of long term liabilities to book value of total assets is highest for the telecommunications sector at 33%. The mean leverage of the entire sample is 20%.

III. Results and Analysis

A. OLS estimation with robust standard errors

The starting point of this analysis is a pooled OLS regression of the model specified by equations (3) and (4). Breusch-Pagan/Cook-Weisberg tests reveal the presence of panel heteroskedasticity which is corrected by the use of a Huber-White

Sandwich estimator for robust standard errors[25]. Wooldridge (2002) autocorrelation tests for panel data show autocorrelation in the levels but no serial correlation when first differences are used. As the model is a first differenced mode, the problems associated with autocorrelation are not a concern.

Column (1) in Table 3.3 reports the result of a simple pooled regression with the absence of individual firm effects and cross industry dummies for capital, labor, and intangibles. The coefficient on growth rates of the input factors is positive and significant at the 1% level. The coefficient of 0.0022 on the lagged *CORPG* term is also positive and highly significant. This implies that a one point increase in CORPG will increase the value added by 1%.[26] As expected, the coefficient on firm age is negative and is significant. However, there is a positive and significant (at 10%) intercept term which possibly indicates the presence of an omitted variable. The intercept becomes insignificant when cross industry dummies of the factor inputs are included in the regression as specified by equation (3). The coefficient on lagged *CORPG* is similar to the value in column (1) and significant at the 1% level. The coefficients for the factor inputs except capital are all insignificant, though a few of individual cross industry dummies for labor and intangibles are significant. The 30 cross industry dummies for factor inputs are not presented for brevity of exposition.

The regressions in Table 3.3, columns (3) and (4) expand the model to incorporate temporal and per-industry heterogeneity by adding year and industry dummies to the

[25] We also use Roger's standard errors for robustness but the significance of the coefficient of the regressors does not change.
[26] A firm that is one standard deviation better than the average firm in terms of its corporate governance measure will have a 1% higher value added than the average firm in the sample, given by the product of the standard deviation and the coefficient on *CORPG*, which is 4.59 times 0.22%.

model. Column (3) reports a fixed time effects pooled regression model which includes year dummies. This helps in controlling for a time effect that makes errors spatially correlated. The coefficient on the governance variable is positive and significant at 1%. Column (4) reports the result of a pooled OLS regression with 10 industry dummies. The coefficient on *CORPG* is significant at 5%. The last column uses both fixed time and industry effects and finds similar results. The coefficient on *CORPG* in all the five pooled OLS regressions is stable and significant. Overall, the results imply a robust positive and significant effect of corporate governance on a firm's productivity growth.

B. Endogenously Issues

One of principal problems faced when creating an empirical model for governance studies is the problem of endogeneity. The variables that represent levels of corporate governance may be also determined simultaneously with dependent variables related to firm value and productivity. The simultaneous equations bias makes it difficult to determine the direction of causality. Corporate governance can affect productivity, but productivity can also generate a better governance structure (Hermalin and Weisbach, 2003).

The problem of simultaneous equation bias could be empirically treated by the use of an instrumental variables or the Arellano-Bond (1991) approach, but such an instrument for G is not easily identified. GIM (2003) also report their inability to come up with a suitable instrument for G to use as an instrumental variable.

Using lagged values of *CORPG*, however, may partially reduce this endogeneity problem. Lagged governance index also ensures that the information set at the beginning of time t contains the prior year value of each firm's governance index, preventing a look-ahead bias. The endogeneity problem can also be reduced if productivity growth is included rather than productivity levels simply because productivity growth is less persistent than productivity levels (Nickell, 1996).

C. Panel Data Fixed Effect Model

An alternative solution for the endogeneity problem is the use of panel data fixed effect models. A source of endogeneity can be omitted variables related to firms, years, or industries. A combined time and firm fixed effect regression model eliminates omitted variables arising both from unobserved variables that are constant over time and unobserved variables that are constant across firms. With firm fixed effects, the regression coefficient on *CORPG* is driven by the extent of variation over time *within* each firm. Since the governance index for a firm being largely invariant over time (in our sample around 55% of the firms do not undergo a change during the sample period 1990-2004), the fixed effects regression coefficient on *CORPG* is mostly attributed to the variation of *CORPG* of the firms for which the governance index does change over time. If a firm's governance is sticky over time, that firm would not contribute to the coefficient estimation but will only introduce noise and lower test power (Chi, 2005). GIM rejects the use of panel data fixed effect in the sense of firm fixed effects with time-varying coefficients for the above-mentioned reason. Another problem with firm-fixed effects is that including all our firm dummies significantly reduces the degrees of freedom.

Hausman (1978) test suggests picking fixed effects over random effects. Though, both fixed and random effects regression results are presented to check for robustness. The GLS random effects results are discussed in the robustness section. Column (1) in

Table 3.4 corresponds to the total sample. This sample is then divided over two sub-samples called *DEM* and *DICT* that correspond to the levels of lagged $G \le 5$ and $13 \le G \le 24$, respectively.[27] Note that there are no firms with G above 18 in the sample. With higher levels of *CORPG* corresponding to better corporate governance, the sub-samples *DEM* and *DICT* correspond to democratic and dictator firms in the previous year since they are based on lagged G values. Columns (2) and (3) of Table 3.4 correspond to sub-samples *DEM* and *DICT* respectively. In each column, regressions are for the growth of firm value added on firm's capital, labor and intangibles growth, and lagged corporate governance index *CORPG* with the log age of firms used as a control variable.

Regressors also include industry specific capital, labor, and intangibles components that are not reported in the table for brevity of exposition. For all firms and dictator sub-samples, the coefficient on lagged *CORPG* is positive but marginally significant at the 10% level. The coefficient on *CORPG* for all firms is higher in magnitude though lower in significance than the previous pooled OLS results in Table 3.3. Notice, that the t-values are lower than those reported in the pooled OLS models. This is because in the fixed effects model, only the time-series variation of governance is captured. For the democratic sub-sample, the coefficient on *CORPG* is 0.0054 which implies that a one point increase in *CORPG*, all else equal, have 2.47% higher value

[27] We modify the GIM (2003) classification for Dictator firms by including firms from $G \ge 13$ instead of $G \ge 14$. This allows us to add about 500 firm years to the sample which makes our dictator sub-sample less skewed in number of observations in comparison to the democratic sub-sample. Our results do not change qualitatively if the GIM (2003) classification is used though.

added[28]. For the dictator sub-sample, the coefficient on the governance variable is negative but insignificant. The results for the entire sample and for the democratic sub-sample are quite strong considering the fact that for a sizeable number of firms in the sample the corporate governance index does not change over time. Hence, the fixed effect regression only captures changes in *CORPG* for firms which undergo a change in its G index.

D. Robustness section

A series of robustness checks is included in this subsection. The results indicate that the empirical findings documented in the previous subsection are robust to different econometric model specifications, additional control variables, and yearly analyses.

D.1 Year-by-Year Regression

In the unlikely event that the results were influenced by the effect of a single year or few years, OLS regressions on the model specified by equations (3) and (4) are conducted for each year starting from 1990 to 2004. All regressions use the Huber-White sandwich estimator, which is robust to the presence of generic heteroskedasticity. Table 3.5 shows that in 14 out of 15 years in the sample, the coefficient of *CORPG* remains positive. In eight of the fifteen years it is positive and significant. The only year it is negative is 1997, but it is insignificant. The coefficient on *CORPG* is relatively stable throughout the years.

D.2 Generalized Least Squares Random–Effects Model.

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[28] A firm that is one standard deviation better than the average firm in terms of its corporate governance measure will have a 2.47% higher value added than the average firm in the sample, given by the product of the standard deviation and the coefficient on *CORPG*, that is 4.59 times 0.54%.

It is possible that the level of governance effects firm productivity not only in the time series but also in the cross section. A random effect model captures both the time-series and the cross sectional variations while modeling the error terms differently for each firm, and therefore generates more efficient estimates than a fixed effects model does. However, a Hausman (1978) specification test indicates that a fixed effects model is more efficient as there may be omitted variables present. Random effects regression results are also presented; as such specification is widely used in finance research[29]. The justifications for reporting the random effects model are as follows. First, the omitted variable may have nothing to do with the governance level. Second, as governance levels tend to be sticky over time, the fixed effects regression may not reveal the true picture. Third, fixed effects may work best when there are relatively fewer firms and more time periods, as each dummy variable removes one degree of freedom from the model. There are close to 2,000 firms with an average of only 9 yearly observations.

Table 3.6 reports the result of GLS random effects regressions. Column (1) indicates that lagged *CORPG* is positive and significant at 1% for the entire sample. For democratic firms represented by sub-sample *DEM*, the coefficient of lagged *CORPG* has a higher positive number and significance at the 1% level. This implies that the effect of the governance variable on productivity growth is the strongest for the democratic sub-sample. The coefficient on age is negative and significant at 5% for both the entire sample and democratic sub-sample. Column (3) shows the results of dictator firms

[29] Statistically, fixed effects are always a reasonable thing to do with panel data (they always give consistent results) but they may not be the most efficient model to run. Random effects will give better p-values as they are a more efficient estimator, so random effects should be employed if it is statistically justifiable to do so.

represented by sub-sample *DICT*. The coefficient of lagged *CORPG* is negative but insignificant.

D.3 Additional Control Variables

There is a stream of literature[30] which includes lagged output as a control variable in the empirical Cobb-Douglas production function. In particular, it is assumed that firm i's production function is given by the standard Cobb-Douglas formulation (1) and (2). Following Nickell (1996), lagged output is included in the empirical production function. This expansion takes into account potential persistence in output levels. This gives the basic log-linear empirical production function, with y_{it}, k_{it}, l_{it}, h_{it} and ϕ_{it} denoting the logs of Y_{it}, K_{it}, L_{it}, H_{it} and Φ_{it}, respectively

$$\begin{aligned} y_{it} = {} & \phi_{it} + \beta_o y_{it-1} + \beta_k k_{it} + \beta_l l_{it} + \beta_h h_{it} \\ & + \beta_{k,j(i)}(k_{it} \times IND_{j(i)}) + \beta_{l,j(i)}(l_{it} \times IND_{j(i)}) \\ & + \beta_{h,j(i)}(h_{it} \times IND_{j(i)}) + \mu_i + \upsilon_{it} \end{aligned} \qquad (2')$$

Secondly, taking first differences eliminates the fixed firm effect μ_i which accounts for all unobserved company-specific factors influencing the level of productivity. The differenced growth version of the adjusted Cobb-Douglas production function is thus obtained

$$\begin{aligned} \Delta y_{it} = {} & \Delta\phi_{it} + \beta_o \Delta y_{it-1} + \beta_k \Delta k_{it} + \beta_l \Delta l_{it} + \beta_h \Delta h_{it} \\ & + \beta_{k,j(i)}(\Delta k_{it} \times IND_{j(i)}) + \beta_{l,j(i)}(\Delta l_{it} \times IND_{j(i)}) \\ & + \beta_{h,j(i)}(\Delta h_{it} \times IND_{j(i)}) + \Delta\upsilon_{it} \end{aligned} \qquad (3')$$

[30] For example, see Nickell (1996) and Köke and Renneboog, (2005).

where Δy_{t-1} controls for any growth or momentum effect that may obscure results of the regressions.

The inclusion of dynamics in the form of a lagged dependent variable captures the fact that, whenever there is a change in factor inputs of production, it takes some time for output to reach its new long run level. For example, if new capital goods are purchased, it may take a considerable amount of time for the new machines to be fully operational. Autonomous shocks to effort (such as increasing the speed of the production line) may induce a rise in output and a possible fall in employment. In fact, including Δy_{t-1} puts a downward bias on the right-hand side exogenous variables, so the results should be stronger if there is still a significant relationship between governance and productivity growth after controlling for potential persistence in output.

To control for growth effects related to firm size but unrelated to corporate governance, lagged log total assets is included. This is expected to make the coefficient on assets negative as small firms tend to grow faster than large firms (Hall, 1987). Also, intangible-intensity *INTANI* is included as a control variable. The modified equation including additional control variables is given by

$$\begin{aligned}\Delta\phi_{it} = \lambda_1 CORPG_{i,t-1} + \lambda_2 \ln(Age) + \lambda_3 \ln ASSETS_{i,t-1} + \lambda_4 INTANI_{i,t-1} \\ + Year\ Effects + Industry\ Effects\end{aligned} \quad (4')$$

Table 3.7 reports pooled OLS results with Huber-White sandwich estimators. Column (1) shows OLS regression results without the cross industry dummies. All of the regressors except the lagged log assets are significant. Comparing these results with the results in Table 3.3, the coefficient on *CORPG* is still positive and significant though has declined from 0.0022 to 0.0019. The coefficient on log lagged assets is negative as expected. Intangible-intensity is positively related to growth in value added. The coefficient on *CORPG* is fairly stable and significant, though the magnitude of the coefficient and the level of significance has decreased after the inclusion of additional control variables.

D.3.1 Panel Data Fixed Effect and GLS Random Effects Model.

How the coefficient on *CORPG* behaves in the presence of additional control variables for the entire sample and the sub-samples of *DEM* and *DICT* is particularly relevant. Column (1) of Table 3.8 reports the result of a fixed effects model for all firms. The coefficient on *CORPG* is positive but has declined from 0.0031 to 0.0024. For the random effects model in column (2), the coefficient on *CORPG* is 0.0023 and significant at 5%. For the democratic sub-sample, the fixed effect model generates a coefficient of 0.0042 but is now insignificant, as is seen in column (1) of Table 3.9. The corresponding coefficient for the dictator sub-sample in column (1) of Table 3.10 is negative as before and also insignificant. Column (2) in Table 3.9 shows that the result for the DEM firms on CORPG for the random effects model is positive and significant, whereas for the *DICT* firms it is negative but insignificant.

In general, the inclusion of additional control variables does not change the sign of the coefficient on the governance variable, though the magnitude and the significance declines.

D.4 Young and Old firms

Though firm age is included in the regressions as a control variable, a check for whether the strong relation between productivity and *CORPG* is primarily due to the younger firms in our sample is necessary. Follow Anderson and Reeb (2003), firms are classified into young and old based on whether the firm is under or over 50 years of age. Also, a cut-off age as 37 years (the median) is used and had roughly similar results. Table 3.11 shows that the coefficient on *CORPG* for both young and old firms is positive and significant; though for younger firms the effect is stronger. The results confirm that there is a positive association between productivity and corporate governance regardless of firm age.

D.5 Outliers

Table 3.1 gives the summary of the main regression variables. Some of the regressors, like growth in intangibles, assets, and intangible-intensity, are highly skewed. To test whether if the results are influenced by extreme values in the sample, each of the regression variables except *CORPG* is winsorized. Each tail of the distributions is trimmed by 5%, 10%, and 20%. The results still show a positive relation between strong shareholder rights and productivity. For brevity, only the results based on 10% winsorization of each tail are presented in Table 3.13. Column (1) of Table 3.12 shows the pooled OLS regression with robust standard errors. Column (2) shows a similar model with additional control variables, while columns (3) and (4) report results of a panel fixed effects regression and a GLS random effects regression respectively. The results are even stronger than without winsorizing. *CORPG* was only marginally significant at 10% for the pooled OLS with control variables and the panel fixed effects model, referring to Table 3.8 and Table 3.9). After trimming for outliers, the coefficient on *CORPG* is positive and significant at the 1% level for each of the four regressions.

IV. Conclusions

This paper shows that a firm's growth of total factor productivity is positively related to the quality of governance *CORPG* which proxies the strength of shareholder rights for a firm. The effect varies positively with the quality of governance, and is strongest among firms which have the strongest shareholder rights. As the governance quality becomes poorer, the strength of the effect declines. At very low levels of *CORPG*, corresponding to the weakest shareholder rights, the effect on productivity growth is less clear, and in some of the results there is a negative relationship between the level of governance and productivity growth. One possible explanation behind this behavior could be that at the weakest levels of shareholder rights, a discrete addition or inclusion of governance provisions does not have much of an additional effect on governance quality, and thus does not provide clear results in the regressions. Another possible reason is the much smaller size of dictator firms in the sample results in low power for testing.

To summarize, some firms are very efficient whereas others are not and some firms have much faster rates of innovation and productivity growth than others though they use similar factor inputs. There are some factors which contribute to higher total factor productivity growth that may determine this difference among firms. This paper provides evidence that the quality of corporate governance in a firm is a likely source of productivity growth. Better governance implies lower takeover defenses, more competition for the managers and hence more corporate innovation. The channels through which it influences productivity growth are not directly investigated. However, it is suggested that good governance can have a positive influence on a manager’s ability, which in turn contributes to productivity growth.

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Table 3.1: Variable Description and Summary Statistics

Variable Name	**Variable Description**	**Median, Mean (Std. Dev.)**
$\ln(AGE)_{it}$	Log of Age (in years) of firm *i*, defined as the difference between the current year, *t*, and the date of formation.	37 years 58 years (28 years)
G	Governance index measure of a firm as constructed in GIM (2003). Higher values of G denote weaker shareholder rights.	9 8.40 (4.59)
$CORPG_{it}$	A Corporate Governance measure formed as a linear transformation of the G index. Higher values of *CORPG* signify stronger shareholder rights.	15 15.60 (4.59)
Δy_{it}	Growth rate of value added or the gross profit of firm *i* in year *t*, defined as the difference in the log values of gross profit, Y_{it} and Y_{it-1}.	5.16% 7.93% (16.53%)
Δk_{it}	Growth rate of the net capital stock of firm *i* in year *t*, defined as the difference in the log values of net capital stock, K_{it} and K_{it-1}.	3.65% 6.34% (15.77%)
Δl_{it}	Growth rate of labor of firm *i* in year *t*, defined as the difference in the log values of number of employees, L_{it} and L_{it-1}.	3.7% 5.65% (11.4%)
Δh_{it}	Growth rate of intangibles of firm *i* in year *t*, defined as the difference in the log values of intangibles, H_{it} and H_{it-1}	-1.86% -3.07% (13.07%)
$\ln(ASSETS)_{it}$	Log of the Book value of Total Assets of firm *i* in year *t*.	$5389 million $45,746 million ($24, 284 million)
$INTANI_{it}$	Intangible intensity of firm *i* in year t. Defined as the ratio of the Book value of Intangibles to the Book value of Net Fixed Assets for firm *i* in year *t*.	54%% 128% (60.66%)

Note: The median, mean and standard deviation for age and assets are given without the logs. The assets are in the unit of millions of dollars. The industry groups are discussed in Table 3.2 and Appendix A.

Table 3.2: Means and standard errors of selected variables based on industry.

	G	Δy	*EBMARGIN*	*GPM*	*ROE*	*ASSETS $ millions)*	*INTANG*	*LEV*
Consumer Non-Durables	9	8.39%	16.77%	43.17%	24.40%	3925	1.37	0.22
		0.6%	*3%*	*4%*	*5.9%*	*288.020*	*0.065*	*0.006*
Consumer Durables	10	10.43%	12.22%	31.63%	12.38%	1676	1.10	0.23
		2.1%	*4%*	*6%*	*0.09%*	*167.908*	*0.178*	*0.012*
Manufacturing	9	7.46%	14.63%	32.36%	14.61%	3519	0.64	0.23
		0.5%	*0.1%*	*3%*	*1.0%*	*133.926*	*0.022*	*0.004*
Energy, Oil, Gas, and Coal Extraction	9	17.84%	27.09%	36.07%	8.78%	7720	0.12	0.23
		2.5%	*1.0%*	*1.0%*	*0 .5%*	*909.157*	*0.031*	*0.007*
Hitech-software and Electronic Equipment	7	14.70%	16.51%	42.52%	13.18%	2594	1.06	0.14
		0.9%	*0.3%*	*0.5%*	*1.7%*	*207.931*	*0.062*	*0.006*
Telecommuni-cations	8	16.34%	32.80%	48.03%	6.92%	17481	2.67	0.33
		1.5%	*6%*	*9%*	*1.4%*	*1890.681*	*0.223*	*0.013*
Wholesale, Retail, and Some Services	8	14.58%	9.24%	29.17%	12.33%	3051	0.92	0.19
		0.5%	*0.1%*	*0.4%*	*0.6%*	*192.697*	*0.097*	*0.004*
Healthcare, and Drugs	8	18.29%	22.58%	54.89%	15.82%	3712	2.24	0.15
		0.9%	*3%*	*7%*	*1.4%*	*308.749*	*0.194*	*0.005*
Utilities	9	9.31%	24.21%	24.67%	10.28%	12131	0.04	0.32
		1.8%	*5%*	*5%*	*0.4%*	*655.830*	*0.003*	*0.004*
Others	8	15.50%	19.41%	35.53%	14.61%	13962	2.11	0.18
		0.6%	*2%*	*3%*	*1.2%*	*1233.527*	*0.093*	*0.003*
Total Sample	9	12.3%	18.89%	38.2%	15.05%	5389	1.28	0.20

For governance index G, the numbers are for median values of G for each industry.

Table 3.3: OLS regression with Robust Standard Errors

The panel data encompasses all firms which have a governance index value created by GIM (2003) for 1990-2004. The dependent variable is Δy_t or growth in value added. The regression result corresponds to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. *Ln (Age)* is the logarithm of firm age in years. Robust standard errors are due to Huber-White sandwich estimators. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1) (OLS)	(2) (OLS)	(3) (Fixed Time Effects)	(4) (Fixed Industry Effects)	(5) (Fixed Time and Industry)
Δk_t	0.228***	0.0346	0.4338***	0.0091	0.4505***
	(0.0244)	(0.1159)	(0.1097)	(0.1437)	(0.1148)
Δl_t	0.3544***	0.5654**	0.5688**	0.5642**	0.204*
	(0.0342)	(0.1899)	(0.1921)	(0.1897)	(0.0981)
Δh_t	0.0244***	-0.035	-0.0148	-0.0508	-0.015
	(0.0056)	(0.346)	(0.045)	(0.3546)	(0.0449)
$CORPG_{i,t-1}$	0.0022***	0.0024***	0.0024***	0.0023**	0.0022**
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Ln(Age)	-0.0124***	-0.0112***	-0.012***	-0.0083*	-0.0092**
	(0.0032)	(0.0033)	(0.0034)	(0.0035)	(0.0035)
Intercept	0.0483*	0.0345	0.021	0.0111	0.0035
	(0.0174)	(0.0206)	(0.0238)	(0.0283)	(0.0289)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	no	yes	yes	yes	yes
R-Squared	0.2174	0.2276	0.2404	0.2304	0.2432
No. of Firm Years	11122	10530	10530	10530	10530

Table 3.4: Fixed –Effects regression

The panel data fixed effect regression encompasses all firms which have a governance index value created by GIM (2003) for 1990-2004. The dependent variable is Δy_t or growth in value added. The regression result corresponds to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by $CORPG$ where higher values of $CORPG$ signify stronger shareholder rights in a company. Ln(Age)is the logarithm of firm age in years. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
	ALL	*DEM*	*DICT*
Δk_t	0.3581	0.3689	0.4929
	(0.1920)	(0.6178)	(0.8093)
Δl_t	0.3458**	0.2637	0.0606
	(0.1325)	(0.4046)	(0.9139)
Δh_t	-0.2702	-0.1313	0.0127
	(0.3826)	(0.0908)	(0.1961)
$CORPG_{i,t-1}$	0.0031*	0.0054*	-0.0118
	(0.0014)	(0.0025)	(0.0152)
Ln(Age)	-0.0274*	-0.0174	-0.0567
	(0.0138)	(0.0251)	(0.072)
Intercept	0.0799	0.005	0.3809
	(0.0608)	(0.1463)	(0.333)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes	yes
R-Squared (within)	0.1838	0.1545	0.2138
R-Squared (between)	0.2579	0.3645	0.1674
R-Squared (overall)	0.2235	0.2268	0.2303
No. of firm years	10530	3023	1010

Table 3.5: Year-by-Year Regressions

The data is comprised of all firms which have a governance index value created by GIM (2003) from 1990-2004. The dependent variable is Δy_t or growth in value added. The regression result corresponds to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. Ln(Age)is the logarithm of firm age in years. For brevity of exposition, only the coefficient on lagged *CORPG* is tabulated. Robust standard errors are due to Huber-White sandwich estimators. ***,**,* denote significance at 1%, 5% and 10% respectively.

year	**1990**	**1991**	**1992**	**1993**	**1994**
$CORPG_{i,t-1}$	0.00329	0.00265	0.00263	0.00231*	0.00028*
	(0.0024)	(0.0016)	(0.0014)	(0.0011)	(0.0001)
R-Squared	0.2183	0.1913	0.2720	0.2794	0.2181
No. of Observations	387	799	860	928	1004

year	**1995**	**1996**	**1997**	**1998**	**1999**
$CORPG_{i,t-1}$	0.00145	0.00274*	-0.00046	0.00404**	0.00681***
	(0.0009)	(0.0013)	(0.0368)	(0.0015)	(0.0016)
R-Squared	0.2113	0.2859	0.3506	0.3577	0.2968
No. of Observations	1085	1159	1266	1399	1504

year	**2000**	**2001**	**2002**	**2003**	**2004**
$CORPG_{i,t-1}$	0.00401**	0.00118	0.00153*	0.00154*	0.00099
	(0.0015)	(0.0006)	(0.0007)	(0.0007)	(0.0007)
R-Squared	0.3174	0.3069	0.1816	0.1778	0.1786
No. of Observations	1596	1703	1880	2135	2245

Table 3.6: GLS Random –Effects regression

The panel data generalized least squares random effects regression encompasses all firms which have a governance index value created by GIM (2003) from 1990-2004. The dependent variable is Δy_t or growth in value added. The regression result corresponds to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock, Δk_t , growth rate of labor Δl_t , and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. Ln(Age)is the logarithm of firm age in years. Random effects use the Swamy-Aurora estimator for computing standard errors. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
	ALL	DEM	DICT
Δk_t	-0.0129	0.7073	0.3915
	(0.1454)	(0.5389)	(0.7685)
Δl_t	0.0283	0.201	-0.2636
	(0.1248)	(0.3285)	(0.7931)
Δh_t	0.0015	0.0032	-0.0642
	(0.3458)	(0.0674)	(0.1791)
$CORPG_{i,t-1}$	0.0028***	0.0069***	-0.0182
	(0.0008)	(0.002)	(0.0116)
Ln(Age)	-0.0124**	-0.0167**	0.0198
	(0.0042)	(0.0054)	(0.0206)
Intercept	0.0343	-0.0281	0.1395
	(0.0237)	(0.0489)	(0.1482)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes	yes
R-Squared (within)	0.1832	0.1472	0.2182
R-Squared (between)	0.2773	0.4588	0.0456
R-Squared (overall)	0.2274	0.2426	0.1915
No. of firm years	10530	3023	1010

Table 3.7: OLS regression with robust standard errors and Control variables

The data is comprised of all firms which have a governance index value created by GIM (2003) from 1990-2004. The dependent variable is Δy_t or growth in value added. The regression results correspond to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. The control variables are lagged value of log total assets $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, defined as the ratio of intangibles to net fixed assets, lagged growth in value added, $\Delta y_{i,t-1}$, and Ln(Age), the logarithm of firm age in years. Robust standard errors are due to Huber-White sandwich estimators. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1) OLS	(2) OLS	(3) Fixed Time Effects	(4) Fixed Industry Effects	(5) Fixed Time and Industry Effects
Δk_t	0.2526***	0.1129	0.4402***	0.1024	0.4585***
	(0.0258)	(0.1034)	(0.1147)	(0.1086)	(0.1193)
Δl_t	0.3428***	0.5062**	0.5088**	0.5031**	0.5052*
	(0.0342)	(0.1942)	(0.1968)	(0.1938)	(0.1964)
Δh_t	0.0246***	-1.4897**	-0.0127	-1.5026**	-0.0131
	(0.0056)	(0.4629)	(0.0441)	(0.4621)	(0.0441)
$CORPG_{i,t-1}$	0.0019**	0.0019*	0.0016*	0.0017*	0.0015*
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
$\ln ASSETS_{i,t-1}$	-0.0033	-0.0042*	-0.0037	-0.0054**	-0.0048*
	(0.0018)	(0.0021)	(0.0021)	(0.0021)	(0.002)
$INTANI_{i,t-1}$	0.0023**	0.0021*	0.0022*	0.0019*	0.002*
	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
$\Delta y_{i,t-1}$	-0.0636*	-0.0641*	-0.0677*	-0.0681*	-0.0719*
	(0.0285)	(0.0291)	(0.0297)	(0.0292)	(0.0298)
Ln(Age)	-0.0108**	-0.0092*	-0.0107**	-0.0058	-0.0074*
	(0.0035)	(0.0037)	(0.0037)	(0.0038)	(0.0038)
Intercept	0.0799	0.04	0.0952	0.0259	0.084
	(0.024)	(0.0273)	(0.0304)	(0.0335)	(0.0353)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	no	yes	yes	yes	yes
R-Squared	0.2319***	0.2437	0.2558**	0.2461	0.2582*
Number of Obs.	10584	10011	10011	10011	10011

Table 3.8: ALL firms with control variables

The panel data fixed effects regression and GLS random effects regression encompasses all firms which have a governance index value created by GIM (2003) from 1990-2004. The dependent variable is Δy_t or growth in value added. The regression result corresponds to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. The control variables are lagged values of log total assets $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, defined as the ratio of intangibles to Net fixed assets, lagged growth in value added, $\Delta y_{i,t-1}$, and Ln(Age), the logarithm of firm age in years. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1) (Fixed Effects)	(2) (Random Effects)
Δk_t	-0.1234	0.0877
	(0.182)	(0.1419)
Δl_t	0.0544	0.0395
	(0.1263)	(0.121)
Δh_t	-0.9377	-0.0429
	(0.491)	(0.3458)
$CORPG_{i,t-1}$	0.0024*	0.0023**
	(0.001)	(0.0008)
$\ln ASSETS_{i,t-1}$	-0.0389***	-0.0059**
	(0.0068)	(0.0023)
$INTANI_{i,t-1}$	0.0027*	0.0021**
	(0.0011)	(0.0007)
$\Delta y_{i,t-1}$	-0.1292***	-0.0843***
	(0.0094)	(0.0086)
Ln(Age)	-0.0029	-0.01*
	(0.0159)	(0.0041)
Intercept	0.3352*	0.0544
	(0.1581)	(0.0314)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes
R-Squared (within)	0.2138	0.2081
R-Squared (between)	0.1676	0.2829
R-Squared (overall)	0.2099	0.2429
No. of firm years	10011	10011

Table 3.9: Democratic firms with control variables

The panel data fixed effects regression and GLS random effects regression encompasses all firms which belong to the democratic portfolio characterized by G values of 5 or less based on a governance index value created based on firm anti-takeover amendments and charter provisions from the Investor Responsibility Research Center (IRRC). See GIM (2003) for a detailed explanation of this governance index. Democracies are defined as firms with 5 or fewer charter provisions having G values of 5 or less. The dependent value is Δy_t or growth in value added. The regression results correspond to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. The control variables are lagged value of log total assets $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, defined as the ratio of intangibles to net fixed assets, lagged growth in value added $\Delta y_{i,t-1}$ and Ln(Age), the logarithm of firm age in years. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1) (Fixed Effects)	(2) (Random Effects)
Δk_t	0.1009	0.5685
	(0.8838)	(0.3894)
Δl_t	0.2456	0.1589
	(0.3851)	(0.3095)
Δh_t	-0.1295	0.0042
	(0.0869)	(0.0125)
$CORPG_{i,t-1}$	0.0042	0.0058**
	(0.0032)	(0.0021)
$\ln ASSETS_{i,t-1}$	-0.0361**	-0.0073*
	(0.0134)	(0.0033)
$INTANI_{i,t-1}$	0.0031	0.0017
	(0.0017)	(0.001)
$\Delta y_{i,t-1}$	-0.1190***	-0.0032
	(0.0168)	(0.0144)
Ln(Age)	0.0071	-0.0112
	(0.0292)	(0.0057)
Intercept	0.2569	0.0156
	(0.1821)	(0.0628)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes
R-Squared (within)	0.1808	0.2068
R-Squared (between)	0.5746	0.2045
R-Squared (overall)	0.2846	0.1950
No. of firm years	2924	2924

Table 3.10: Dictator Firms with Control Variables

The panel data fixed effects regression and GLS random effects regression encompass all firms which belong to the dictator portfolio characterized by G values of 13 or more based on a governance index value created based on of firm anti-takeover amendments and charter provisions from the Investor Responsibility Research Center (IRRC). See GIM (2003) for a detailed explanation of this governance index. Dictators are defined as firms with 13 or more restrictive charter provisions. The dependent value is Δy_t or growth in value added. The regression results correspond to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the rate of growth of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross-industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by $CORPG$ where higher values of $CORPG$ signify stronger shareholder rights in a company. The control variables are lagged value of log total assets $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, defined as the ratio of intangibles to net fixed assets, lagged growth in value added $\Delta y_{i,t-1}$ and Ln(Age), the logarithm of firm age in years. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1) (Fixed Effects)	(2) (Random Effects)
Δk_t	-0.2209	-0.3517
	(1.3019)	(1.2659)
Δl_t	-0.1278	-0.1082
	(0.9021)	(0.7482)
Δh_t	0.1886	0.1911
	(1.6627)	(1.628)
$CORPG_{i,t-1}$	-0.0019	-0.0137
	(0.016)	(0.0115)
$\ln ASSETS_{i,t-1}$	-0.0318	-0.0012
	(0.0236)	(0.0086)
$INTANI_{i,t-1}$	-0.2209	-0.3517
	(1.3019)	(1.2659)
$\Delta y_{i,t-1}$	-0.1278**	-0.1082*
	(0.9021)	(0.7482)
Ln(Age)	0.1886	0.1911
	(1.6627)	(1.628)
Intercept	0.0019	-0.0137
	(0.016)	(0.0115)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes
R-Squared (within)	0.2503	0.2356
R-Squared (between)	0.0438	0.2809
R-Squared (overall)	0.1819	0.2649
No. of firm years	969	969

Table 3.11: Old and Young Firms

The data is comprised of all firms which have a governance index value created by GIM (2003) for 1990-2004. The sample is divided into "young" and "old" firms based on whether the firm age is below or above 50 years. The dependent value is Δy_t or growth in value added. The regression results correspond to the empirical Cobb-Douglas production function discussed in the paper. The regressors include the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and the growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ *and* $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. The control variables are lagged value of log total assets $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, defined as the ratio of intangibles to net fixed assets, and lagged growth in value added, $\Delta y_{i,t-1}$. Robust standard errors are due to Huber-White sandwich estimators. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)
	Age< 50	Age< 50	Age> 50	Age> 50
Δk_t	-0.1381	0.3148*	-0.1299	-0.1229
	(0.4990)	(0.1394)	(0.3368)	(0.3415)
Δl_t	0.0768	0.0537	0.3091	0.6327
	(0.1534)	(0.1545)	(0.2265)	(0.4543)
Δh_t	-0.0443	0.023	0.6134	-0.8112
	(0.0348)	(0.0213)	(0.4952)	(0.6957)
$CORPG_{i,t-1}$	0.0038***	0.0028**	0.0025**	0.0022*
	(0.0009)	(0.0011)	(0.0009)	(0.0010)
$\ln ASSETS_{i,t-1}$		-0.0057		-0.0008
		(0.0034)		(0.0026)
$INTANI_{i,t-1}$		0.0015		0.0017
		(0.001)		(0.001)
$\Delta y_{i,t-1}$		-0.0508		-0.0245
		(0.0336)		(0.0378)
Intercept	-0.0267	0.0121	0.0054	-0.0216
	(0.0198)	(0.0403)	(0.0158)	(0.0334)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes	yes	yes
R-Squared (within)	0.2314	0.2482	0.2158	0.2295
No. of firm years	6685	6360	5350	5064

Table 3.12: Winsorized Sample

The data is comprised of all firms which have a governance index value created by GIM (2003) for 1990-2004. The dependent variable is Δy_t or growth in value added. The regression results correspond to the empirical Cobb-Douglas production function discussed in the paper. The regressors are the growth rate of tangible capital stock Δk_t, growth rate of labor Δl_t, and growth rate of intangible capital stock Δh_t. $\Delta k_t IND_i$, $\Delta l_t IND_i$ and $\Delta h_t IND_i$ give the cross–industry dummies associated with tangible capital, labor, and intangible capital respectively. The measure of corporate governance is given by *CORPG* where higher values of *CORPG* signify stronger shareholder rights in a company. The control variables are lagged value of log total assets, $\ln ASSETS_{i,t-1}$, lagged intangible intensity $INTANI_{i,t-1}$, and defined as the ratio of intangibles to net fixed assets, lagged growth in value added $\Delta y_{i,t-1}$ and, Ln(Age), the logarithm of firm age in years. The independent variable and the dependent and control variables except *CORPG* are winsorized 10% in each tail to remove extreme values. Robust standard errors are due to Huber-White sandwich estimators. ***,**,* denote significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)
	OLS	OLS	Fixed Effects	Random Effects
Δk_t	0.2633	0.0799	0.1023	0.0652
	(0.1902)	(0.0830)	(0.1645)	(0.093)
Δl_t	0.3109**	0.4785***	0.3451***	0.3970*
	(0.106)	(0.1120)	(0.0993)	(0.1582)
Δh_t	0.0328	0.0335	0.0373	0.0308
	(0.033)	(0.0337)	(0.0707)	(0.0411)
$CORPG_{i,t-1}$	0.0014***	0.0013***	0.0022***	0.0015***
	(0.0003)	(0.0004)	(0.0006)	(0.0004)
$\ln ASSETS_{i,t-1}$		-0.0026*	-0.0330***	-0.0032*
		(0.0011)	(0.0042)	(0.0013)
$INTANI_{i,t-1}$		0.0032	0.0077*	0.003
		(0.0016)	(0.0035)	(0.0017)
$\Delta y_{i,t-1}$		0.0036	-0.0240***	-0.0021
		(0.0078)	(0.0048)	(0.0044)
Ln(Age)	-0.0113***	-0.0088***	0.0267*	-0.0088***
	(0.0018)	(0.002)	(0.0129)	(0.0022)
Intercept	0.0576**	0.0714*	0.2047**	0.0747
	(0.0199)	(0.0342)	(0.069)	(0.0369)
$\Delta k_t IND_i$, $\Delta l_t IND_i$, $\Delta h_t IND_i$	yes	yes	yes	yes
R-Squared	0.3202	0.3218	0.2558	0.3216
No. of firm years	10530	10011	10011	10011

CHAPTER 4

IPO Underperformance and Corporate Governance: An Evidence from the US Stock Market

C H A P T E R 4

IPO Underperformance and Corporate Governance: Evidence from the US Stock Market

Introduction

This third essay serves as a connecting link between the previous two essays. It compares long run performance of IPOs with strong shareholder rights and weak shareholder rights. In this essay, the sample is narrowed to those firms from Gompers, Ishii, and Metrick (GIM, 2003) to a subsection of firms which were IPOs in the 1990s and early part of 2000.

I. Background and Motivation

A. Background

Jensen and Meckling (1976) argue that modern corporations are plagued by two types of agency conflicts. First, an agency conflict occurs between shareholders and managers. Managers who own less than 100% of a firm's equity may not act in the best interests of shareholders, potentially running the firm to maximize their own private benefits rather than those of the shareholders. Second, there is an agency conflict between shareholders and creditors. Here, an agency conflict occurs when shareholders invest the borrowed funds in risky projects, thereby exposing creditors to a level of risk that is not commensurate with the return they are promised. This paper is confined to the first type of agency conflict.

B. Corporate Governance and IPOs: Existing Literature

Both Daines and Klausner (2001) and Field and Karpoff (2002) analyze the use of takeover defenses at the date of an IPO. Daines and Klausner examine the bylaws and charters of 310 IPOs, finding that over two-thirds of their sample has anti-takeover provisions (ATPs). By looking at the cross-sectional determinants of ATP adoption, they argue that putting ATPs in place at the time of an IPO is more likely to be an effort to entrench management rather than to maximize value. Field and Karpoff reach a similar conclusion in their analysis of a sample of 1,019 IPOs from 1988 to 1992, observing that the extensive use of ATPs by IPOs is associated with a lower likelihood of being acquired, but is unrelated to premiums for acquired firms. They find no difference in post-IPO operating performance between firms with and without ATPs.

Smart and Zutter (2003) look at a sample of 253 dual-class and 2,369 single-class IPOs, showing that underpricing is greatest for single-class IPOs. Furthermore dual-class IPOs have greater institutional ownership and obtain higher price sales multiples at the time of an IPO. Baker and Gompers (2003) view the structure of the board of directors at the time of an IPO as an outcome of a bargaining game between management and outside shareholders. They find that the presence of venture capitalists in the firm act as a sort of balance to CEO power. Hartzell, Kalberg and Liu (2004), in a sample of 107 IPOs on real estate investment trusts (REITs) from 1991 to 1998, discovering that REIT firms with stronger governance structures not only have higher initial IPO valuations, but also have better long-term operating performance than their peers.

C. Tying them together.

In order to evaluate a firm's performance, it makes sense to define the ultimate purpose of a corporation as long term value creation. However, Monks and Minow (2001) write that

> The expressions "long term" and "value" are subject to many interpretations. Anyone who is being evaluated has an incentive to define "long term" as "after I am gone." Anyone who is being evaluated has an incentive to define "value" as "results from whichever financial formula makes us look most appealing this year.

Nevertheless, the ultimate objective of managers is long term shareholder wealth maximization which roughly amounts to how well a stock price (or dividends plus capital gains) performs in the long run. In this context it is important to consider IPOs because the literature suggests that IPOs under perform size and value matched peer firms in the long-run (Ritter, 1991; Loughran and Ritter, 1995). It seems that managers in IPO firms are unable to attain the goal of long term shareholder wealth maximization. Thus, the long-run underperformance of IPOs could be, among other things, a corporate governance issue. Thus far, there has been no study to test the relationship between the broad based corporate governance index created by GIM (2003) and the long run performance of IPO firms.

This paper presents two hypotheses about the relationship between shareholder rights and IPOs. First, IPO firms having stronger shareholder rights outperform relative to the peer IPOs having weaker shareholder rights. This paper presents evidence in support of this hypothesis. Second, the widely documented underperformance of IPOs might be attributed partly to the governance structure of IPOs. The sample of IPOs in this paper for which the governance index is available lacks smaller IPOs and is therefore not representative. So, testing for the second hypothesis is left for future research.

The remainder of this paper is as follows. Section II describes the data set. Section III presents the methodology used. Section IV discusses the results. Section V concludes.

II. Data

A. Data on Corporate Governance

In the U.S. there are few agencies which rate corporations on the basis on their corporate governance. Institutional Shareholder Services, GovernanceMetrics International, Standard and Poor's, and The Corporate Library are among the companies which supply governance scores. These companies gather data on various aspects of corporate governance, such as the structures and make-ups of boards of directors, management and director compensation, and charter provisions.

Gompers, Ishii, and Metrick (2003) use the Investor Responsibility Research Center (IRRC), which publishes detailed listings of corporate-governance provisions for individual firms in Corporate Takeover Defenses (Rosenbaum 1990, 1993, 1995, 1998, 2000, 2002, and 2004) as their primary data-source. The G index constructed by GIM (2003) is widely used in the finance literature as a broad based index for the strength of shareholder rights. This essay also employs their governance index to measure to level of corporate governance.

GIM's (2003) governance index is created on the basis of how many restrictive governance provisions are imposed on shareholder rights – the more restrictive the governance, the weaker the shareholder rights. The governance index G is constructed as follows. For every firm, GIM (2003) add one point for every provision that restricts shareholder rights (increase managerial power). While this index may not accurately reflect the relative impacts of the various provisions, it has the advantage of being transparent and easily reproducible. The index does not require any judgments about the efficacy or wealth effects for any of the provisions; GIM (2003) only considers the impact on the balance of power.

B. Data Description

Equity market data is used from the CRSP database.[31] There are some limitations to this approach. Index G is created using mostly large firms. The sample of IPO firms would be larger in market capitalization than a typical IPO firm. Only firms listed in the G index within first four years of their initial public offering are included. This reduces the sample to only 495 firms. It is assumed that firms which appear in the index after 5 or more years are already seasoned firms. Hence, it would be incorrect to include them in the final IPO sample.

The median G score of the entire sample created by GIM (2003) is 9. Figure 4.1 reveals that the distribution is heavily centered on the median G values, between 7 and 11. For the IPO sample of 495 firms used here, the mean is 7.65 and the median 7.5 (Table 4.1). In general, the distribution of IPO firms is skewed more towards lower values of G than the sample containing all firms (Table 4.3).

III. Methodology

In their paper, GIM (2003) classify the democratic firms as $G \leq 5$ and $G \geq 14$ for dictator firms. Unfortunately, the 495 IPO firms used here are a small subset of about 2000 firms in the extended GIM dataset. There are very few firms in this reduced dataset

[31] We thank Andrew Metrick for providing the CRSP permno of firms in the G index

with G greater than 14 which renders classification based on GIM (2003) not feasible. Instead, for the sample, firms are sorted into democratic IPOs and dictator IPOs based on the G index scores less than or equal to seven ($G \leq 7$) and G scores greater than or equal to nine ($G \geq 9$), respectively. An alternative selection method (with $G \leq 5$ for democratic IPOs and $G \geq 12$ for dictator IPOs) is used as well, and, as is shown, the results are not markedly different.

To determine how democratic and dictator firms perform against each other in calendar time, an equal-weighted portfolio is created based on the governance criteria G, as discussed in the previous paragraph. Each portfolio is rebalanced each month such that only IPOs of relevant age are included in the portfolio. Thus, each month some IPOs may be dropped because of age or because of delisting. If the firm gets delisted, the delisting return is taken as -0.30 calculated using Shumway's (1997) correction. Also, IPOs are added to the portfolio if they reach the appropriate age.

A value-weighted portfolio is similarly constructed. The weight on each firm in the democratic or dictator portfolio is the value of the market capitalization of that firm *divided* by the sum of the market capitalizations of all the firms in that particular portfolio (democratic or dictator). Furthermore, alternative time horizons are considered for the analysis.

The hedge portfolio each month is created as the difference between the return on the democratic portfolio and the return on the dictator portfolio for that month. The regression equation for the analysis is:

$$R_{Dem,t} - R_{Dic,t} = \mu + \varepsilon_t$$

where $R_{Dem,t}$ is an equal-weighted or a value-weighted monthly return on democratic IPO firms at time t and $R_{Dic,t}$ is the corresponding equal-weighted or value-weighted monthly return on dictator IPO firms.

IV. Results

A. Cumulative Average Returns

Panel A of figure 4.2 shows the cumulative equal-weighted returns of the two portfolios $R_{Democratic}$ and $R_{Dictator}$, where democratic firms are IPO firms which have $G \leq 7$ and dictator firms are IPO firms which have $G \geq 9$. It is clearly evident from the graph that democratic firms have a higher cumulative return than their peer dictator firms in calendar time. Panel B of figure 4.2 depicts the corresponding graph for cumulative value-weighted returns. The difference in cumulative returns between the democratic and dictator firms is lower in magnitude than the equal-weighted case, but the democratic firms cumulative returns are always above that of dictator firms. The difference between the equal-weighted and value-weighted returns for IPOs is also evident from the regression results discussed below.

B. Zero Investment Portfolio

Panel A of Table 4.1 presents the returns for a portfolio which is long on democratic IPO firms (where democratic firms are all IPO firms which have $G \leq 7$) and short on dictator firms (where dictator firms are all IPO firms which have $G \geq 9$) from 1992 to 2003. The long term returns are from the second month of an IPO to 5 years (60 months). The hedge portfolio generates a significant excess monthly return of 0.39% which is equivalent to an annualized return of about 5%. The value-weighted excess monthly return is 0.3% but it is statistically insignificant. Panel B presents the result of a similar portfolio of democratic and dictator firms based on the time horizon from the 2^{nd} year (13^{th} month) to the 5^{th} year (60^{th} month) of an IPO. The equal-weighted excess monthly return of 0.53% (significant at 10% level) translates to about a 6.5% annualized return. The value added excess return of 0.59% monthly is also significant at 10% level.

C. Multi Factor Framework

The results discussed above are based on raw returns. In order to see the performance of the IPOs in a multifactor framework, the Fama French (1992, 1993) three factor model and the Carhart (1997) four factor model is used. They are described in detail in chapter 2. Before the performance of the democratic and dictator IPOs is tested, an examination of how the entire IPO sample[32] performs in comparison to Metrick's entire sample of firms for which the G index exists[33] is provided for the time period January, 2000 to December, 2005.

The entire sample of firms which are available on Andrew Metrick's website contains many firms which were not included in the GIM (2003) dataset, which looked at the years from 1990 to 1999. Column (1) in Table 4.2 reports the Fama French (1992, 1993) three factor regression results for a portfolio of all the firms that have an G index and are included in the Metrick dataset. During the sample period from 1990 to 2005, an equal-weighted portfolio of these firms has a positive and significant Jensen's alpha of 0.034%. For the Carhart (1997) four factor model, the alpha is 0.055% and highly significant (column (2) of Table 4.2). Column (3) of Table 4.2 shows the Fama French 3-

[32] The entire IPO sample is obtained from SDC platinum new issue database and has been cross checked with Jay Ritter's data.
[33] Available at Andrew Metrick's website.

factor regression results of a portfolio of firms which have issued new equity for cash within the prior 60 months. The Jensen's alpha in this regression is -0.285% per month and significant. This implies an underperformance of 3.5% annually.

If the Carhart (1997) model is considered, the alpha is -0.135% but not significant (column (4) of Table 4.2). A comparison of the factor loadings for the different factors for the Metrick dataset and the IPO dataset is important. For the Metrick sample, the factor loading on the market premium for the Fama French (1992, 1993) model is 1.16 as compared to 1.315 for the IPO portfolio during the same period from January, 1990 to December, 2005. However, both the samples have a higher beta than the market. The factor loading on the size factor for the IPO portfolio is almost double that of the Metrick sample. This is expected as small capitalization portfolios will have a large positive factor loading on size. The coefficient on the value factor for the Metrick sample is positive at 0.55 for the Fama French model, suggesting that an average firm in the Metrick sample is not a growth firm. In contrast, the IPO portfolio has a factor loading of -0.3 which suggests that IPO firms are high growth firms. The factor loadings on the momentum factor for Carhart (1997) for both samples are negative and highly significant, but the coefficient on the IPO portfolio is larger in absolute value than Metrick's sample.

For the sample of 495 IPO firms employed here which form a part of the Metrick sample, a portfolio of IPOs is created which have issued new equity for cash within the prior 60 months. The monthly portfolio returns are then regressed using the Fama-French and Carhart (1997) frameworks. The first IPO which appears in the sample is in April of 1990. Accordingly, the sample period is from April, 1990 to December, 2005.

Table 4.2, columns (5) and (6), report the results of two multifactor regressions. For the Fama French model, the alpha is positive and significant at 0.067, implying over-performance in the long-run for IPOs. This contrasts the monthly underperformance of -0.285 basis points reported in column (3) of Table 4.2 for the entire IPO sample. For the Carhart (1997) model, the over-performance still persists though it is lower in significance level than reported for the three factor model. In comparison with the entire Metrick sample, the factor loadings are not markedly different except for the loading on the value factor. For the IPO sample of 495 firms, the loading on the value factor is -0.29 for the Fama French model, compared to 0.4 for the Metrick sample with a similar model specification. This suggests the IPO firms in Metrick's sample are high growth firms. Compared to the entire data set of IPO firms, the truncated IPO sample have similar factor loadings for most factors except for the loading on the size factor. For the truncated IPO sample the factor loading on the size factor is 0.56 compared to 1.05 for the entire IPO sample. This signifies that the truncated IPO sample has, on average, larger market capitalization than a typical IPO firm.

Table 4.3 displays descriptive statistics for the three samples. The GIM dataset has a mean market capitalization of about $305.5 million and a median of $762 million. In comparison, during the same sample period from 1990 to 2005, the entire IPO sample has a mean of $61.1 million and a median of just $14.7 million. The truncated IPO sample of 495 firms has a much larger mean market capitalization than a typical IPO firm that has a mean market capitalization of $274.1 million. This supports the explanation of low factor loading on the size factor for the truncated IPO sample.

D. Democratic versus Dictator IPOs

As discussed in section III, firms having *G* index scores less than or equal to seven are classified as democratic firms and with firms having *G* scores greater than or equal to nine are classified as dictator firms. Equal-weighted monthly return portfolios of IPOs that have gone public during the prior 60 months are formed. These portfolio returns are regressed on the Fama French three factor model and the Carhart (1997) four factor model for the period April, 1990 to December, 2005. Table 4.3 reports the results.

Columns (1) and (2) of Table 4.3 correspond to the Fama French (1992, 1993) and Carhart (1997) multifactor model results for the democratic portfolio and columns (3) and (4) report the corresponding results for the dictator portfolio. The Jensen's alphas in all the four regressions are positive and significant. The dictator firms in the sample do not underperform the multifactor models though the extent of over-performance is lower than that of the democratic firms. For the Fama French three factor model, the democratic portfolio has a positive abnormal monthly return of 0.135% which translates to a 1.65% annual abnormal return. For the dictator portfolio the corresponding monthly abnormal return is 0.087%, or 1.05% per year. If the factor loadings on the market factor for the two portfolios are considered, they are very similar at 1.33 for democratic and 1.31 for the dictator firms for Fama French model. The coefficients on the size factor are quite similar as well. For the value factor, the portfolio returns on democratic firms have a higher negative factor loading than that of dictator firms.

Different portfolio creation criteria are also used by forming a portfolio of IPOs which have completed their first anniversary of IPO but have not exceeded the 60 month age limit. Columns (1) through (4) of Table 4.4 report the Fama French 3 factor and

Carhart (1997) four factor results for the democratic and dictator portfolios. Jensen's alpha is positive but insignificant for all regressions except for the Carhart (1997) four factor model with democratic portfolio, which has a significant alpha equal to 0.0925%. The magnitude of the Jensen' alpha for the Fama French model is an insignificant 0.038% for the democratic portfolio and an insignificant 0.026% for the dictator portfolio. In each of the regressions, the alpha for the democratic firms is larger than the corresponding alpha for the dictator firms.

These results suggest that during the sample period 1990 to 2005, none of the IPO sub-samples showed underperformance. In fact, in most of the regressions, the sub-samples had over-performance, though the magnitude of over-performance was higher for the democratic sub-sample.

E. Zero Investment Results in a Multi-factor Framework

To evaluate the zero-investment strategy returns in the Fama French framework augmented by momentum and liquidity factors, the five factor model can be re-written:

$$R_{Dem,t} - R_{Dic,t} = (\alpha_{Dem} - \alpha_{Dic}) + (b_{Dem} - b_{Dic})MKT_t + (s_{Dem} - s_{Dic})SMB_t +$$

$$(h_{Dem} - h_{Dic})HML_t + (l_{Dic} - l_{Dem})LIQ_t + (u_{Dem} - u_{Dic})UMD_t + \xi_t$$

this can be re-written as:

$$R_{d,t} = \alpha_d + b_d MKT_t + s_d SMB_t + h_d HML_t + c_d LIQ_t + u_d\, UMD_t + \varepsilon_t$$

where $R_{d,t}$ is the monthly returns on a portfolio that buys the democratic portfolio ($G \leq 7$) and sells short the dictatorship portfolio ($G \geq 9$). The alpha ($\alpha_{d,t} = \alpha_{Dem,t} - \alpha_{Dic,t}$) in the regression is the excess return on the zero investment strategy. Table 4.6 reports the regression results for Fama French and Carhart (1997) models. Columns (1) and (2) of Table 4.6 shows the results for the portfolio holding period of five years and columns (3) and (4) show the results for the hedge portfolio created on IPOs which have completed their one year anniversary but have not exceeded the five year age limit. For all the regressions, α_d is positive but insignificant, though for the Carhart model in column (2) the t-statistic is high at 1.72.

Analyzing the coefficient on the market, size, value, and momentum factors for the zero investment portfolio returns is also relevant. This gives information about the extent to which the two portfolios vary from each other apart from the characteristic based on the *G* index scores. The coefficient on the market premium is insignificant and does not have a definitive sign for all the regressions. The coefficient on the size factor and momentum factors are also highly insignificant and do not have definitive signs. For value factor, the coefficient is negative for all the regressions (Table 4.6), implying that the democratic firms have higher negative factor loadings than the dictator firms. This may confirm that democratic firms are "high growth" firms compared to dictator firms.

F. Different Sample Periods

Core, Gray, and Rusticus (2006) find that the relative over-performance of 8.5% per year of the democratic portfolio over the dictator portfolio documented by GIM (2003) during the sample period of 1990 to 1999 diminishes in magnitude and significance to 4.8% per year if the sample period is increased to 2003. As figure 4.2, panels A and B suggest, there is a similar decline in the returns for the democratic portfolio for the IPO sample starting mid-2000. The decline in returns for the democratic portfolio is arrested in early 2003 when it shoots up sharply. The sharp rise and the widening of the gap between the returns of the democratic and dictator portfolios continue to the end of the sample. The performance of the democratic portfolio is consistently higher than dictator portfolio barring the years from 2000 to 2002 when the bubble burst and the economy moved into a recession. Interestingly, this was also the period in the U.S. where the two huge corporate scandals at Enron and Worldcom happened.

Following Core, et al. (2006), the sample period is divided into two parts. The first sample period is 1990 to 1999, which corresponds to the sample period analyzed by GIM (2003). The second sample period starts in year 2000 and extends the Core, et al. (2006) sample period by two years to 2005.

Table 4.7 reports the results of the multi-factor regressions for the dictator and democratic portfolio returns between 1990 and 1999. Jensen's alpha is positive and significant for both the democratic and dictator firms though the magnitude of the over-performance is higher for the democratic portfolio. The hedge portfolio results confirm that as alpha is positive, though insignificant, for the Fama French (1992, 1993) and the Carhart (1997) model. Table 4.8 reports the corresponding result for the sample period from 2000 to 2005. The alphas are positive but insignificant for the democratic and dictator portfolios. The hedge portfolio gives an alpha of 0.075% for Fama French model with a t-statistic of 1.88.

G. Small and Big IPOs

The results have so far shown that there is no evidence of long term underperformance for the IPO sample of 495 firms between 1990 and 2005. In fact, in many of the regressions, there is significant over-performance. This runs counter to the evidence of the long-run underperformance of IPOs documented in chapter 2 as well in

Table 4.2 of this essay. Further, the truncated IPO sample differs from a typical IPO firm by size characteristic. How the "small" and "big" IPOs in the truncated sample perform is now examined.

The sample is sorted into four size quintiles based on market capitalization. In the two extreme size quintiles, firms are sorted into democratic and dictator portfolios based on their *G* scores. Table 4.9 reports the multi-factor regression results for the "small" firms. Jensen's alpha is negative for both democratic and dictator firms and is significant for the Fama French model for the dictator portfolio. The under-performance for the small dictator portfolio during the period 1990 to 2005 is 0.2% per month or 2.5% per year. This is slightly less than -3.45% per year documented for the entire IPO sample during the similar sample period (Table 4.2). The hedge portfolio in Table 4.9 shows a positive but insignificant alpha which supports the previous results.

Similar regressions for the "big" firms in the IPO sample documented in Table 4.10, show that Jensen's alpha now has significant over-performance for both the democratic and dictator portfolios. The hedge portfolio alpha is positive but not significant. These result support Brav and Gomper's (1997) finding that IPO underperformance is a small firm effect. The significant over-performance for the "big" sample implies that the overall results for the truncated IPO sample, as in Table 4.2, may be driven by the large number of big IPO firms in the sample.

The focus now shifts to the small size IPO firms as they are more representative of a typical IPO firm than the big size IPO firms in the truncated sample and how they perform in different sample periods. From 1990 to 1999, the Fama French regression results for both the democratic and dictator firms are insignificant and negative, Table

4.11 reveals. In the Carhart model, there is an insignificant positive Jensen's alpha for the democratic and dictator portfolios. For the hedge portfolio, there is an insignificant negative and positive alpha for the Fama French and Carhart models respectively.

The results change dramatically for the sample period 2000 to 2005, documented in Table 4.12. For the small size IPOs, the Jensen's alpha is negative for both democratic and dictator portfolios. For the Fama French model, the small democratic IPOs have a significant alpha of -0.23% per month which translates to about -2.8% annual underperformance. The results are more severe for the dictator firms where the Fama French regression generates an under-performance of -0.42% per month or -5.1% per year.

The last two columns in Table 4.12 report the results for the hedge portfolio. Though both the democratic and dictator sub-samples under performed, the alpha for the hedge portfolio is significantly positive. The excess return was close to 0.2% per month or 2.4% per year for the hedge portfolio.

Overall, the small IPOs in the truncated sample underperformed in the long-run and the underperformance is more severe for the dictator firms. The extent of under performance varied between the two sample periods.

F. Robustness Checks

F.1. Value Weighted Portfolio Returns

The previous regressions were based on equal-weighted returns which are commonly used in long-run event studies. Now, how the democratic and dictator IPO portfolios behave when value-weighted portfolio returns are used on three Fama French and the momentum factors is tested. The results presented in Table 4.13 are not qualitatively different from similar model and sample period specification for equal-weighted returns. The dictator and democratic firms have significant over-performance and the magnitude of this over-performance is the larger than the equal-weighted portfolios (Table 4.4). This result is expected for the value-weighted portfolios as large IPOs over-performed irrespective of being a dictator or a democratic firm.

The alpha for the hedge portfolio is positive but not significant which is consistent with the previous results.

F.2. Alternative Definition of Democratic and Dictator Portfolios

GIM (2003) defines democratic firms as firms which have G index score less than or equal to five. The dictator firms are the firms with G index scores of fourteen and above. The sample of 495 IPOs is heavily biased towards stronger shareholder rights. There are very few firms with G greater than or equal to 14 in the IPO sample, making it difficult to create a feasible dictator portfolio based on GIM (2003). In the regression results in the previous sub-sections, $G \leq 7$ and $G \geq 9$ are used to screen the IPO firms into democracy and dictator portfolios. The main reason is that there are many fewer firms if democratic firms with smaller G and autocratic firms with larger G are chosen. In particular, there are few firms with $G < 5$ and very few firms with $G \geq 14$ in the sample. For robustness then, an alternative criterion is used to sort IPO firms into two sub-portfolios. This alternative criterion specifies that democratic firms are those with $G \leq 5$ which similar to GIM (2003) definition of democratic firms. Dictator firms are categorized those with $G \geq 12$. This process sacrifices test power, but it is closer to the definition of democratic and dictator firms as defined in GIM (2003).

As before, equal-weighted monthly returns portfolio of IPOs that have gone public during the prior 60 months are formed. The portfolios returns are regressed using the Fama French 3 factor model and the Carhart (1997) four factor model for the period April, 1990 to December, 2005. Columns (1) and (2) of Table 4.14 correspond to the Fama French and Carhart (1997) multifactor model results for the democratic portfolio and columns (3) and (4) report the corresponding results for the dictator portfolio. The alphas for both democratic and dictator portfolios are positive though only significant for the democratic portfolio. As before, the dictator firms in the sample do not under perform in the multifactor models though the extent of the over-performance is lower than that of the democratic firms. For the Fama French model, the democratic portfolio has a positive abnormal monthly return of 0.101%, which translates to a 1.21% annual abnormal return.

Columns (5) and (6) of Table 4.14 report the results of the hedge portfolio returns on the Fama French and Carhart models. The excess return of the democratic portfolio over the dictator portfolio measured by alpha is positive but not significant. The magnitude of underperformance from 1990 to 2005 is around 1.25% per year. All the results in this sub-section support the previous multifactor regression results that during the sample period 1990 to 2005, none of the IPO sub-samples show underperformance.

A series of tests based on value-weighted returns, different sample periods, and size were also performed. The results are not qualitatively different from what was previously found. For the purpose of brevity, these results are omitted.

F.3. Regression with Year Dummies.

As a final robustness check, Table 4.15 reports the results of the multi-factor regressions for the dictator, democratic and hedge portfolio returns including year dummies to take account of the temporal effect. The coefficient on the year dummies are positive and significant for the dictator firm in 1991 and 1995. The year dummy is negative and significant for the democratic firm in 2002 which interestingly was the year when the corporate scandal of Enron took place. The year 1999 has positive and significant coefficient on both democratic and dictator portfolios. The Jensen's alpha is positive and significant (at for the democratic firms but negative and insignificant for dictator firms. This is a major change from the previous results where the alpha was positive and significant for both portfolios for entire sample. The result on the hedge portfolio is even stronger. The Jensen's alpha is positive and significant at 1% level for the Fama French (1992, 1993) and the Carhart (1997) model. The .magnitude of the over-performance is little over 0.6% per year for both the models. What is interesting is the coefficient on the year dummies on the hedge portfolios are all negative and statistically significant except for year 2005 where it is negative but not significant at 10% level. This

In summary, the inclusion of the year dummies brings the result closer to what GIM (2003) found for their sample that the hedge portfolio has significant positive returns.

V. Concluding Remarks

The existing literature on IPO underperformance (Welch and Ritter, 2002) suggests that IPOs under perform in the long-run. GIM (2003) find that the democratic firms outperformed dictator firms over a period from 1990 to 1999. This paper find that IPOs which are included in GIM sample are more democratic than the sample of the more seasoned firms. Thus, following GIM's results, IPOs should be performing better than seasoned firms. Indeed, the results here confirm that IPO firms belonging to GIM sample actually do not underperform in the long-run. An explanation for these contradictory results is that the IPO firms in the Metrick's sample are not representative IPO firms. The IPO firms in GIM sample differ from a typical IPO firm by the size. There is no underperformance found for the large IPO firms in the sample. These results support Brav and Gomper's (1997) contention that IPO underperformance disappears for the larger IPO firms.[34]

Moreover, the results here suggest that governance plays a role in how an IPO performs in the long-run. IPOs having stronger shareholder rights perform better than IPOs with weaker shareholder rights in most of the results. However, in few cases, this performance is statistically insignificant, which may be partly attributed to the relatively small sample of IPOs with the governance index. There is also some evidence of underperformance for smaller firms that are less democratic even in the sample. The effect is most pronounced for the period from 2000 to 2005. Future research should explore the effect of governance on IPO performance using a more representative sample. The hypothesis suggest here is that IPOs in general might be less democratic, which could contribute to the explanation of IPO underperformance. This would require more data collection which will hopefully be possible in the future.

[34] Brav and Gompers (1997) find that the IPO underperformance is driven by nonventure capital backed firms in the smallest size decile.

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Figure 4.1

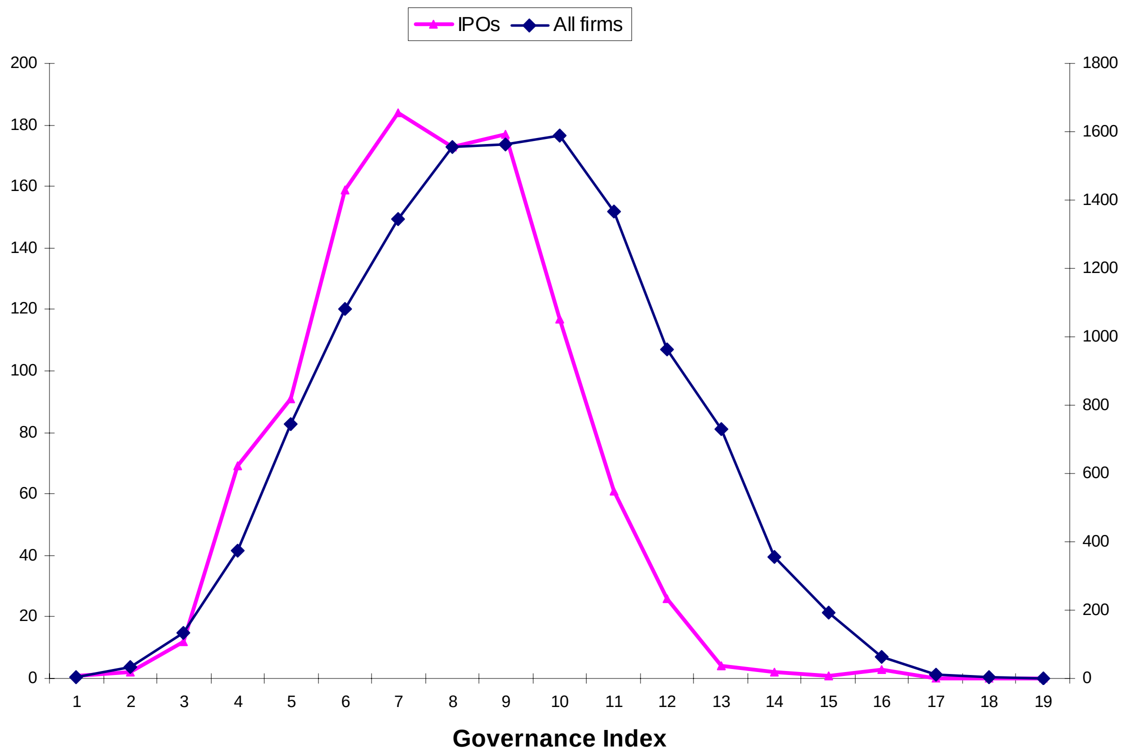
IPOs
All firms
200
180
160
140
120
100
80
60
40
20
0
1800
1600
1400
1200
1000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Governance Index

Figure 4.2: Panel A

Cumulative Equally Weighted returns on Democratic - Dictator portfolio

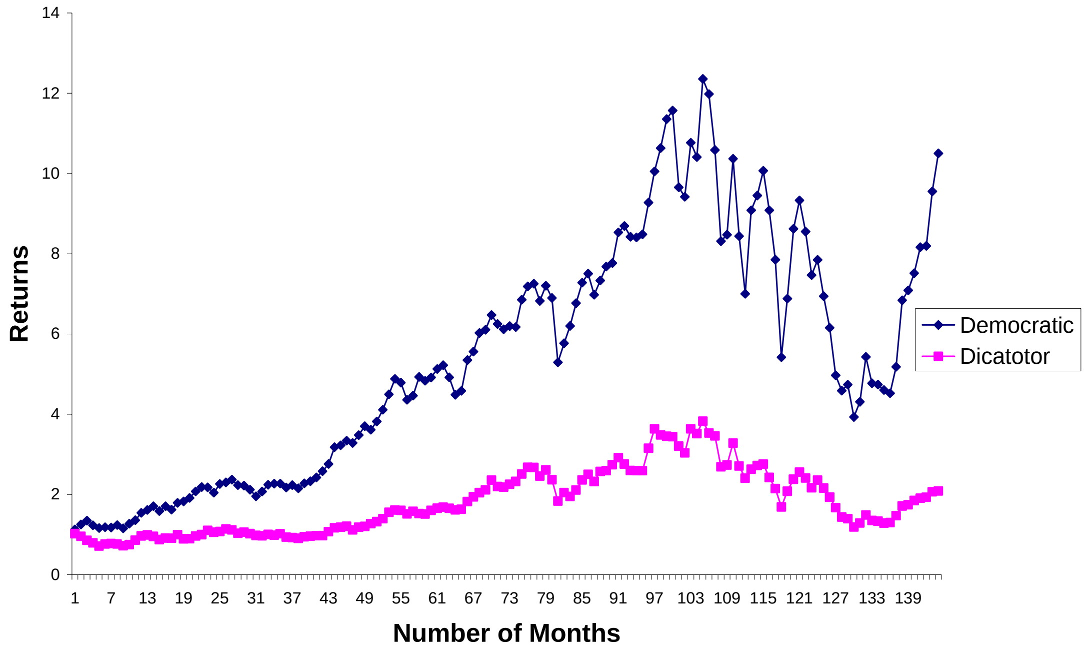

Figure 4.2: Panel B

Cumulative Value Weighted returns on Democraric - Dictator portfolio

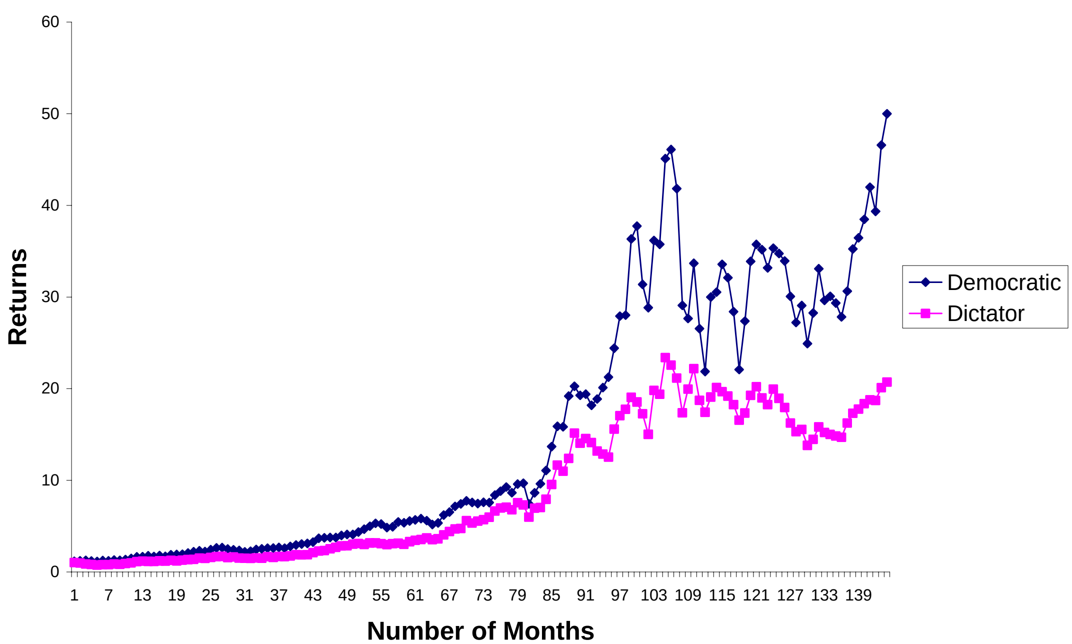

Table 4.1

This table presents the calendar time results of a hedge portfolio which is long on democratic IPOs (G≤7) and short on dictator IPOs (G≥9). The data period is from 1990 to 2005, and comprises of IPO firms taken from the data set on Governance index G, created by Gompers, Ishii, and Metrick (2003).

The regression equation is: $R_{Dem,t} - R_{Dic,t} = \mu + \varepsilon_t$, where $R_{Dem,t}$ is an equal-weighted or a value-weighted monthly return on IPOs which form the democratic portfolio based on criteria outlined in panels A and B. $R_{Dic,t}$ is the corresponding equal-weighted or value-weighted monthly return on IPOs which form the dictator portfolio based on criteria the in panels A and B. The portfolios are rebalanced monthly such that only IPOs of relevant age are included in the portfolio. μ_A and μ_B are the excess return on the $R_{Dem} - R_{Dic}$ monthly portfolios based on the criteria in panels A, B, and C. The t-statistics are provided in parentheses. ***, **, * denote significance at 1%, 5% and 10% levels respectively.

		Equally Weighted	Value Weighted
Panel A: *(2-60 months)*			
DEM (G≤7) -DICT (G≥9)	μ_A	0.0039*	0.0030
		(1.952)	(1.029)
ANOVA (p-value)		0.1323	0.4351
Panel B: *(13-60 months)*			
DEM (G≤7) - DICT (G≥9)	μ_B	0.0053*	0.0059*
		(1.893)	(1.67)
ANOVA (p-value)		0.0749	0.1466

Table 4.2

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results on the portfolio of three related samples. Columns (1) and (2) are the results based on the dataset compiled by Gompers, Ishii, and Metrick (2003). Columns (3) and (4) are the regression estimates based on the entire IPO sample for January 1990 to December 2005. The sample of IPOs is procured from SDC platinum's new issue database and cross-checked with Jay Ritter's dataset. Columns (5) and (6) are based on the truncated sample of IPOs which went public during 1990 to 2003 and are also included in the GIM dataset. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

	GIM		All IPOs		GIM-IPOs	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
	(1)	(2)	(3)	(4)	(5)	(6)
α	0.0342**	0.0548***	-0.285*	-0.1315	0.067**	0.0764*
	(0.0115)	(0.011)	(0.1352)	(0.1123)	(0.0279)	(0.0323)
MKT	1.157***	1.1***	1.315***	1.142***	1.264***	1.153***
	(0.0321)	(0.0211)	(0.1115)	(0.0719)	(0.0936)	(0.0723)
SMB	0.5464***	0.5729***	1.053***	1.101***	0.5567***	0.5829***
	(0.0835)	(0.0508)	(0.1664)	(0.1074)	(0.113)	(0.108)
HML	0.3956***	0.36***	-0.2958	-0.4267***	-0.2941**	-0.3538***
	(0.0763)	(0.0592)	(0.1679)	(0.1203)	(0.125)	(0.1097)
UMD		-0.1794***		-0.4873***		-0.3052**
		(0.0229)		(0.0756)		(0.1195)
R-squared	0.9375	0.964	0.8186	0.8841	0.7458	0.7716
No. of Observations	192	192	192	192	188	188

Table 4.3

This table presents the market capitalization (in millions) for different samples. The GIM dataset is based on the dataset compiled by Gompers, Ishii, and Metrick (2003) and obtained from Andre Metrick's website. The entire IPO sample data is obtained from SDC platinum's new issue database and cross-checked with Jay Ritter's dataset. The GIM-IPO dataset is based on the truncated sample of IPOs which went public during the period 1990 to 2003 and are also included in GIM dataset.

	GIM	All IPOs	GIM-IPOs
Mean	$304.47	$61.09	$274.10
Median	$762.12	$14.68	$102.18
Std. Dev.	$1026.58	$251.19	$662.16

Table 4.4

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7) and dictator (G≥9) IPO portfolios consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. *MKT* is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

	1990-2005: Equal-Weighted, 60 months			
	Democratic (G≤7)		Dictator (G≥9)	
	(1)	(2)	(3)	(4)
	FF-3 factor	Carhart(1997)	FF-3 factor	Carhart(1997)
α	0.1352***	0.183***	0.0873**	0.1211***
	(0.029)	(0.0323)	(0.033)	(0.0316)
MKT	1.334***	1.201***	1.314***	1.22***
	(0.1715)	(0.1443)	(0.1312)	(0.1171)
SMB	0.5803***	0.6375***	0.6367***	0.6771***
	(0.1159)	(0.0921)	(0.1342)	(0.1041)
HML	-0.6165***	-0.7005***	-0.3528***	-0.4121***
	(0.123)	(0.1158)	(0.1179)	(0.1134)
UMD		-0.3982***		-0.2809**
		(0.1245)		(0.0984)
R-squared	0.7037	0.7428	0.6217	0.6421
No. of Observations	188	188	188	188

Table 4.5

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7) and dictator (G≥9) IPO portfolios. The holding period is from the end of the first year of the IPO to the 5 year age limit. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-2005: Equal Weighted, 13months-60months				
	Democratic (G≤7)		Dictator (G≥9)	
	(1)	(2)	(3)	(4)
	FF-3 factor	Carhart(1997)	FF-3 factor	Carhart(1997)
α	0.0379	0.0925***	0.0256	0.0713
	(0.023)	(0.029)	(0.041)	(90.041)
MKT	1.594	1.447	1.529	1.405
	(0.1605)	(0.0962)	(0.1388)	(0.0991)
SMB	0.6734	0.7613	0.6395	0.7132
	(0.1389)	(0.0886)	(0.163)	(0.1044)
HML	-0.2857	-0.3725	-0.1726	-0.2454
	(0.149)	(0.0974)	(0.1594)	(0.105)
UMD		-0.472		-0.3955
		(0.1261)		(0.1028)
R-squared	0.7841	0.8422	0.5807	0.6158
No. of Observations	178	178	178	178

Table 4.6

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results on the hedge portfolio formed by a trading strategy based on G-index. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G≤7) and taking a short position in on equal-weighted portfolio of dictator IPOs (G≥9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

	Hedge Portfolio (1990-2005) and G≤7 & G≥9			
Holding Period	60 months		13months -60 months	
	Democratic -Dictator		Democratic -Dictator	
	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.0479	0.062	0.0123	0.0211
	(0.035)	(0.036)	(0.039)	(0.040)
MKT	0.0200	-0.0191	0.06533	0.04138
	(0.0831)	(0.0775)	(0.0812)	(0.0781)
SMB	-0.0564	-0.0395	0.03388	0.04812
	(0.1021)	(0.1122)	(0.0808)	(0.0848)
HML	-0.2637	-0.2885*	-0.1131	-0.1271
	(0.1345)	(0.1306)	(0.1216)	(0.1224)
UMD		-0.1173*		-0.07644
		(0.0573)		(0.0659)
R-squared	0.0213	0.044	0.0117	0.0154
No. of Observations	188	188	178	178

Table 4.7

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9) and hedge portfolios consisting of firms that have gone public during the prior 60 months. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G<=7) and taking a short position on an equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 1999. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-1999: Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.1664***	0.1764***	0.1361***	0.1308**	0.0349	0.0503
	(0.026)	(0.035)	(0.034)	(0.039)	(0.049)	(0.053)
MKT	1.176***	1.169***	1.226***	1.23***	-0.0550	-0.0653
	(0.0916)	(0.0979)	(0.1023)	(0.1013)	(0.1009)	(0.1024)
SMB	0.8181***	0.7982***	0.9613***	0.9718***	-0.1394	-0.1701
	(0.0889)	(0.1056)	(0.1509)	(0.1461)	(0.1818)	(0.1927)
HML	-0.4379***	-0.4744***	-0.2649	-0.2455	-0.1903	-0.2467
	(0.0913)	(0.1222)	(0.1867)	(0.1894)	(0.2409)	(0.2570)
UMD		-0.08387		0.04454		-0.1295
		(0.1037)		(0.1429)		(0.1388)
R-squared	117	117	118	118	118	118
No. of Observations	0.813	0.8143	0.6341	0.6243	0.08	0.137

Table 4.8

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9), and hedge portfolios consisting of firms that have gone public during the prior 60 months. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G<=7) and taking a short position in on equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is January, 2000 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

2000-2005: Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.0957	0.0921	0.0112	0.0078	0.0752	0.0742
	(0.050)	(0.054)	(0.055)	(0.055)	(0.040)	(0.042)
MKT	1.905***	1.611***	1.736***	1.511***	0.1704	0.0992
	(0.1707)	(0.1501)	(0.1044)	(0.1198)	(0.1116)	(0.1089)
SMB	0.6358***	0.9078***	0.6510***	0.8595***	-0.0066	0.0593
	(0.1003)	(0.1105)	(0.1553)	(0.1539)	(0.1215)	(0.1392)
HML	-0.4259*	-0.3554*	-0.1951	-0.1406	-0.2213	-0.2041
	(0.1742)	(0.1526)	(0.1333)	(0.1281)	(0.1186)	(0.1179)
UMD		-0.4592**		-0.351*		-0.111*
		(0.1666)		(0.137)		(0.0498)
R-squared	0.8363	0.8821	0.8596	0.8952	0.1752	0.2075
No. of Observations	71	71	71	71	71	71

Table 4.9

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9), and hedge portfolios consisting of firms that have gone public during the prior 60 months and belong to the smallest size quintile. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G<=7) and taking a short position on an equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. *MKT* is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-2005: Small IPOs, Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	-0.1283	-0.0361	-0.2003*	-0.0895	0.0691	0.049
	(0.066)	(0.068)	(0.097)	(0.098)	(0.073)	(0.077)
MKT	1.524***	1.269***	1.859***	1.539***	-0.3059	-0.2477
	(0.1895)	(0.1318)	(0.2218)	(0.1519)	(0.1756)	(0.1707)
SMB	0.8677***	0.9774***	1.207***	1.349***	-0.3431	-0.369
	(0.2206)	(0.1147)	(0.2752)	(0.1696)	(0.1913)	(0.2007)
HML	0.0966	-0.0653	0.3554	0.1644	-0.2455	-0.2107
	(0.2728)	(0.1675)	(0.3669)	(0.2073)	(0.2289)	(0.2077)
UMD		-0.7644***		-0.9307***		0.1693
		(0.1219)		(0.1705)		(0.1406)
R-squared	0.5779	0.7066	0.4649	0.5718	0.0356	0.0442
No. of Observations	189	189	186	186	186	186

Table 4.10

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9), and hedge portfolios consisting of firms that have gone public during the prior 60 months and belong to the largest size quintile. The hedge portfolio is constructed by taking a long position on an equal weighted portfolio of democratic IPOs (G<=7) and taking a short position on an equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1999-2005: Big IPOs, Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.2457***	0.2150***	0.1932***	0.1719***	0.024	0.0417
	(0.039)	(0.038)	(0.049)	(0.045)	(0.029)	(0.034)
MKT	1.270***	1.275***	1.369***	1.433***	-0.03244	-0.08549
	(0.0948)	(0.0876)	(0.0604)	(0.0704)	(0.0904)	(0.0831)
SMB	0.4622***	0.3515***	0.3500***	0.3056***	0.07439	0.1114
	(0.1297)	(0.0973)	(0.0921)	(0.0823)	(0.1006)	(0.1089)
HML	-0.8047***	-0.6611***	-0.3344	-0.3102	-0.2888*	-0.309**
	(0.1152)	(0.1079)	(0.1944)	(0.1564)	(0.1318)	(0.1200)
UMD		0.07097		0.1822		-0.1519
		(0.0967)		(0.0661)		(0.0777)
R-squared	0.7927	0.7943	0.7393	0.7592	0.0594	0.0834
No. of Observations	189	189	159	159	159	159

Table 4.11

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9), and hedge portfolios consisting of firms that have gone public during the prior 60 months and belong to the smallest size quintile. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G<=7) and taking a short position on an equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 1999. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-1999: Small IPOs, Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	-0.0141	0.0575	-0.0115	0.00934	-0.0057	0.0487
	(0.073)	(0.078)	(0.0117)	(0.0138)	(0.0114)	(0.1280)
MKT	1.080***	1.033***	1.547***	1.475***	-0.4385	-0.4158
	(0.1582)	(0.1564)	(0.2797)	(0.2329)	(0.2643)	(0.2472)
SMB	1.254***	1.111***	1.854***	1.647***	-0.601	-0.5357
	(0.1686)	(0.1961)	(0.4137)	(0.318)	(0.4241)	(0.3562)
HML	0.02365	-0.2376	0.4525	0.0699	-0.4132	-0.2926
	(0.3658)	(0.2379)	(0.6524)	(0.4504)	(0.467)	(0.4441)
UMD		-0.6008**		-0.8757		0.276
		(0.1819)		(0.488)		(0.3952)
R-squared	0.5742	0.6268	0.4144	0.4584	0.052	0.0591
No. of Observations	118	118	115	115	115	115

Table 4.12

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤7), dictator (G≥9) and hedge portfolios consisting of firms that have gone public during the prior 60 months and belong to the smallest size quintile. The hedge portfolio is constructed by taking a long position on an equal-weighted portfolio of democratic IPOs (G<=7) and taking a short position on an equal-weighted portfolio of dictator IPOs (G>=9) consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is January, 2000 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

2000-2005:Small IPOs, Equal weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	-0.2271*	-0.2354*	-0.4236***	-0.434	0.1965***	0.1986***
	(0.094)	(0.101)	(0.090)	(0.087)	(0.044	(0.038)
MKT	1.997***	1.451***	2.093***	1.407***	-0.0953	0.0439
	(0.1842)	(0.1756)	(0.2704)	(0.1859)	(0.1746)	(0.1933)
SMB	0.658**	1.164***	0.9127***	1.548***	-0.2547	-0.3835*
	(0.2112)	(0.1338)	(0.2247)	(0.2053)	(0.1285)	(0.146)
HML	0.2132	0.3455	0.3843	0.5504*	-0.1712	-0.2049
	(0.1991)	(0.2256)	(0.2744)	(0.2538)	(0.187)	(0.1763)
UMD		-0.8524***		-1.069***		0.2169
		(0.1436)		(0.1282)		(0.1173)
R-squared	0.6433	0.7973	0.5936	0.7904	0.0398	0.0957
No. of Observations	71	71	71	71	71	71

Table 4.13

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly value-weighted portfolio returns on the democratic (G≤7) and dictator (G≥9) IPO portfolios consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is April, 1990 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. *UMD* is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-2005: Value weighted Portfolio Returns

	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.2117***	0.1899***	0.1883***	0.1686***	0.0267	0.0246
	(0.038)	(0.030)	(0.040)	(0.041)	(0.034)	(0.037)
MKT	1.273***	1.333***	1.125***	1.18***	0.1452	0.151
	(0.094)	(0.097)	(0.1247)	(0.1134)	(0.0944)	(0.0969)
SMB	0.4714***	0.4454***	0.3328***	0.3092***	0.1376	0.1351
	(0.1285	(0.0985)	(0.078)	(0.0858)	(0.1312)	(0.1265)
HML	-0.7953***	-0.757***	-0.5077***	-0.473***	-0.2971**	-0.2934*
	(0.1138)	(0.1062)	(0.1572	(0.1410)	(0.1138	(0.1268)
UMD		0.181		0.1639		0.01745
		(0.0922)		(0.0884)		(0.0927)
R-squared	0.8243	0.8338	0.6292	0.6385	0.0984	0.0986
No. of Observations	188	188	188	188	188	188

Table 4.14

This table presents the Fama French (1992, 1993) and Carhart (1997) regression results for monthly equal-weighted portfolio returns on the democratic (G≤5) and dictator (G≥12) IPO portfolios consisting of firms that have gone public during the prior 60 months. The value of the governance index G is obtained from the dataset compiled by Gompers, Ishii, and Metrick (2003). The sample period is from April, 1990 to December, 2005. MKT is the realization of the market risk premium in period *t*, *SMB* is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period *t*, and *HML* is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period *t*. UMD is the momentum factor as in Carhart (1997).The factor returns are obtained from Kenneth French's web site. The Newey-West standard errors are in parentheses. ***,**,* denote significance at 10%, 5% and 1% levels respectively.

1990-2005: Equal weighted Portfolio Returns

	Democratic (G≤5)		Dictator (G≥12)		Democratic- Dictator	
Variable	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	0.1012**	0.1470***	0.0014	0.0449	0.1025	0.1047
	0.034	0.038	0.092	0.112	0.102	0.116
MKT	1.554***	1.427***	1.013***	0.8924***	0.5396*	0.5334
	0.1555	0.1188	0.229	0.2729	0.2288	0.2753
SMB	0.7171***	0.7717***	0.4651	0.517	0.2512	0.2539
	0.1284	0.0991	0.4084	0.4105	0.3358	0.3648
HML	-0.2874	-0.3679**	-0.2498	-0.3262	-0.04521	-0.04913
	0.1416	0.1253	0.3914	0.4227	0.3623	0.3824
UMD		-0.3801***		-0.3612		-0.0186
		0.1114		0.3263		0.2622
R-squared	0.7223	0.7561	0.1893	0.2074	0.0538	0.0539
No. of Observations	189	189	188	188	188	188

Table 4.15

	Regression with Year dummies					
	Democratic (G≤7)		Dictator (G≥9)		Democratic- Dictator	
	FF-3 factor	Carhart	FF-3 factor	Carhart	FF-3 factor	Carhart
α	.0328*	.0372**	-0.0075	-0.0065	.0516***	.0539***
	0.0132	0.0128	0.011	0.011	0.012	0.012
MKT	0.4179	0.3602	0.1567	0.1385	0.2645	0.2247
	0.2333	0.2472	0.2485	0.2677	0.1308	0.1467
SMB	.5764*	.6161*	.7099***	.7223***	-0.1339	-0.1067
	0.2639	0.2442	0.2011	0.2061	0.1284	0.1292
HML	.8669**	.8414*	.7281*	.72*	0.1422	0.1244
	0.3162	0.329	0.2828	0.2861	0.1591	0.169
UMD		-0.1805		-0.0563		-0.1235
		0.118		0.1293		0.1225
1991	0.0037	0.0014	.0854***	.0850***	-.0929***	-.0939***
	0.0166	0.0151	0.0173	0.0170	0.0177	0.0168
1992	-0.0148	-0.0183	0.0157	0.0149	-.04186**	-.0435**
	0.0245	0.0248	0.0159	0.0159	0.0154	0.0154
1993	-0.0295	-0.0302	0.0059	0.0061	-.0467***	-.0465***
	0.0198	0.0188	0.0169	0.0164	0.0134	0.0133
1994	-0.0226	-0.0266	0.0140	0.0131	-.0479***	-.0499***
	0.0149	0.0150	0.0125	0.0125	0.0123	0.0123
1995	0.0148	0.0140	.0471***	.0472***	-.0437**	-.0436**
	0.0161	0.0159	0.0128	0.0127	0.0136	0.0136
1996	0.0030	0.0003	.03874*	.03822*	-.0471***	-.0482***
	0.0187	0.0178	0.0161	0.0157	0.0128	0.0126
1997	-0.0210	-0.0226	0.02634	0.0262	-.0588***	-.0591***
	0.0187	0.0181	0.0147	0.0145	0.0129	0.0126
1998	0.0044	0.0045	.04257*	.04295*	-.0495***	-.0487***
	0.0180	0.0183	0.017	0.0171	0.0122	0.0121
1999	.0481*	.0478*	.0924***	.0926***	-.0555***	-.055***
	0.0200	0.0212	0.0248	0.0252	0.0136	0.0132
2000	-0.0517	-0.0532	-0.0097	-0.0098	-.0534**	-.0537**
	0.0560	0.0577	0.0434	0.0437	0.0182	0.0181
2001	-0.0462	-0.0522	-0.0226	-0.0242	-.0348*	-.0382**
	0.0275	0.0268	0.0248	0.0254	0.0137	0.0143
2002	-.0582*	-.0593*	-0.0320	-0.0321	-.0374**	-.0374**
	0.025	0.0235	0.0218	0.0214	0.0136	0.0131
2003	-0.0217	-0.0281	0.0235	0.0218	-.0565***	-.0601***
	0.0191	0.0181	0.0187	0.0180	0.0165	0.0163
2004	-0.0278	-0.0316	0.0096	0.0088	-.0488***	-.0507***
	0.0178	0.0170	0.0125	0.0122	0.0135	0.0133
2005	0.0113	0.0103	0.0163	0.0158	-0.0049	-0.0065
	0.0207	0.0201	0.0175	0.0179	0.0147	0.0182
R-squared	0.1129	0.1201	0.1665	0.1672	0.1323	0.1426
No. of Observations	180	180	180	180	180	180

APPENDICES

Appendix A

A. Long Run performance and choice of Asset Pricing Models

In a short-term study to look for abnormal returns, the risk adjustment is straightforward and typically unimportant. The error in calculating abnormal performance due to errors in adjusting for risk is likely to be small. However, in a long-term event-study, an appropriate adjustment for risk is critical in calculating abnormal return performance. Event studies are joint tests of market efficiency and an asset pricing model. Evidence of abnormal returns would reject efficient market hypotheses as well as the assumed asset pricing model. Even though it is still unresolved and contentious whether asset pricing models capture the risks or styles they claim, the first step towards measuring abnormal returns in performance studies begins with the choice of an asset pricing model.

Testable asset pricing models begin with the capital asset pricing model (CAPM) first introduced by Sharpe (1964). Derived under the assumptions of competitive markets, homogeneous expectations, and rational agents, the capital asset pricing model can compute the expected return for any asset if its beta, the extent to which the asset returns co-varies with the market, is known. The early testing of the capital asset pricing model supports the model. In the 1980's, the CAPM model of expected returns came under criticism as anomalous evidence was found. The Fama-French (1993) three factor model was presented as an improvement over the capital asset pricing model. The Fama-French three factor model was found to better addresses empirical phenomena like size and value effects.

Although the Fama and French (1993) model is more popular, it also is criticized. Jegadeesh and Titman (1993) show that returns to portfolios formed on past returns cannot be explained by the returns to stocks of differing size and book-to-market characteristics. This past return phenomenon, dubbed as momentum, is used by Carhart (1997) for studying the returns to mutual funds. Carhart (1997) modified the Fama and French (1993) model with the inclusion of a momentum factor.

The Fama and French (1993) and Carhart (1997) factors have been seen as lacking from a sound economic rationale motivating the inclusion of the size, book-to-market, and momentum factors. Whether these factors represent equilibrium compensation for risk or they are an indication of market inefficiency has not yet been resolved in the literature. One alternative to the Fama and French (1993) and Carhart (1997) multifactor models are conditional asset pricing models of both the consumption type and the market model type. Conditional asset pricing models have intuitive appeal and theoretical soundness. Conditional consumption models are well aligned with Breeden's (1979) theory which provides an intuitive appeal when considering what risks are pertinent to investors. However, the inability of conditional models to empirically outmatch the Fama and French (1993) and Carhart (1997) multi-factor models may have contributed to their relatively limited use.

The Fama and French (1993) and Carhart (1997) models used extensively in testing for long-term abnormal returns suffer from a few empirical deficiencies. Large returns to size, book-to-market, and momentum strategies all begin to disappear when studied out of sample. According to Kothari and Warner (2005), the purpose of an event study is to isolate the incremental impact of an event on asset price performance. Since the returns performance associated with the size, book-to-market, and momentum characteristics is applicable to all stocks sharing those characteristics, and not just the sample of firms experiencing the event, the performance associated with the event itself must be distinguished from that associated with other known determinants of performance. For example, the above mentioned four factors and the liquidity factor.

Appendix B

Industries and Standard Industrial Classification Codes Used in Analysis

The table below represents the Standard Industrial Classification Codes (SIC) for each of the ten industry groups used in Chapter 3 of this dissertation. The 4 digit SIC codes are obtained from COMPUSTAT. The industry groupings are based on Fama-French industry classification. We thank Kenneth French for making the industry classification data available on his website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html.

Table B.1: Industry categories and Standard Industrial Classification Codes

Industry	SIC Code	IND(j)
Consumer Non-Durables Food, Tobacco, Textiles, Apparel, Leather, Toys	0100-0999	1
	2000-2399	1
	2700-2749	1
	2770-2799	1
	3100-3199	1
	3940-3989	1
Consumer Durables Cars, TV's, Furniture, Household Appliances	2500-2519	2
	2590-2599	2
	3630-3659	2
	3710-3711	2
	3714-3714	2
	3716-3716	2
	3750-3751	2
	3792-3792	2
	3900-3939	2
	3990-3999	2
Manufacturing Machinery, Trucks, Planes, Chemicals, Office Furniture, Paper, Commercial Printing	2520-2589	3
	2600-2699	3
	2750-2769	3
	2800-2829	3
	2840-2899	3
	3000-3099	3
	3200-3569	3
	3580-3629	3

	3700-3709	3
	3712-3713	3
	3715-3715	3
	3717-3749	3
	3752-3791	3
	3793-3799	3
	3830-3839	3
	3860-3899	3
Energy Oil, Gas, and Coal Extraction and Products	1200-1399	4
	2900-2999	4
HiTech & Business Equipment Computers, Software, and Electronic Equipment	3570-3579	5
	3622-3622	5
	3660-3692	5
	3694-3699	5
	3810-3839	5
	7370-7372	5
	7373-7373	5
	7374-7374	5
	7375-7375	5
	7376-7376	5
	7377-7377	5
	7378-7378	5
	7379-7379	5
	7391-7391	5
	8730-8734	5
Telecommunications Telephone and Television Transmission	4800-4899	6
Shops Wholesale, Retail, and Some Services (Laundries, Repair Shops)	5000-5999	7
	7200-7299	7
	7600-7699	7
Health Healthcare, Medical Equipment, and Drugs	2830-2839	8
	3693-3693	8

	3840-3859 8000-8099	8 8
Utilities	4900-4949	9
Others Mines, Construction, Transport, Hotels, Business Services, Entertainment, Finance	Everything Else	10

What the caterpillar calls the end of the world, the master calls a butterfly.

-RICHARD BACH (*Illusions*, 1977.)