Performance and Efficiency Dynamics of Initial Public Offerings in Pakistan Sector-wise Analysis

By

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DOCTOR OF PHILOSOPHY IN MANAGEMENT SCIENCES (FINANCE)

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Dedicated

To

MY LATE MOTHER & FATHER

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ARs	Abnormal Returns.
BHARs	Buy-and-Hold Abnormal Returns.
CAPM	Capital Asset Pricing Model.
CARs	Cumulative Abnormal Returns.
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
GCT	Generalized Calendar Time Portfolio Approach
HML	High Minus Low
HNWIs	High Net Worth Investors
3-FF	Fama French Three Factor Model
4-F	Carhart Four Factor Model
IPO	Initial Public Offerings
KSE	Karachi Stock Exchange
MPI	Malmquist Productivity Index
MAAR	Market Adjusted Abnormal Returns
MAM	Market Adjusted Model.
SECP	Securities and Exchange Commission of Pakistan.
SMB	Small Minus Big
SOEs	Stated Owned Enterprises
SPSS	Statistical Package for the Social Sciences
E-views	Econometric Views
VRS	Variable Returns to Scale

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Performance and Efficiency Dynamics of Initial Public Offerings in Pakistan: Sector-wise Analysis

ABSTRACT

In this study performance and efficiency of IPO firms listed on Karachi Stock Exchange from 2000 to 2012 is analyzed. The main objectives include; to provide insights of the underpricing (first trading day) of IPOs, to find out the determinants of underpricing in the light of asymmetric information and signaling theories, to provide insights of the long run IPO performance, analysis and comparison of the efficiency of IPOs and especially comparison on sectoral basis in the pre and post period of IPOs.

The results indicate that the level of underpricing is also observed in KSE. In this study initially 83 IPO firms are analyzed for underpricing analysis covering the period of 13 years from year 2000 to 2012. For long run performance, the sample is reduced to 61 IPOs to cover the period of three years after the listing. The level of underpricing with regard to marked adjusted model is found to be 28.28% for the full sample of 83 IPOs, showing that investors can make a market adjusted profit of 28.28% while investing in the new issues of the firms. The profit opportunity for the day traders is also observed. The year-wise analysis of underpricing shows that the overall amount of level of underpricing decreased over the years, however, year 2007 has shown highest level of underpricing. Further, the level of underpricing is observed in all the sectors except equity investment instruments, technology hardware and equipment and personal goods.

The risk adjusted performance is also measured with the help of four models by using matched firms. The selection of matched firms as true proxy of IPO firms is validated by tracking error and t statistics. The level of underpricing is observed to be 39% or greater on the basis of the entire five models for reduced sample. All the five models on average gave some consistent and significant results. The amount of level of underpricing increases accounting for taking more risk factors size, value and momentum. Further, the results indicate that the choice of model does not matter while measuring the risk adjusted returns of IPO firms on first trading day.

The determinants for level of underpricing are observed in the KSE in the light of asymmetric and signaling theories. The regression analysis is made to explain these determinants of level of underpricing with the help of Ex-Anti, Market Capitalization, Incidence of secondary market issues, Market Volatility, Offer Size, the proportion of shares offered to general public, Over / Under Subscription and Price Earnings ratio variables. These results validate the prior theories.

The long run performance of IPOs is measured by using CARs, BHARs, and Jensen's alpha through CAPM, 3-FF and 4-F models for different time horizons after the period of three years of going public. Considering the volatile nature of the KSE, performance is measured on weekly and fortnightly basis in addition to monthly basis. The results suggest that IPOs do not sustain their initial level of underpricing and provide investors with negative abnormal returns over a long period of one to three years after listing. The investors earn market adjusted negative returns as well as risk adjusted negative returns accounting for market, size, value and

momentum factors. The results also validate the misspecification of model in KSE.

The amount of level of underperformance is increased in BHARs model as compared with the CARs model. In all the regression models with regard to CAPM, 3-FF and 4-F, Jensen's alpha is observed to be negative but insignificant under monthly, fortnightly and weekly basis analysis. In the analysis of GCT regression model, the Jensen's alpha is found to negative and significant under the three level of maturity of firms showing the significant underperformance of IPOs. In all the three cases of maturity levels, the risk adjusted performance marginally found to be higher from 1st to 2nd level and then 2nd to 3rd level of maturity by -1.339%, -1.154% and -1.121% respectively after the period of three years.

To measure the efficiency of IPOs in pre and post IPO window MPI under DEA is used in three stages according to Zhoo (2001) methodology. In first stage (profitability), the number of employees, total assets and equity of sample IPOs used as input variables while total revenue and profit after taxes used as output variables. In second stage (marketability), total revenue and profit after taxes of sample IPOs used as input variables while earning per share, return to investors and market value of IPO firms used as output variables. In third stage (overall), the input of 1st stage and output of 2nd stage variables are used. The overall efficiency scores of IPO firms remain dismal as the percentage of optimum level of IPO firms remain between 5% and 20% in all the three stages in pre and post IPO. In the analysis of broader categories of sectors; private, SOEs, manufacturing, financial, other services sectors, the results of DEA model of three stages suggest that neither of the sector is CRS efficient nor VRS efficient in pre and post IPO. Even the efficiency scores are decreased in post IPO after one year. However, SOEs showed some better efficiency than private IPO firms. The overall results of declining trend in total productivity growth of IPOs after three years' period in KSE are observed. and it was accordance with the Alanzai (2010) and Gao and Li (2013) studies. The overall results suggest that, after acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after three years of IPOs.

CHAPTER 1

INTRODUCTION

Initially, all firms tend to use private placement to raise funds. As they progress the standard practice is to go public and issue securities to meet their funding requirements. The initial public offerings (IPOs) means issuing of securities first time to the general public. These securities include; debt, common stocks or preference stocks. After issuing of common stocks the private company becomes the public limited company. Normally new, younger and less matured firms issue stocks to general public.

The firms going public, issue securities to raise capital for expansion of business operations and to promote the value of the firm. Usually the stocks of many IPO firms do not perform well after few days of the offering to public. Many explanations for the obvious IPO underperformance were reported in the earlier studies. Ritter (1991) envisaged underperformance of IPOs on long-run basis. On the other hand, underpricing of IPO seems to be a common characteristic of IPOs prevailing in all over the world and it results in the initial excess return on the IPO investment. Investors of IPOs can earn huge returns if they manage to sell at first day of trading of the IPOs. This high return of the IPOs on the first trading day is called underpricing. The underpricing means pricing of an IPO less than its market value on close of first trading day. In other words, this is the huge return to investors that motivate them to subscribe for IPO firms. A number of studies on IPOs have identified the under-pricing, the long-run underperformance, under-writer role, risk and most recently corporate governance to be the main issues empirically analyzed in the field of IPOs. First, history of Karachi Stock Exchange (KSE) is discussed with reference to listing of new firms.

1.1 History of IPOs in KSE

Karachi Stock Exchange (KSE), Pakistan is largest as well as the most liquid market of Pakistan. The KSE was established on September 11, 1947 and was incorporated as

company limited by Guarantee. Its incorporation date is March 10, 1949, just six months after the independence. It starts working by five firms with a paid-up capital of Pak Rupee (PKR) 37 million. Initially, the trading system was by open-out-cry method. Before 1991, KSE-50 index was used, later on KSE-100 index was introduced on November 01, 1991. Since its incorporation, over 65 years of age, the KSE has enabled by helping a wide range of participants, from individual to institutional investors, the trading community and the listed companies. Especially KSE involved helping the large or new and innovative firms to raise the funds from general public. It remains always the pioneer of the developments of capital market of Pakistan.

The demutualization process of KSE was completed in August 2012. After demutualization, it is now a public company limited by shares. The market capitalization of KSE rises to US$ 2.0701(Jun 30, 2013). KSE has now six indices; KSE-100, KSE-30, KSE All Share Index, KMI-30, Oil & Gas sector Index & Banking sector Index.

KSE is the most volatile market in the world (Ahmad, 2000), however, in the decade 2000-2009 and subsequent years, it has shown tremendous performance except 2008, as, KSE was dropped from emerging market index in 2008 due to liquidity crunch. After some slump (2010-2011) the KSE-100 index crossed the barrier of 29,000 points (April 20, 2014) which is almost three times just in the period less than three years (KSE-100 index was 10260 in October 08, 2010). In year 2012-13, 52% increase in the KSE index is observed. Due to this performance KSE remains at top in all emerging Asian countries during the year 2012-13. At present the stock market is considered a viable investment opportunity for individual and institutional investors.

About IPO it is said that IPOs have to be bought and it is not to be sold when subscription start. Pakistan observed stimulating expansion of IPOs market in the 1990s. The table 1.1 represents the listing of new companies both private as well as SOEs from year 1992 to year 2012. The record related to issuing of IPOs in Pakistan showed that from 2000 to 2012 (during the study period) 94 IPOs were listed at KSE and year 2004 and 2005 were the best years in terms of number of IPOs. However, year 1992 was the best year in

overall history of IPOs at KSE followed by year 1994. On the other hand, year 1999 showed the very dismal performance with the alarming position that no IPO in that year. This may be military takeover in 1999. Similar position is also observed in year 1998, where only one IPO listed at KSE. Further, the IPO activity is also disappointing as compared with registered companies at SECP where thousands of companies registered in SECP during the sample period, specially 3385 in 2010-11, 3925 in 2011-12, 3960 in 2012-13 and 4587 in 2013-14.

Table 1.1: Listing of IPOs 1992-2012

Year	Number of IPOs	Year	Number of IPOs	Year	Number of IPOs
1992	86	1999	0	2006	4
1993	38	2000	3	2007	11
1994	73	2001	3	2008	9
1995	41	2002	4	2009	4
1996	30	2003	6	2010	6
1997	4	2004	17	2011	4
1998	1	2005	19	2012	4

Source: KSE and SECP

1.2 Procedure to go public in KSE

In IPOs, general public is involved by owning the share i.e. transferred from the hands of private firms to the investors of IPOs through subscription by purchasing the shares from primary market. There are regulatory institutions in every country that regulate and monitor the process of IPOs. In Pakistan, Security Exchange Commission of Pakistan (SECP) is the regulatory institution.

All the IPO firms are required to adhere the regulations of SECP and KSE who decided to go public ever first time since their inception of the business. In Pakistan, an IPO firm can issue shares for subscription to general public by fixed price method or by book building method (under regulation of April 2008). The three main regulations; listing regulation, Companies Ordinance, 1984 and Issue of Capital Rules, 1996 are strictly followed for listing of new IPO firm in the KSE. In the listing process, the firm who

decided to go public also involved in due diligence, selection of underwriters, valuation and pricing of an IPO by underwriter and marketing placement. The following are the main aspects / regulations for listing at KSE that should be followed by an IPO firm.

1. An IPO firm required at least Rs. 200 million of paid-up capital for listing. It means that to become a public limited company, the firm should have at least Rs. 200 million of paid-up capital after an IPO.
2. Five hundred subscribers of the new issues are required for the successful of IPO (for equity). An IPO firm is allowed up to 5 percent to its employees while 25 percent to the overseas Pakistanis.
3. If an IPO firm has paid-up capital of Rs. 500 million, then 25 percent of capital is offered to general public for subscription.
4. If an IPO firm has paid-up capital of Rs. 500 million or more, then 12.5 percent of capital or Rs. 1250 million whichever is higher offered to general public for subscription.
5. An IPO firm should has to adhere the minimum fresh public offering through prospectus under Provisions of Listing Regulation 6, while it should also has to adhere the Companies (Issue of Capital) Rule, 1996 for the minimum public offering requirements by way of Offers For Sale.
6. If IPOs issued through book building process, the prospectus should contain all the disclosures and information to follow the Companies Ordinance 1984 together with disclosure of the strike price and results of the Book Building process.
7. The maximum thirty and minimum seven days are required to publish prospectus before subscription date, in widely circulated Urdu and English newspaper (Islamabad, Karachi and Lahore edition) and or as the Exchange may in addition.
8. The Applications for shares are invited through bankers whose names shall be contained in the prospectus.
9. The offerers or directors are not allowed to participate in process of subscription.
10. After the ten days of subscription, the company is required to disclose the list of successful applicants.

11. An IPO firm has to seek clearance of its documents from KSE before getting approval from SECP.
12. An IPO firm is required to satisfy the relevant requirement of the KSE and SECP under the Listing Regulations and the disclosures as required under the Second Schedule of the Companies (Issue of Capital) Rules, 1996 and Companies Ordinance 1984.
13. In case of Book Building, an IPO firm is required to comply the instruction contained in Appendix-4 of this regulation. These instructions are related to the Listing Regulations of the Exchange under Book Building process.
14. In case of the allocation of shares to the Sponsors (in excess of 25%) and under the Pre IPO placement (including employees of the companies), these shares not saleable up to six months after the date of subscription of an IPO.
15. In case where the shares of the company are issued /offered through book building, it shall comply with the requirements as set out in Appendix 4 of these Regulations.
16. Karachi Stock Exchange usually take two to three weeks for clearance of the offering documents if an IPO firm has submitted the application of listing at KSE completed in every respect.
17. After getting approval from SECP, an IPO firm is allocated dates for public subscription / publication of offering document under the relevant Laws of SECP.
18. After the close of subscription from general public, an IPO firm is formally listed at KSE within 30 days.
19. Fee applicable for listing is mentioned in the websites of KSE and SECP. The detailed procedure can be sought from the websites of KSE and SECP.

1.3 Reasons for IPO

A firm can raise funds by different sources like private equity placement, equity capital, bonds, debentures, preference equity and loans. The table 1.2 portrays that firms raise funds through initial public offerings is the main source of funding in the world. From year 2001 to 2013, 15,216 new IPO firms raised the capital of $ 2,123 billion. Globally, in year 2012, 837 IPO firms raised $128.6 billion whereas in year 2013, 864 IPO firms

raised $163 billion showing increase of 3% from year 2012 to 2013. The year 2007 remains at top with 1,967 new IPO firms to raise the equity capital of $ 338 billion. In year 2013 US was the best performer to raise 37% of capital through IPO (US raised $59.6 billion). On the other hand, Asia shows best performance with respect to number of IPOs with China at top as 347 IPOs in 2013. Similarly, in Hong Kong 68 IPOs, in Japan 60 IPOs, In India 3 IPOs while in Pakistan 4 IPOs come in year 2013. Overall Pakistan shows 0.62% of total IPOs from year 2001 to 2013 across the globe.

Table 1.2: IPOs by number & funds raised (world-wide)

Year	Number of IPOs	Amount Raised (in $ billion)	Year	Number of IPOs	Amount Raised (in $ billion)
2001	964	94	2008	756	101
2002	941	70	2009	566	120
2003	864	59	2010	1367	285
2004	1453	139	2011	1241	170
2005	1618	181	2012	837	129
2006	1778	274	2013	864	163
2007	1967	338	**Total**	**15216**	**2123**

Source: EY Global IPO Trends

There are numerous theories that explain the choice of sources of financing and cost associated with the financing type. Myers (1984) incorporated information asymmetry theory between managers and investors and recommended the firms to go public for equity financing as a last resort. He developed new theory the Pecking order theory, and recommended IPOs after debt. Burton et al. (2006) validated the recommendation of Zingales (1995) that the new IPO firms enjoyed the benefits of initial public offerings by raising additional financing, access to capital markets, diversification opportunities and more prominently the liquidity of shares and market valuation of firm.

The agency theory of Jensen and Meckling (197l) suggest a separation of shareholders and management. On the other hand, the firm value is differed due to 100 percent owner-managed and when it is not. In this theory management seems to be cause of underpricing. Management creates higher demand of IPOs by underpricing in order to

sell their shares afterward. Baker and Wurgler (2002) suggested that when the M/B ratio (market to book) of a firm is high, firms should go public to raise additional financing through equity to reduce their gearing levels. Marchisico and Ravasi (2004) discussed social and networking issues and concluded that the firms become more social and their networking increases that ultimate create reputation of the new IPO firm. In the same way, Goergen et al., (2006) demonstrated that when a firm decides to go public it shows quality of firm, because new IPO firm has been passed through various checks before listing like credit screening, meeting with sponsors, adherences of listing regulations of regulating authorities.

On the basis of questionnaires, Brau and Fawcett (2006) concluded that the main motive of IPOs is to raise funds to take the advantage of growth opportunities and crate value of firms through acquisitions. Bancel and Mittoo (2009) also validated the conclusion of Brau and Fawcett (2006) as one of the motive is acquisitions, mergers and forming joint ventures. Therefore, going public not only help a firm to raise large funds instead of private placement on lesser cost compared with venture capitalist and insiders get liquid and get rid of lockup position. Besides this many stake holders involved in initial public offerings process that help a country to create economic activity. These stake holders are investors (local and foreigner), fund managers, brokers, investment banker/advisors, underwriters, legal professional, accounting / financial professional, media professionals, other corporate bodies, govt., regulators, executive management, and independent auditors.

1.4 IPO Issues in Pakistan

Pakistani IPOs market is not explored to research different issues. There are still many issues regarding IPOs in KSE, as there is a very little work have been done in context of Pakistani IPOs. At the end of September 2012, going through internet databases, very few studies regarding IPOs literature with reference to Pakistan are to be found. There are only less number of researches that measured the performance of IPOs; (Sohail & Nasr, 2007; Rizwan & Khan, 2008; Sohail & Raheman, 2009; Sohail & Raheman, 2010 and

Kiyani & Amjed, 2011). So it provides a strong motivation for examination of the performance of IPOs under different aspects.

In the global context, the main US and UK's IPO markets have been most widely researched, which over the past 50 years have led to the development of popular theories like agency theory, information asymmetry, signaling, underwriter reputation, litigation avoidance and cascades to explain the IPO's phenomenon. However, the issues of under-pricing and long-run underperformance have been researched most extensively and were remained the main interest of researchers. Loughran et al., (1994), studied the issue of under-pricing of IPOs amongst 25 countries, and reported it to be a universal phenomenon. Anton et al (2011), have reported under-pricing in Germany, Australia, Switzerland, Finland, Japan, Malaysia, Mexico, Thailand, Sri Lanka, Turkey and Greece etc. However, the magnitude of under-pricing varies from county to country. The mean under-pricing in USA was 14.8% from 1990 to 1998, 51.4% from 1999 to 2000 and declined to 12.1% from 2001 to 2009. In the UK it was found to be 16.9% over the period 1959-2009. On the other hand China showed severe under-pricing of 137% from 1990 to 2010.

Moshirian et al. (2010), in their analysis of Asian countries shown that under-pricing vary between the newly emerging Asian market economies compared to the well developed Asian countries. It was reported to be 202.63% to China, 70.30% for Korea and 61.81% for Malaysia compared to 21.43% to Hong Kong, 34.04% for Japan and 33.10% for Singapore. Significant under-pricing is also observed in South Asian countries as shown by Peter (2007) for Sri Lanka, Hasan and Quayes (2008) for Bangladesh, Shah (1995) for India and Sohail & Nasr (2007) for Pakistan.

The analysis of the long-run performance of IPOs showed strong under-performance, as reported by Hoechle & Schmid (2008), Jain & Kini (1994), Shah (1995) and Ritter (1991) etc. Earlier studies have been criticized by other researcher on the grounds that the Market Adjusted Model and Capital Asset Pricing Model used in these studies considering only the single factor (beta risk) while other multifactor models were

ignored. The misspecification of models is also highlighted in the recent research. Chen et al. (2002) observed that Fama French 3-factor model is more appropriate to measure the long-run performance of IPOs by arguing that the model's return patterns are alike as of ordinary asset's return.

On the other hand, DEA approach is widely used to measure the performance in banking, health care and mutual funds sectors, while, in case of IPOs, very few studies measure the efficiency using DEA approach like Alanazi (2010) and Luo & Yao (2009). But in case of Pakistan the issues of IPOs have not been researched extensively to give any conclusive evidence and particularly no one has yet explored this issue by using DEA approach.

The performance of SOEs (State owned enterprises) also remains the main focused area of researchers when shifted to private entities or when going to public. Privatization means to improve the efficiency and profitability of SOEs (which are not performing) by shifting the resources of SOEs to private sector. In Pakistan, the privatization of SOEs started in 1990's and became an important instrument of economic policy. From 1990's to mid of 2000's various SOEs were shifted to private sector which includes banks, telecommunication, cement, textile, fertilizers and energy sectors. Megginson and Netter (2001) have reviewed the literature about SOEs and privatization and concluded the main goals were to reduce budget deficits, to develop financial markets and to increase efficiency.

Luo & Yao (2009) analyzed pre-post IPOs performance of banking sector and observed 10% efficiency of Chinese's banks after IPOs period. They further reported that the previously inefficient state owned banks reduced the gap of efficiency with the joint stock commercial banks of China. In contrast to Lou & Yao (2009) study, Alanazi (2010) reported significant decline of IPOs after listing.

1.5 Research Questions of Study

Further considering the volatile nature of the KSE, particularly during 2000-2011, the objective of the present study is to analyze the efficiency and performance of IPOs in Pakistan on a wider scale, using different approaches to answer the following questions:

1. Do Pakistani IPOs underpriced / overpriced?
2. What are the determinants of underpricing for the sample IPO firms?
3. How underpricing can be predicted in the light of asymmetric information and signaling theories?
4. What is the performance of Pakistani IPOs in the long run?
5. What is the performance of matured and less matured IPOs in the long run?
6. Whether the efficiency of Pakistani IPOs improved between pre and post IPO period especially SOEs as compared with private firms?
7. Whether sector-wise efficiency of IPOs improved during pre and post IPO period?
8. Whether the efficiency analysis and long run performance analysis of IPOs provide similar results?

To address these research questions, the study is proceeded as follows: first, the underpricing of IPOs is measured by using different models: Market Model, Market Adjusted Model, CAPM and 3-factor Fama French Model, this is followed by an analysis of the determinants of IPOs under-pricing covering different sectors listed in KSE. Secondly DEA approach is applied to measure the efficiency on sector-wise Pre and Post IPO's windows. Thirdly, a comparative analysis is carried on the long-run performance of IPOs by applying DEA approach and CARs (cumulative abnormal returns), BHARs (buy and hold abnormal returns) models. Lastly, the GCT regression model, the most recent approach introduced by Hoechle & Schmid (2008) is also applied to measure the performance of matured and less matured IPO firms covering the period of three years after the IPOs.

1.6 Objectives of Study

The main objectives of this research are:

- To investigate the existence of the underpricing (first trading day) of Pakistani IPOs.
- To find out the determinants of underpricing for Pakistani IPOs in the light of asymmetric information and signaling theories.
- To provide insights of the long run performance.
- To provide analysis and comparison of the efficiency of IPOs and especially SOEs in the pre and post period and also to perform this analysis on sectoral basis.
- To compare the results of efficiency analysis with long run performance analysis
- To compare the results of matured and less matured IPO firms in the long run.

1.7 Significance of the study

It is expected that the present study is beneficial in a number of ways. First, this study has a wider horizon than the earlier studies in Pakistan. This study uses different models to capture the effect of risk adjusted performance (level of underpricing) as the research of this type has not been undertaken previously, specially, first time, matched firms is used by applying asset pricing models to capture the risk adjusted performance (level of underpricing) of IPOs**.** So the present study produces first time risk adjusted returns (level of underpricing) to best of our knowledge as in earlier studies only market adjusted returns are used for underpricing.

Second, the sector-wise efficiency of these IPOs by using DEA approach in pre and post window of IPOs is analyzed. Although the technique is widely used to measure the efficiency of firms under different aspects, but in case of IPOs there are very few studies (three studies, to the best of our knowledge) that has taken this aspect. In these three studies, efficiency of IPO firms is measured after public offerings only. So, the current study is the first one that contributes and find that whether the public listing help in to increase efficiency level of the new firms. Further it adds the contribution to observe the efficiency on sectoral basis especially SOEs. This is also a new piece of work as earlier this type of study has not been done.

Third, this study is contributing additional evidence of after-market performance of IPOs for long horizons periods, especially to address the issue of measurement problems. The different models like market adjusted cumulative returns model, market adjusted buy-holding returns model, market model, capital asset pricing model, Fama French three factor Model and Corhart four factor model, that is helping to study the sensitivity of the models employed. So the study is not only contributing to the increasing body of evidence on the after-market performance of IPOs for long horizons periods in KSE but also help investors to decide whether to retain the shares for longer period after buying them from primary market. Fourth, a comparative analysis is carried out, to find, whether DEA approach provide similar results in long-run efficiency analysis of IPOs as other models like BHARs, CARs and asset pricing models. This comparative analyses are a significant contribution to the existing finance literature as such comparison has not been done earlier.

Fifth, regression analysis is conducted to capture the effect of underpricing and to find the influence of different variables in the light of previous theories. The relationship of underpricing with number of explanatory variables (Ex-Ante, Market Capitalization, Incidence Secondary Issues, Market Volatility, Offer Size, Proportion of Shares Offered to General Public, Oversubscription and P/E ratio) using multiple regression models is addressed. So this research is taking account of this feature to help to predict the underpricing under the umbrella of Asymmetric information and signaling theories. In this research is also investigating that which sector is less / high underpriced.

Lastly, The GCT regression model, the most recent approach introduced by Hoechle & Schmid (2008) is applied to measure the long run performance of matured and less matured IPO firms after the period of three years which is further check the robustness of results of underperformance after the period of three years.

In addition, the earlier studies examined this issue for the developed and developing countries but the county like Pakistan is not taken into account, so this research is devoted to analyze different aspects regarding Pakistani IPO's market. As an IPO market

is considered to be one of the best investment avenues due to higher first day reward to investors. So this study contributes by giving the relevant information to investors for an IPO evaluation in Pakistani Capital Market.

It is expected that this research is a contribution in finance literature. It is a new piece of work in Pakistan as such type of study has not already been presented. Specifically, measurement of level of underpricing by capital asset pricing models, sector-wise analysis by DEA and the GCT regression model approach to analyze the under / over performance of IPOs in the long run has not been performed in earlier studies.

1.8 Chapters Organization

This study contains five chapters. The first chapter is about introduction, in which the overview of IPOs, history of KSE and IPOs in Pakistan, the decision to go public, short literature of IPOs to arrive at research questions and objective of the study and finally significance and contribution of the study is discussed. The second chapter is about the literature review, in which after discussing the main issues of IPOs, the literature review is divided into four parts. 1. Overview of level of underpricing across different countries; developed countries, south Asian countries and in Pakistan. 2. The level of underpricing and its determinants under various theories. 3. The long run performance and comparisons of different models and 4. The efficiency of IPOs in pre and post event window of IPOs.

The third chapter is about the methodology and frame work of the study, in which data set and sample, the models to capture the effect of underpricing, long run performance and efficiency measure, variables and testing of hypothesis is discussed. The chapter 4 is divided into three sections, in which results are discussed in detail. In these three sections the descriptive statistics, results of models, graphical presentation of data and interpretation of the results with findings of the study are discussed. The last chapter is about the conclusion of the study. After conclusion, the limitation of the study, recommendations for future research and policy implication is discussed. The thesis ends with the appendix tables and references.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

The IPOs have been analyzed mainly with reference to underpricing, the long-run underperformance, under-writer's role, risk and most recently corporate governance issues. In addition, some studies are related with theories for going public, motivation and behavior aspects. Earlier studies reflect these issues in detail. In this section the literature is reviewed with respect to underpricing of IPOs; determinants of underpricing, the long-run underperformance of IPOs and the efficiency of IPOs.

The phenomenon of underpricing has been extensively studied by different researchers in different time horizons like Ibbotson (1975), Ritter (1984 and 1991) and (1984) etc. Ritter (1984) studied 1028 firms that went public during 1977 - 1982 in US. He found that after issuance the price of IPOs rose by around 14% at the end of first trading day. He also found that the mean return on IPOs that were purchased from primary market and put up for sale at in the first trading day was 48.4%. He investigated the degree of underpricing has positive relationship with the level of uncertainty. Peter (2007) investigated that underpricing in an emerging market (Sri Lanka) is considerably higher as compared to developed countries. In Bangladesh Hasan and Quayes (2008), by using a sample of 90 IPOs and analyzed the issues of underpricing.

In Egyptian IPOs, Omran (2005) by taking the sample of 53 firms showed the underpricing, and found some controversial results in the long-run performance of IPOs. In his determinants of IPO's underpricing model, ex-ante uncertainty and over-subscription variables were the only statically significant variables for longer-run performance of IPOs (after one year), the ARs were also determined by P/E ratio and ex-ante uncertainty variables. The underpricing issue in Pakistani IPO's market, first time

analyzed by Sohail & Nasr (2007) and they showed underpricing of 35.66%. They also found the effect of different variables that influenced the underpricing.

There is very little work with regards to measuring the efficiency of IPO firms. Especially in Pre IPO, the literature is modest; due to the non-availability of data of IPO firms before going public or IPO firm is the newer one. Gao and Lee (2013), selected 51 SOEs in China and presented efficiency analysis of these SOEs after going public in 2010. They found that efficiency is not increased in these IPOs after going public. Contrary to the finding of Gao and Lee (2013), other researchers Shenq and Chen (2012), showed that the technical efficiency of 21 banks increased to 6.22%, while the improvement in technological changes went to 16.07% from year to 2006 to 2011.

In this chapter literatures regarding IPO are reviewed in detail. First an extensive review of IPOs and level of underpricing is reviewed. Secondly, it discusses to find additional aspects of IPO underpricing and its determinants. The relation of underpricing with its various determinants is reviewed. The third part discusses the long run performance and comparisons of different models while the last part is about the efficiency of IPOs. In all these four issues, first literature of developed markets like US, UK, Europe, Australia, Canada and Japan is reviewed, after that the literature of IPOs in Asian countries, developing counties, emerging markets and south Asian countries is reviewed. Therefore, the literature review has been broadly classified as follows:

a. Overview of level of underpricing across different countries; developed countries, south Asian countries and in Pakistan.
b. The level of underpricing and its determinants under various theories.
c. The long run performance and comparisons of different models
d. The Efficiency of IPOs in pre and post IPOs window.

Thus, these four different aspects of IPO literature will help the academia, investors and researchers to start the journey of IPO and conclude with fruitful results in the form of efficiency. Therefore, the literature review is divided into four parts, in the first part

amount of underpricing across different countries is discussed. The second part of the literature is about the determinants of IPO underpricing. The third part discusses the long run performance and comparisons of different models while the last part is about the efficiency of IPOs.

2.2. IPO underpricing.

The amount of level of underpricing is diverges in different countries. A comprehensive literature is reviewed across different countries to compare the amount of underpricing and is summarized in the following table 2.1. The table summarizes the amount of underpricing in different markets over different time period with covering the sample size, as well. The overall results suggest that the level of underpricing is changed in different time horizons as well as in different countries that were led to anomalies in the field of IPOs. Therefore different researchers across the globe intended to solve these anomalies.

Table 2.1: Level of underpricing across the globe

Country	Researchers	Sample size	Time period	1st day return	Country	Researchers	Sample size	Time period	1st day return
Argentina	Eijgenhuijsen & van der Valk	20	1991-1994	4.40%	Japan	Fukuda; Dawson and Hiraki	975	1970 - 1996	24.00%
Australia	Lee, Taylor and Walter	381	1976 - 1995	12.10%	Japan	Hebner & Hiraki	2579	1970-2007	40.50%
Australia	Woo	1,103	1976-2006	19.80%	Japan	Pettway & Kaneko	3,136	1970-2011	40.20%
Australia	Pham	1,562	1976-2011	21.80%	Jordan	Al-Ali and Braik	53	1999-2008	149.00%
Austria	Aussenegg	76	1984 - 1999	6.50%	Korea	Jhatt, Kim and Lim	347	1980 -1990	78.10%
Austria	Aussenegg	96	1971-2006	6.50%	Korea	Ihm	1417	1980-2007	57.40%
Austria	Aussenegg	102	1971-2010	6.30%	Korea	Choi & Heo	1,593	1980-2010	61.60%
Bangladesh	Islam M. S	95	1994 - 1999	116.01%	Malaysia	Isa and Yong	401	1980 – 1998	104.10%
Bangladesh	Hoque and Musa	113	1994 - 2001	285.21%	Malaysia	Mellisa yeap	323	2000 - 2005	46.44%
Belgium	Rogiers, Manigard and Ooghe	28	1984 - 1990	10.10%	Malaysia	Isa; Isa & Yong; Yong	350	1980-2006	69.60%
Belgium	Manigart; DuMortier	114	1984-2006	13.50%	Malaysia	Yong; Ma	413	1980-2009	62.60%
Brazil	Aggarwal, Leal and Hernandex	62	1979 - 1990	78.50%	Mauritius	Bundoo	40	1989-2005	15.20%
Brazil	Saito	180	1979-2006	48.70%	Mexico	Aggarwal, Leal and Hernandex	37	1987 - 1990	33.00%
Brazil	Ushisima	275	1979-2011	33.10%	Mexico	Eijgenhuijsen & van der Valk	88	1987-1994	15.90%
Bulgaria	Nikolov	9	2004-2007	36.50%	Netherlands	Wessels; Jenkinson	143	1982 - 1999	10.20%
Canada	Job and Riding	258	1971 - 1992	5.40%	Netherlands	Jenkinson, Ljungqvist & Wilhelm	181	1982-2006	10.20%
Canada	Srivastava	635	1971-2006	7.10%	New Zealand	Vos and Cheung; Camp	201	1979 - 1999	23.00%
Canada	Kryzanowski, Lazrak & Rakita	696	1971-2010	6.70%	New Zealand	Munro; Ritter	214	1979-2006	20.30%
Chile	Maturana	55	1982 - 1997	8.80%	Nigeria	Ikoku	63	1989 - 1993	19.10%

Chile	Aggarwal, Leal & Hernandez	65	1982-2006	8.40%	Nigeria	Achua	114	1989-2006	12.70%
China	Datar and Mao	226	1990 - 1996	388.00%	Norway	Emilsen, Paderson and Saettern	68	1984 - 1996	12.50%
China	Chan et al	701	1992-1997	145.00%	Norway	Liden	153	1984-2006	9.60%
China	Chen, Choi,and Jiang	1,394	1990-2005	164.50%	Philippines	Sullivan and Unite	104	1987 - 1997	22.70%
China	Jia & Zhang	2,102	1990-2010	137.40%	Philippines	Sullivan & Unite	123	1987-2006	21.20%
Cyprus	Gounopoulos, Nounis, and Stylianides	73	1997-2011	20.30%	Poland	Aussenegg	149	1991 -1998	35.60%
Denmark	Jakobsen and Sorenson	117	1984 - 1998	6.40%	Poland	Jelic & Briston	224	1991-2006	22.90%
Denmark	Jakobsen & Sorensen	145	1984-2006	8.10%	Poland	Woloszyn	309	1991-2012	13.30%
Denmark	Jakobsen & Sorensen	164	1984-2011	7.40%	Portugal	Alpalhao	62	1986 - 1987	54.40%
Egypt	Omran	53	1990-2000	8.40%	Portugal	Almeida & Duque	28	1992-2006	11.60%
Finland	Keloharju	85	1984 - 1992	9.60%	Russia	Woloszyn	40	1999-2006	4.20%
Finland	Keloharju	162	1971-2006	17.20%	Saudi Arabia	Al-Anazi, Forster, & Liu	76	2003-2010	264.50%
France	Leleux and Muzyka; pallard and Belletante	187	1983 - 1992	4.20%	Singapore	Leep, Taylor and Walter	128	1973 - 1992	31.40%
France	Husson & Jacquillat	686	1983-2006	10.70%	Singapore	Dawson	441	1973-2006	28.30%
France	Paliard & Belletante; Derrien & Womack	697	1983-2010	10.50%	Singapore	Lee, Taylor & Walter	591	1973-2011	26.10%
Germany	Ljungqvist	407	1978 - 1999	27.70%	South Africa	Page & Reyneke	285	1980-2007	18.00%
Germany	Rocholl	652	1978-2006	26.90%	Spain	Rahnema and Fernandex	71	1985 - 1990	35.00%
Germany	Vismara	736	1978-2011	24.20%	Spain	Ansotegui & Fabregat; Alvarez Otera	128	1986-2006	10.90%
Greece	Kazantzis and Levis	79	1987 - 1991	48.50%	Sri Lanka	Samarakoon	105	1987-2008	33.50%
Greece	Nounis, Kazantzis & Thomas	363	1976-2005	25.10%	Sweden	Simonov	406	1980-2006	27.30%
Greece	Thomadakis, Gounopoulos & Nounis	373	1976-2011	50.80%	Sweden	Rydqvist; Schuster	374	1980-2011	27.20%
Hong Kong	McGuiness; Chao and Wu	334	1980 - 1996	15.90%	Sweeden	de Ridder	251	1980 -1994	34.10%
Hong Kong	Ljungqvist & Yu; Fung	1,259	1980-2010	15.40%	Switzerland	Kunz and Aggarwal	42	1983 - 1989	35.80%
Hongkong	Radhakrishnan	1008	1980-2006	15.90%	Switzerland	Kammermann & Walchli	147	1983-2006	29.30%
India	Krishnamurti and Kumar	98	1992 - 1993	35.30%	Switzerland	Walchli	159	1983-2008	28.00%
India	Balwilder Singh and RK Mittal	500	1992-1996	96.56%	Taiwan	Lin and Sheu	241	1986 - 1995	34.60%
India	Marisetty and Subrahmanyam	2,811	1990-2007	92.70%	Taiwan	Chen	1,312	1980-2006	37.20%
India	Marisetty and Subrahmanyam	2,964	1990-2011	88.50%	Thailand	Wethyavivorn and Koo-Smith	32	1988 - 1989	58.10%
Indonesia	Hanafi; Ljungqvist & Yu; Danny	321	1989-2007	21.10%	Thailand	Lonkani & Tirapat	459	1987-2007	36.60%
Indonesia	Suherman	410	1990-2012	25.70%	Turkey	Kiymaz	138	1990 - 1996	13.60%
Iran	Bagherzadeh	279	1991-2004	22.40%	Turkey	Durukan	282	1990-2004	10.80%
Ireland	Ritter	31	1999-2006	23.70%	Turkey	Ince, Kucukkocaoglu	355	1990-2011	10.30%
Israel	Kandel, Sarig and Wohl	28	1993 - 1994	4.50%	UK	Dimson	3,986	1959-2006	16.80%
Israel	Amihud & Hauser	348	1990-2006	13.80%	UK	Dimson, Levis	4,877	1959-2011	16.10%
Italy	Cherubini and Ratti	135	1985 - 1998	20.30%	USA	Ibbotson	12,007	1960-2007	16.90%
Italy	Arosio, Giudici & Paleari	233	1985-2006	18.20%	USA	Ibbotson, Sindelar	12,340	1960-2012	16.80%
Italy	Vismara	273	1985-2009	16.40%	.	Total	.	.	**42.91%**

Source: The information in the table is presented by going through different research papers

The results of presented in the table suggest that the highest level of underpricing has been reported by Datar and Mao (2006) in China. They reported the 388% of

underpricing by taking the sample of 226 firms during the period 1990 to 1996. Similarly, Hoque and Mousa (2001) also reported highest level of underpricing of 285% in Bangladesh by taking the sample of 113 firms in the period of 1984 to 2001. More than 100% of underpricing is also witnessed in Saudi Arabia, Jordan and Malaysia. In India, Brazil, Korea, Thailand, Portugal and Greece the underpricing of IPOs remained between 50% and 100%. The table envisages that, in some countries, like Norway, Chile, Egypt, Denmark, Canada, Austria, Israel, Argentina, France and Russia underpricing has been observed at the lowest level; below 10%.

The overall results presented in the table suggest that the level of underpricing varies from country to country. Having looked on the IPO literature, mostly developed markets; US, UK, Canada etc. have been extensively researched. Balvers et al. (1993) have found 8.15% of underpricing in NASDAQ market during the period of 1975-1987 by taking the large sample of 1746 IPO firms.

During boom period of internet firms, 1999 and 2000, Yuhong (2005) analyzed the underpricing of firms in two aspects by dividing the IPO firms in two categories; internet IPO firms and non-internet IPO firms. He found higher underpricing of 88.6% in internet IPO firms as compared with the non-internet IPO firms, where underpricing is observed to be 44.7%.

Borges (2007), in his study, divided the IPO firms into two parts before and after the crash of stock market to observe the underpricing of IPOs in Portuguese stock market. Before crash of stock market, he selected 57 IPO firms as sample in the period 1987 and 41 IPO firms in the periods 1988-2004. The higher underpricing of 87.5% was observed before the crash of stock market, whereas, lower underpricing of 11.1% was observed after the crash of stock market. He also observed higher underpricing in book building IPO firms than the fixed price IPO firms.

In world-wide, China has showed highest level of underpricing as discussed earlier, however the study of Ti (2008) showed underpricing of 135.01% by taking the sample of

354 IPO firms from the period of 1999 to 2002. He divided the level of underpricing in three categories. He observed that the 9.9% of IPO firms showed the underpricing level 100% and above, 3.7% of IPO firms showed the underpricing level below the 25% while 86.4% of IPO firms showed the underpricing level above the 50% and below the 100%. In the same way Chiou et al. (2010) showed the underpricing of 118.70% in China by taking the sample of 1031 IPO firms from the period of 1995 to 2007. They also reported the level of underpricing is reducing in China as Chinese Government is regulating the polices of the market.

In south Asian countries, Madhusoodanan and Thiripalraju (1997) have also showed underpricing in Indian IPOs prior to the period of 1997. Deb, S. G. (2009) focused on Indian IPOs during the sample period of 2001-09 and showed level of underpricing of 32.92%. Further, Ranjan and Madhusoodanan (2004) selected 92 IPO firms in India in 1999-2003 and documented that level of underpricing is higher in fixed offer than book building offer.

Islam et al. (2010) made the underpricing analysis of Bangladesh stock market for the period 1995-2005 by taking the sample of 191 IPOs and showed the level of underpricing of 480.72%. This amount is higher than the Hoque and Mousa (2001) study of IPO's underpricing as discussed in the table. They reported the level of underpricing of 285% in Bangladesh by taking the sample of 113 firms in the period of 1984 to 2001. In another study of Bangladesh, Islam et al. (2012) selected 163 IPO firms during the period of 1992-2006 and also found underpricing of 103.97%.

Samarakoon (2010) investigated the underpricing issues in Sri Lanka. He found average underpricing of 33.5% by selecting the sample of 116 IPO firms during the 22 years of period from 1987 to 2008. The author further documented that the underpricing in small firms is higher than larger firms. Similarly private IPO firms are more priced than conventional IPO firms.

On the other hand, very few studies regarding IPOs literature with reference to Pakistan are to be found. There are only less number of researches that measured the performance of IPOs; (Sohail & Nasr, 2007; Rizwan & Khan, 2008; Sohail & Raheman, 2009; Sohail & Raheman, 2010 and Kiyani & Amjed, 2011). Sohail and Raheman (2010) showed level of underpricing in different states of economy. Sohail & Nasr (2007) showed underpricing of 35.66% by selecting the 50 IPOs during 2000-2006.

To calculate the risk adjusted performance on the first trading day of IPOs, market adjusted model has been used in the earlier studies. The model is criticized by considering the beta of newly firm as one. As the beta of newly firm may be different from one so it requires to apply another modes like CAPM, Fama French three factor or four factor to calculate the risk adjusted performance of IPOs on the first trading day. To apply asset pricing models past data is required. As no trading history is available, researchers used market adjusted model to calculate the risk adjusted performance of IPOs on the first trading day. To fill this gap in the literature, this study is using different models to capture the effect of risk adjusted performance (level of underpricing) as the research of this type has not been undertaken previously, specially, first time, matched firms is used by applying asset pricing models to capture the risk adjusted performance (underpricing) of IPOs**.**

2.3 Determinants of underpricing under various theories

The underpricing has been discussed in the light of different theories, the more prominently agency theory, asymmetric information theory and signaling theory. The agency theory of Jensen and Meckling (197l) suggest a separation of shareholders and management. On the other hand, the firm value is differed due to 100 percent owner-managed and when it is not. In this theory management seems to be cause of underpricing. Management creates higher demand of IPOs by underpricing in order to sell their shares afterward.

The underpricing is well supported by asymmetric information theory. The asymmetric information may exist amongst different stakeholders like issuing firm's management,

owners of the firm, under-writers and investors. According to Baron (1982), the asymmetric information exists between the informed stakeholder, under-writer and less informed stakeholder, the firm. The under-writers underprice the new share deliberately to avoid the losses occurring for unsold shares. On the other hand, Rock (1986) is about informed and uniformed investors also supported the winner curse by Hanley and Wilhelm, Jr. (1995).

The asymmetric information theory is also supported by Levis (1990) and he validated the Rock's model. Levis (1990) tested information asymmetry theory in European market. He collected the allocation details informed and uninformed investors in two countries the USA and the UK during the study period of 1985-1988 and final sample was 123 IPO firms. The raw return on first trading day was observed to be 9.14% while level of underpricing by market adjusted model was found to be 8.64%. He used 13 different sizes of application to reach at the allocation of new issues between informed and uninformed investors and he came up with the finding that informed investors have advantageous position over uninformed investors.

Keasey and Short (1992) also validated asymmetric information theory under the presence of number of conflicting assumptions and also proposes some propositions that might not be possible to be tested. On the other hand, Balvers et al. (1993) also validated asymmetric information theory. They applied CAPM and came with the idea that informed investors know about the systematic risk and the intrinsic value of the IPO firm and want compensation through level of underpricing. Further, the results of Balvers et al. (1993) suggest that investors of IPO firms should be compensated in the form of underpricing due to unavailability of information of the new issue.

In the study of Bulow and Klemperer (2002), they further tested the asymmetric information theory. They used allocation rate (number of shares offered divided by the number of shares demanded) for the demand by two types of investors; informed and uninformed investors. Thus the asymmetric information theory suggests that new IPO firm is underpriced to compensate the uninformed investors. As a result of highly

underpriced issue is rationed between the informed and uninformed investors as a result oversubscription occurs. Therefore positive relationship between the level of underpricing and the subscription rate is documented in the previous literature.

Majumdar (2003) selected 628 IPO firms in the India during the period 1992-1994 and showed positive relationship of oversubscription with the level of underpricing.

Welbourne and Andrews (1996) viewed the signaling theory in two standpoints. First the signal should be observable in advance and secondly it should be costly and difficult to emulate. The signal can be observable directly from the prospectus data that are issued prior to IPOs like firm detail, firm's management, its performance and operations. According to Welbourne and Cyr (1999), firms are held responsible for accuracy of information. Tinic (1988) envisaged that firms also underprice the share to avoid lawsuit.

Signaling theory can be observed with the help of different variables. For example, according to Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) that high quality firm underprice the shares and recover this cost of underpricing in its secondary offer to general public by signaling that high quality firms are more underpriced. The level of underpricing increases with the level of uncertainty about the new issue of IPO (Baron 1982, Ritter, 1984, Beatty and Ritter 1986). There is imperfect information between the different participants of IPOs. As an IPO is a new firm, information about potential market demand and true value of firm is unevenly distributed amongst different stakeholders i.e. the IPO firm, the underwriter and the investor, so underpricing is done under the underwriter' umbrella to safeguard a full subscription of the new issue and thus to reduce possible losses arising from ex ante uncertainty about an issuing firm's value.

In the study of Michaely and Shaw (1994), the signaling theory is examined in USA by taking the sample of 947 IPO firms from 1984 to 1988. They concluded that highly underpriced issues give signal that secondary issue in near future will compensate the issuing firms the loss arises due to underpricing of new issues. This will give the signal to

market that issue firm will be compensated by higher return in secondary issue. They found positive relationship between level of underpricing and secondary issue.

Ti (2008) tested the two theories; the first one is information asymmetry and the second is winner's curse theory. The results of Ti validated the winner's curse theory while he failed to validate the information asymmetry theory on the basis of 354 IPO firms in China. He also showed the high correlation between stock market and level of underpricing.

Chen and Guo (2010) analyzed the diverged opinion of investors to invest in an IPO firm. They gave explanation of different anomalies related to IPO firms. They analyzed affect of different variables like information quality, number of shares, uncertain new industry, the firms' decision to go public, investors' optimism, IPO lockup period and analysts' coverage on long run performance and offer price. The authors found the positive relationship of offer price with the variable investors' optimism and negative relationship with the number of shares. They also made analysis of underpricing and showed the negative relationship between the number of shares and level of underpricing.

Yuhong (2005) analyzed the underpricing of firms in two aspects by dividing the IPO firms in two categories; internet IPO firms and non-internet IPO firms. He found higher underpricing of 88.6% in internet IPO firms as compared with the non-internet IPO firm's underpricing of 44.7%. He also tested the theories of overreaction and changing risk composition hypothesis and concluded to support the latter theory driving additional returns for investors due to ex ante uncertainty situations. Ultimately, he showed positive relationship of ex ante uncertainty with the level of underpricing.

Deb (2009) selected two measures of uncertainty, ex ante uncertainty and ex post uncertainty while presenting the analysis of Indian IPOs. The proxy used for ex ante measure was according to Beatty and Ritter (1986) methodology, while post ante was according to Ritter (1984) methodology. He also showed strong positive relationship between uncertainties and level of underpricing.

Krishnamurti (2002), in his study discussed factors of underpricing by examining 386 Indian IPOs in the period 1992-1994. He defined two aspects of risky issues the one that are small firms and the other smaller issues offered to general public. Krishnamurti (2002) concluded that the risky issues are higher underpriced as compared with the less risky issues.

Islam et al. (2010) made the analysis about determinants of underpricing on Bangladesh stock market for the period 1995-2005 by taking the sample of 191 IPOs and showed the positive relationship of level of underpricing with age and size variables while negative relationship with industry type and offer size variables. They showed insignificant relationship of level of underpricing with the timing of offer.

Lamberto and Rath (2010) selected the prospectus data of Australian IPOs during the period of 1995-1997 and showed positive relationship of survival of IPO firms with offer size and dividend yield forecast while negative relationship with risk factor. He concluded the first two factos as deriving factors for the survival of IPO firms.

In the light of these theories different researchers found determinants of underpricing. Ibbotson (1975) found negative relationship between the underpricing and long run performance of IPOs. He also documented that investors have also interested in secondary issue as underpricing has left a good flavor in the mouth of investors.

Brealey and Myers (1991) discussed the uncertainty of new issue as non-availability of past prices of the new issue and found the positive relationship of underpricing with the uncertainty. The study of Nandha and Sawyer (2002) also focused on determinants of underpricing by taking the large sample of 381 Indian IPOs during 1994-95. They also validated the ex ante uncertainty theory. They showed negative relationship of size variable, and positive relationship of EPS with the level of underpricing.

Borges (2007), in his study, divided the IPO firms into two parts before and after the crash of stock market to observe the underpricing of IPOs in Portuguese stock market. In short run, the higher underpricing of 87.5% was observed before the crash of stock market, whereas, lower underpricing of 11.1% was observed after the crash of stock market. On the other hand, he also observed the higher underperformance of IPOs on long run basis term performance before market crash IPOs than after the crash IPOs. Finally he showed negative relationship of underpricing with the long run performance of IPOs and validated the study of Ritter (1991); firms that are more underpriced than others perform worse in the long-run. On the other hand, in the study of Borges (2007), the result was insignificant between level of underpricing and size of the IPO firms; the results were contrary to other studies where negative relationship has been observed.

Aggarwal et al. (2002) found the positive relationship between the level of underpricing and the institution allocation by examining the IPOs of US in the period 1998 to 1999. They argued underwriter's role is important in this underpricing due to their insider's information of IPO firms. Therefore underwriter emphasized to allocate more shares to institutional investors as they know the pre-market demand of the new issues.

On the basis of this comprehensive literature review, Karachi stock market is deficient in respect of determinants of underpricing. No one has explored this issue in the most volatile market of the world. Hence, in this study the influence of different variables in the light of previous theories is analyzed. It addresses the relationship of underpricing with other number of explanatory variables (Ex-Ante, Market Capitalization, Incidence Secondary Issues, Market Volatility, Offer Size, Proportion Of Shares Offered To General Public, Oversubscription Variable and P/E ratio) using multiple regression models. So this research is taking account of this feature to predict the underpricing under the umbrella of Asymmetric information and signaling theories.

2.4 Long run performance of IPOs

Regarding the under-performance of IPOs, several explanations for the apparent IPO underperformance have been put forward in the former researches. To cover very longer

period Chambers & Dimson (2008) investigated the underpricing of 90-years data and found mean underpricing of 11.12% from the sample data 1917-2007. Eckbo and Norli (2005) investigated that low leverage ratios and high stock turnover were the main variables for IPO underperformance.

In USA, Brau (2012) selected a large IPO sample of 3547 during the period of 1985 to 2003 and documented the underperformance of IPOs of -17.1% after the period of three years. This underperformance of IPOs has increased to -25.7% after the period of five years. The author used the value weighted CRSP index as bench mark and applied BHARs methodology.

Loughran and Ritter (1995) also explained the underperformance of IPOs and found that in high IPO activity period the performance was considerably worse as compared with the low IPO activity period. They showed underperformance of -50% after the period of five years of 4,753 IPO firms in twenty years period of 1970-90. However, this underperformance remains at -26.9% after the period of three years after public offerings.

The long run performance of IPOs always remained controversial due to application of different models. However, the uniformity is underperformance of IPOs in the long run. The US and UK markets remain dominant in respect of determination of long run performance of IPOs. Ritter (1991) showed significant underperformance of IPO firms of USA by taking sample of 1,526 in the period 1975-1984. Ritter (1991) has constructed a benchmark as size portfolio and found underperformance of -10.2% after a period of one year and -29.10% after a period of three years by using CARs methodology. Further he replaced the bench mark by NYSE and found stronger underperformance on the same set of data. In his analysis he has also showed that smaller and medium IPO firms do more underperform than larger firms.

In the same line, Loughran (1993) showed market adjusted performance of IPO firms of USA and found highly significant underperformance of -60%. He used the Nasdaq index return as bench mark for market.

Simon (1989) showed long run market adjusted performance of IPO firms of USA and found highly significant underperformance in two different periods. In first part, he used 35 IPO firms of US from 1926 to 1933 and found -29.1% of underperformance after the period of five years after going public. In second part he used 20 IPO firms from 1934 to 1940 and found 6.2% positive performance after the period of five years. Santos (2010) selected the study period of 1973-2008 and divided the IPO firm's data into two categories; low underpricing and high underpricing period. He concluded that during the low underpricing periods, IPO firms did not underperform as compared with IPO firms going public during periods of high underpricing.

Anton et al. (2011) analyzed the performance of Spanish IPOs for the period 2000-10 on short and medium term basis. They concluded that on short-term basis Spanish IPOs out-performed while on medium-term basis their performance was observed to be worse by explaining different reasons. Contrary to underperformance of IPOs on long run basis, Madhusoodanan and Thiripalraju (1997) showed positive returns of IPOs on long run basis.

Borges (2007) observed the higher underperformance of IPOs on long run basis term performance before market crash IPOs than after the crash IPOs.

Dorn (2003) also divided the IPO firms into two categories; retail investors and institutional investors by taking the sample from German stock market. The higher level of underpricing is observed in the IPOs bought by the retail investors but experienced underperformance in long run basis. In long run analysis Dorn (2003) controlled the market factor, book to market factor and size factor.

In UK, Goergen et al. (2007), Espenlaub et al. (2000) and Levis (1990) showed underperformance of IPOs. Similarly Bessler and Thies (2007) and Ljungqvist (1997) showed underperformance of IPOs in Germany. The magnitude of underperformance is

different across the countries and depends upon the method and time period that is used for analysis for the long run period.

Espenlaub et al. (2000) examined the long-run underperformance of UK and showed underperformance in different percentages under various benchmarks. Stehle et al. (2000) in their study presented different underperformance results of IPO firms in Germany in the period 1960-1992. The long run underperformance was found to be -9.01% under equally weighted market portfolio, whereas these returns were found to be -3.17% under value weighted market portfolio. In the size portfolios long run underperformance was observed to be -6.61%.

In UK Gregory et al (2009) selected a large sample of 2499 IPO firms during the period 1975 to 2004. They also discussed the issues of benchmarks to observe underperformance of UK IPOs. By selecting value weighted control portfolio as benchmark, they showed the underperformance of -12.6% after the period of three years. Whereas, the authors have observed the underperformance of -31.6% after the period of five years. In addition, this underperformance increased when equally weighted control portfolio was used as benchmark.

In France, Bossin and Sentis (2012) selected the sample of 207 IPO firms during the period of 1991 to 2005. They used two benchmarks; size and book to market portfolios and documented the long run underperformance of IPOs in France. They reported underperformance of -28.85% when size was used as benchmark portfolio and showed underperformance of -68.1% when book to market portfolio was used as benchmark portfolio.

In the developed markets, other than USA, UK and Europe, the underperformance of IPOs was also observed in Australia, Canada and Japan. In Japan, Kirkulak (2008) observed the underperformance of IPOs by selecting the sample of IPO firms in the period 1998 to 2001. The author has observed the -18.3% underperformance of Japanese IPOs after the period of three years. In Australia, Lee, Taylor, and Walter (1996)

investigated the sample of Australian IPO firms that went into initial public offerings during the period of 1976 to 1989. They reported significant underperformance of -46.5% after the period of three year after initial public offerings.

Kooli and Suret (2004) also showed underperformance in Canadian IPO firms. They selected 445 IPO firms during the period of 1991 to 1998. Using non issuing matched firms as benchmark they also reported the underperformance of IPOs after the period of three to five years. The significant benchmark adjusted underperformance of -19.96% was observed after the period of three years. Whereas this benchmark adjusted underperformance has risen to -26.5% after the period of five years.

The underperformance of IPOs has also been observed in the developing countries, south Asian countries and emerging markets as well. Su, Bangassa and Brookfield (2011) analyzed the long run performance of IPO firms of China in 1996-2005 and concluded the misspecification of model with regard to benchmarks and validated the earlier researches of misspecification of the model. In Hong Kong, MacGiuinness (1993) showed underperformance of -18.3% by taking the 72 IPO firms in 1980-1990.

In China, Su et al. (2011) showed the over performance of Chinese IPOs during the study period of 1996 to 2005 by selecting the large sample of 936 IPO firms listed at Shenzhen and Shanghai and stock exchanges. The authors used matched firms as benchmark. They observed the matched firm adjusted performance of 4.6% after the period of two years. Even this performance got better by 8.6% after the period of three years of listing.

Aggarwal et al. (1993) showed the underperformance of -47% in Brazil, -23.7% in Chile and -19.6% in Mexico after the period of three years of initial public offerings. Govindasamy (2010) also documented the underperformance of IPOs in South Africa. The author used all share index of JSE as benchmark. The sample of 229 IPO firms was selected during the study period of 1995 to 2006. The author documented the market adjusted underperformance of -50% after the period of three years. In the same line, in

Indonesia, Rekik and Bouyelbene (2013) documented the underperformance of -3% after the period of three years after listing.

Komenkul et al. (2012) also documented the underperformance of IPOs in Thailand by selecting the 136 IPO firms during the period of 2001 to 2012. They observed the -16.6% BHARs and -19.6% of analogue CARs after the period of three years of public offerings. In Malaysia, Ahmad Zaluki et al. (2007) selected 454 IPO firms during the period of 1990 to 2000 listed on the Main Board and the Second Board. They applied both event time and calendar time approach in their study and noted that IPOs outperform in the long run under the methodology of CARs and BHARs. However under Fama French three factor model, the abnormal performance vanished.

In south Asian counties, Sahoo and Raib (2010) showed excess returns in Indian IPOs during the study period of 2004 to 2006. They selected the sample of 92 IPO firms listed on National and Bombay Stock Exchange. These results were contrary to other south Asian countries like Pakistan, Bangladesh and Sri Lanka. Gopalaswamy et al. (2008) also documented the long run performance of IPO firms in India by dividing the sample in fixed price issues and book building issues. He showed that the IPOs perform better after the period of one, two and three years that were issued by book building process method than fixed offer method.

In Bangladesh, Islam et al. (2012) selected 163 IPO firms during the period of 1992-2006 and found 38.4% underperformance at the end of 44^{th} months relative to industry benchmark. Further, they made analysis by size and concluded that the underperformance of smaller issues is severe than the larger issues.

The controversial results with regard to underperformance of IPOs was presented in the study of Ritter and Welch (2002) by using two different bench marks for abnormal returns; market and matched firms. For matched firms they used book to market and market capitalization. In their study, market adjusted performance after three year was observed to be -23.4%, whereas this underperformance is observed to by -5.1% by using

matched firm as benchmark. Norli (2005) in his study used Fama-French 3-factor model with modification by selecting a rolling portfolio strategy and came with different results. In his study Jensen's alpha was found to be insignificant to show that IPOs don not underperform in long run after adjusting the risk factors of market, size and value. However, Gompers and Lerner (2003) used the larger set of IPO firms from 1936 to 1976 and showed underperformance by using Fama-French 3-factor model.

Therefore, Kothari and Warner (1997), Barber and Lyon (1997), Fama (1998), Lyon et al. (1999), and Loughran and Ritter (2000) have showed different underperformance results of IPO firms depending upon the choice of method. Barber and Lyon (1997), in their study used same set of sample IPOs and applied two different methodologies CARs and BHARs to observe the long run performance of IPOs. They concluded the different results and preferred BHARs methodology by giving the reasons that CARs model do not observe the investment strategy of investor's return if shares (IPOs) are held for longer time period i.e. returns calculated by CARs model are not accurate. However they also criticized the BHARs model due to skewness problem when returns are calculated on monthly basis and compounded. To tackle the skewness problem, Barber, Lyon and Tsai (1999) recommended skewness adjusted model to observe the long run performance of IPOs.

Contrary to Barber and Lyon (1997) study Fama (1998) preferred the CARs model to observe long run performance of IPOs. He argued that CARs are easy to observe the linearity pattern of averages with the long run period of time. He suggested the CARs model, as in multi period, averages of CARs grow linearly and standard error grow with the square root. On the other hand he criticized BHARs model as in multi period, buy and hold abnormal returns grow exponentially instead linearity that ultimately give the measurement problem.

Therefore this international evidence is still not clear because the magnitude of underperformance is different depending upon choice of benchmark after the period of three to five years of IPO. Gompers and Lerner (2003), Lyon, Barber Tsai (1999),

Kothari and Warner (1997), Loughran and Ritter (1995), Barber and Lyon (1997) and Fama (1998) in their study focused on the measurement problems of IPOs with regard to long run performance. In their study the main themes like used of benchmark, the model and the test statistics were outlined.

Earlier studies have been criticized by also other researcher on the grounds that the Market Adjusted Model and Capital Asset Pricing Model used in these studies considering only the single factor (beta risk) while other multifactor models were ignored. The misspecification of models is also highlighted in the different research. Chen et al. (2002) observed that Fama French 3-factor model is more appropriate to measure the long-run performance of IPOs by arguing that the model's return patterns are alike as of ordinary asset's return. Several studies used three factor Fama French model to observe long run performance of IPOs. On the other hand Brav (2000) criticized the use of Fama French model model due to the reasons that on long run, abnormal returns do not hold the assumptions of independency and normality.

Choi, Lee and Megginson (2006), in their study, focused the methodological problem by taking 241 IPO firms from 42 countries during the period 1981-2003. In study of Gompers and Lerner (2003), 3,661 US IPO firms are analyzed from the period 1935 to 1972. They measured the long run performance after the period of five years. The results of long run performance were found to be different depends upon the choice of method. By using BHAR methodology on value weighted basis, they showed underperformance of IPOs. Whereas the performance of IPOs remain positive when BHARs and CARs methodology on equally weighted basis was applied. In addition no underperformance was observed by CAPM and the three factors Fama and French model.

In the study of Hoechle & Schmid (2008), GCT model was applied. In their study a set of explanatory variables were regressed by quarterly excess return of the individual firms. The results of GCT-regression revealed that firm valuation, leverage & liquidity, investment expenditures and corporate diversification strategies variable were unable to explain the underperformance of IPOs. They concluded that GCT-regression model was

an appropriate measure to cope with the one-dimensionality problem of the calendar time portfolio method. They also found that the fundamental differences in firm characteristics between IPO and more seasoned (non-issuing) firms were the main reason for the IPO underperformance.

In case of Pakistan, there exist only two studies that have measured the performance of IPOs on long run basis; Sohail and Nasr (2007) and Rizwan and Khan (2008). In study of Sohail and Nasr (2007) the long run performance was measured after the period of one year after going initial public offering and they have used the small sample size of 36. Whereas in the study of Rizwan and Khan (2008) they have used the sample size of 35 IPOs and the period of estimation was two years. In the international evidence the estimation period for long run performance of IPOs is three years or greater.

On the basis of this comprehensive literature review, it is hoped that this study is one step ahead to contribute additional evidence of after-market performance of IPOs for long horizons periods, especially to address the issue of measurement problems. The different models like market adjusted cumulative returns model, market adjusted buy-holding returns model, market model, capital asset pricing model. Fama French Model and Corhart four factor model, that help to study the sensitivity of the models employed. So the study is contribution to the increasing body of evidence on the after-market performance of IPOs for long horizons periods in KSE as well as internationally as earlier only monthly basis analysis are made. In this study after market performance is measured monthly, fortnightly and weekly basis. In addition, the study will also help investors to decide whether to retain the shares for longer period after buying them from primary market.

2.5 Efficiency of IPOs

The data envelopment analysis (DEA) is widely used to measure the performance and productivity of different sectors like banking, health care and mutual funds etc. The DEA approach has also been used in Pakistan to measure the efficiency of banking sector and working capital management issues. However in case of IPOs, application of DEA

approach is not common. In the globe there are very few studies to measure the performance of IPOs using DEA approach like Gao and Lee (2013), Shenq and Chen (2012), Alanazi (2010), Luo & Yao (2009) and Greg (2006).

In lieu of application of DEA in initial public offering, there are numerous studies with regard to application of DEA. Nunamaker (1985) measured the efficiency of nonprofit organizations by using DEA approach. Yeh (1996) has used DEA approach in conjunction with financial ratios for bank performance evaluation. Vahid & Sowlati (2007) used DEA to measure the efficiency of the Canadian's firms, Kong and Tongzon (2006) used DEA approach to estimate total factor productivity growth (TFP) of Singapore's firms, Choi & Murthi (2001) applied DEA to measure performance of mutual funds. Wang (2006) used DEA and balanced Scorecard (BSC) approach to analyze and evaluate the corporate performance efficiency. Ataullah & Le, (2006) used DEA technique for efficiency measurement of the Indian Banking Industry.

Greg (2006) was the first researcher who used DEA approach in initial public offering. He used 5 variables to measure the efficiency of IPOs. In his study, offer price, offer size and number of IPOs offered to general public used as inputs while first day closing pricing and closing price after the three months used as output. By using input CCR model and Zhoo (2003) model, Greg (2006) concluded that an efficient IPO fall in low price range of all the periods of sample and give a better avenue to select an IPO.

Luo & Yao (2009) analyzed pre-post IPOs performance of banking sector by using DEA approach and observed 10% efficiency of Chinese's banks after IPOs period. They further reported that the previously inefficient state owned banks reduced the gap of efficiency with the joint stock commercial banks of China. In contrast to Lou & Yao (2009) study, Alanazi (2010) reported significant decline of Saudi IPOs after listing using Malmquist productivity and efficiency indices under DEA approach.

Luo and Yao (2009) reported the mean efficiency of Chinese commercial banks to 0.7 under the input CCR model. They further reported that efficiency of 10 commercial

banks improved after going to IPOs. Under VRS model they reported the increase efficiency up to 6% as compared with the CCR model. In pure technical efficiency SOE outperformed from all other Chinese banks.

Gao and Lee (2013) selected 51 SOEs in China and presented efficiency analysis of these SOEs after going public in 2010. They found that efficiency is not increased in these IPOs after going public. Contrary to the finding of Gao and Lee (2013), other researchers Shenq and Chen (2012) showed that the technical efficiency of 21 banks increased to 6.22%, while the improvement in technological changes went to 16.07% from year to 2006 to 2011.

Therefore, this study is analyzing the efficiency of these IPOs by using DEA approach in pre and post window of IPOs. Although the technique is widely used to measure the efficiency of firms under different aspects, but in case of IPOs there are very few studies (three studies, to the best of our knowledge) that has taken this aspect. This study is the first one for Pakistani initial public offerings. The current study is contributing to find that whether the public listing help in to increase efficiency level of the new firms or not and especially SOEs. This is also a new piece of work as earlier no study is available to find the pre IPO efficiency of firms.

To sum up, on the basis of extensive literature that started with developed markets like US, UK, Europe, Australia, Canada and Japan and this journey of literature reviews goes to Asian countries, developing counties and ended with emerging markets. This literature review was mainly confined to four main aspects; overview of level of underpricing & the level of underpricing and its determinants under various theories; the long run performance and comparisons of different models and the efficiency of IPOs in pre and post IPOs window.

The main deficient in the literature was identified as the KSE market was not explored in context of level of underpricing and its determinants considering the large set of IPO firms and longer period. The gap of misspecification of model in the literature also exists

as internationally misspecification of models in longer run was not considered on weekly and fortnightly basis for volatile market. Further, the deficient in the existing literature is identified to measure the efficiency of IPOs and specially the sector-wise efficiency in pre and post IPOs event window as prior to this study, no one such study exist in the globe. Hence in this study the research questions are addressed as discussed in section 1.5.

CHAPTER 3

METHODOLOGY

In this chapter the research methodology and frame work is discussed to answer the research questions that have been identified in the introductory chapter. The chapter starts with the sample data set and describes the sources of data collection of the study. After the discussion of sample data, the models are discussed in the light of research questions. The variables selection, measurement in the light of previous theories of IPOs, relationships and the research hypotheses are presented.

3.1 Sample and Data Set

The present study has covered a period of 13 years from 2000 to 2012 by selecting the data of new IPO firms floated on the Karachi Stock Exchange. The sample IPO firms were selected in this study comprised of 83 IPO firms that were listed on the KSE. Total population consists of 87 IPO firms that were listed during the study period. The year-wise sample of IPO firms is displayed in table 3.1 and graphically in Figure 3.1. The 4 IPO firms were not taken due to the delisting and merger & acquisitions of these IPO firms.

In this study secondary data is used for analysis. The data of stock prices is taken from different web sources: KSE, khistocks and business-recorder. The data required for application of DEA approach is collected from the annual reports of IPO firms and the balance-sheet analysis published by state bank of Pakistan. Furthermore, to measure the Pre-IPOs efficiency of IPO firms with regard to DEA, the data is collected from Security Exchange Commission of Pakistan (SECP) and directly from the company's prospectus. Data used for CAPM, Fama-French three factor model and Corhart four factor model, analysis reports of KSE, annual-reports and balance-sheet analysis of SBP from year 2000 to 2010 are consulted.

The data set in high frequency is collected and compiled for each year from year 2000 to year 2010 for size factor, value factor and momentum factor. As there was no access to data streams, to collect this data set of stock prices on daily basis, in different time intervals from 1 year to 3 years after IPO and starts each year separately from 2000 to 2010, programing modules are developed in the form of macros. After the collection of data of stock prices on daily basis, programing modules are also developed to calculate the returns of the stocks on weekly, fortnightly and monthly basis.

For the study of long-run performance, those IPOs are included which has covered a period of more than three years. As a result, number IPO firms reduced to 61 IPOs for the long run analysis of IPOs. The list of sample firms is displayed as Table A-3.1-a, while sector-wise list of these firms are displayed as Table A-3.1-b in the appendix.

Table 3.1: Sample IPO firms

Year	No. of IPO Firms	Sample	Sample for Long Run
2000	3	1	1
2001	3	3	2
2002	4	4	3
2003	5	5	5
2004	12	12	8
2005	18	18	15
2006	5	4	4
2007	12	11	10
2008	9	9	9
2009	3	3	3
2010	6	6	1
2011	4	4	0
2012	3	3	0
Total	**87**	**83**	**61**

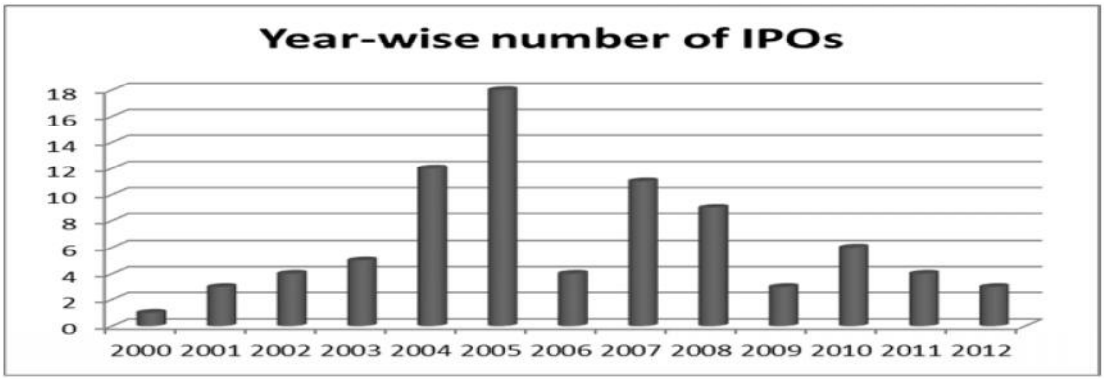


Figure 3.1: Year-wise sample of IPO firms

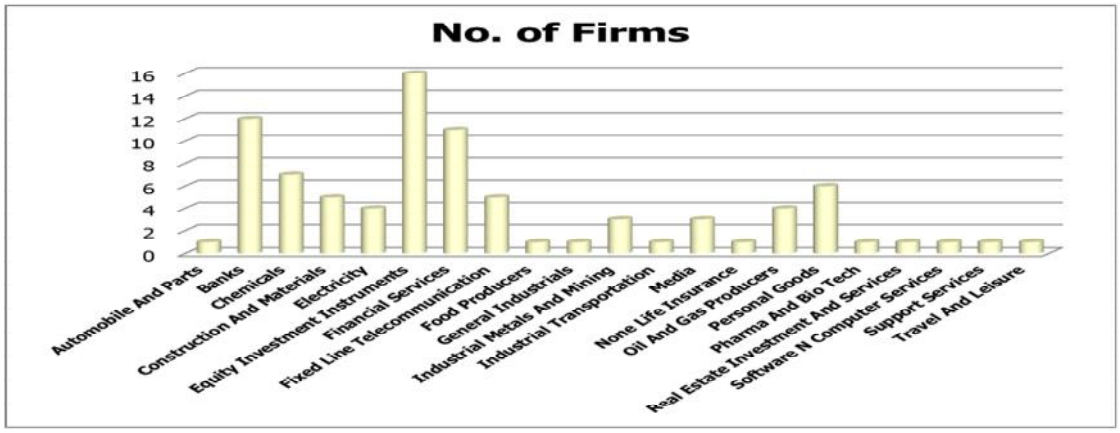


Figure 3.2: Sector-wise sample of IPO firms

As graph of sector-wise distribution of IPOs samples depicts that some sectors are larger one while some are smaller one, even some sectors contain only one IPO firm. To tackle with this problem sectors are divided into three broader categories; manufacturing sector, financial sector and other services sector for sectoral analysis of IPOs.

3.2 Variable measurement, model specification and research hypotheses.

In this section, first the measurement of variables is discussed. Second different models are described to measure the level of underpricing. Third, the regression model is developed to capture the effect of different variables in the light of theories. Fourth, the long run performance and the efficiency of IPO firms is measured by different models are

presented. Last GCT model is used to measure the performance of matured and less matured IPO firms in the longer run.

3.2.1 Measure of Abnormal Returns / Underpricing

Initial return of each IPO and market return is calculated as mentioned below:

$$R_{i,1} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} \quad \text{1-a}$$

$$R_{m,1} = \frac{I_{m,1} - I_{m,0}}{I_{m,0}} \quad \text{1-b}$$

Where, $P_{i,1}$ represents the closing price of IPO firm '*i*' at the end of first trading day, $P_{i,0}$ is the offer price of that IPO firm while $R_{i,1}$ is the return on first trading day, it is also termed as raw return. In the same way, $I_{m,1}$ is the closing KSE-100 index value at the end of first trading day, $I_{m,0}$ is the closing KSE-100 index value on the offer day of the corresponding stock. $R_{m,1}$ represents the market return on the first day.

First, the level of underpricing is calculated with the help of market adjusted model (see equation 8), Market Model, CAPM, 3-factor Fama French Model and four factor Carhart model using matched firm's technique. The criterion to select matched firm is based upon the following algorithm

- The sector of an IPO firm and the matched firm is same. The classification of sector is based on new KSE classification of sectors incorporated in year 2008. However in case of only single IPO firm in the sector, the matched firm is selected on the basis of old classification of sectors at KSE before 2008.
- As expected return is based on capital asset pricing models, therefore those firms were selected that have same size and capital structure to calculate systematic risk (Beta).

- In case of different capital structure, adjusted betas are used for CAPM and market model to calculate the expected returns for the matched firms (proxy companies).
- The firm's asset is used to measure the size of an IPO firm and matched firm.
- Tracking error[1] technique is modified to check the similarity of an IPO firm with that of matched firm.
- To conform the results obtained from tracking error are further verified with the help of sample t statistics of difference of means assuming equal variances.

To check whether the proxy firm represents an IPO firm in the light of above algorithm truly, two methods under the asset selection criterion are adopted. One is revised tracking error methodology and other is use of t statistics of difference of means under the assumption of equal variances.

a. Revised tracking error methodology

The relative weights of each firm of matched firm according to total assets of the matched firms (bench mark portfolio) are calculated. In the same way relative weights of each IPO firm according to total assets of all IPO firms (managed portfolio) are calculated.

$$RW_{(IPO\ firm),i} = Asset_{(IPO\ firm),i} / Total\ Assets_{(IPO\ firm)} \quad 2\text{-a}$$

$$RW_{(matched\ firm),i} = Asset_{(matched\ firm),i} / Total\ Assets_{(matched\ firm)} \quad 2\text{-b}$$

$$\triangleleft_t = RW_{(IPO\ firm),i} - RW_{(matched\ firm),i} \quad 2\text{-c}$$

$$\text{Tracking Error} = \sigma_{\triangleleft} = \sqrt{\sum_{t=1}^{n} (\triangleleft - \triangleleft bar)\text{^}2/(n-1)} \quad 2\text{-d}$$

Where RW is the relative weight of a matched firm or an IPO firm in the portfolio, $\triangleleft_t$ is the difference of weights of each firm and t =1 to N firms.

[1] Tracking error technique is used in passive portfolio strategy. Fund manager replicate equity portfolio with that of bench mark portfolio i.e. how closely the constructed portfolio of fund manager with the bench mark index are. The tracking error less than five percent is considered to be best proxy portfolio of the bench mark index. Overall fund manager try to minimize portfolio's return volatility with relative to the index

b. t statistics

The following t statistics of difference of means assuming equal variances is used to test the compatibility of IPO firm with matched firm.

$$t = \frac{\left(\overline{X}_1 - \overline{X}_2\right) - \left(\mu_1 - \mu_2\right)}{Sp\left[\left(\frac{1}{n_1}\right) + \left(\frac{1}{n_2}\right)\right]^{\frac{1}{2}}} \qquad \text{2-e}$$

$$\text{Where } S_p^2 = \frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} \qquad \text{2-f}$$

Where, S_p^2 is pooled variance, n_1 is number of assets in matched firms and n_2 is number of assets in IPO firms, (μ_1-μ_2) is the difference between two population means and $\overline{X}_1 - \overline{X}_2$ is the difference of means between matched firm and an IPO firm.

The expected returns of matched firms are calculated with the help of following four models (3 to 6).

3.2.1.1 Market Model

To calculate expected returns in the market model, the actual returns of matched firm and market returns are used in regression model of equation (3) prior to six months of listing of an IPO firm.

$$\acute{R}\,1_{i\,t} = \alpha_i + \beta\,1_i\ R_{m\,t} + \varepsilon_{i\,t} \qquad 3$$

3.2.1.2 Capital Asset Pricing Model

To calculate expected returns in the capital asset pricing model, the excess returns of matched firm and excess market returns are used in regression model of equation (4) prior to six months of listing of an IPO firm. For risk free rate three month treasury bill rates are used.

$$\acute{R}\,2_{it} = R_f + (R_{mt} - R_f)\,\beta\,1_I + \varepsilon_{it} \qquad 4$$

As discussed in the algorithm for matched firms, the selected matched firm has different capital structure, so the betas obtained in equation 3 and 4 are adjusted. The betas obtained in the equation 3 and 4 are termed as levered betas. These betas are calculated according to the capital structure of the matched firm. As the capital structure of an IPO firm is different from the matched firm, so beta is adjusted according to the capital structure of an IPO firm. First beta for the matched firm is calculated in absence of debt with the help of following equation.

$$\beta_{(\text{matched, unlevered})} = \beta_{(\text{matched, levered})} / [\ 1 + (\text{Debt}_{(\text{matched firm})} / \text{Equity}_{(\text{matched firm})} * (1\text{-tc})\ ]$$

Now adjusted Beta is calculated with new capital structure of an IPO firm with the help of following equation.

$$\beta_{(\text{adjusted})} = \beta_{(\text{matched, unlevered})} * [\ 1 + (\text{Debt}_{(\text{IPO firm})} / \text{Equity}_{(\text{IPO firm})} * (1\text{-tc})\ ]$$

This adjusted beta is used to calculate expected return in equation 3 and 4 for each IPO firm.

3.2.1.3 Fama French Three Factor Model

In addition to market factor in CAPM, two other factors size and value factors were incorporated by Fama and French (1993).

$$\acute{R}\,3_{it} = R_f + (R_{mt} - R_f)\,\beta\,1_I + S_t\,SMB_t + H_t\,HML_t + \varepsilon_{it} \qquad 5$$

3.2.1.4 Carhart Four Factor Model

The four factor i.e. momentum factor is further incorporated by Carhart (1997) in addition to three factors of Fama French model.

$$\acute{R}\,4_{it} = R_f + (R_{mt} - R_f)\,\beta\,1_I + S_t\,SMB_t + H_t\,HML_t + M_t\,WML_t + \varepsilon_{it} \qquad 6$$

The expected returns $\acute{R}1_{it}$ equation (3), $\acute{R}2_{it}$ equation (4), $\acute{R}3_{it}$ equation (5) and $\acute{R}4_{it}$ equation (6) are obtained by applying OLS regression model. In equation (5) SMB_t (small minus big) is the risk premium for size factor and HML_t (high minus low) is the risk premium for value factor while in equation (6), WML (winner minus looser) is the risk factor for momentum.

Fama (1993) argued that investors of small firms should be compensated for taking additional risk as these firms are more sensitive with regard to various risk factors like problem of financial flexibility and less diversification in the business. Moreover, he argues that investors of value stock firms should also be compensated for taking another risk as value stocks is considered to be weaker firm due to current distress and the future prospects are vague. In CAPM, the market factor is used for risk. In Fama and French three factor model, three factors are used for risk; market factor, the size factor and the value factor while in Carhart's model four factors are used for risk; market factor, the size factor, the value factor and the momentum factor.

To calculate size and value factors, all the firms of KSE are sorted on the basis of market capitalization (size) of the firms. The firms are divided in two parts by using the median; small firms (S) and big firms (B). B/M ratio is calculated by dividing the book value per share at the end of year t by market value per share. The KSE firms are further divided into three B/M groups: (Low, L), bottom 30%, Middle (M) 40% and top 30% (H, high). As a result, from the intersection of the three B/M and two size groups, six portfolios (S/L, S/H, S/M, B/L, B/H, B/M) are formed. As historical data of IPO firms do not exist, to measure the IPOs returns, the matched firms are used to calculate expected returns as discussed in the algorithm.

Where, SMB and HML are calculated as:

$$SMB = \{(S/L + S/M + S/H) - (B/L + B/M + B/H)\}/3 \qquad 7\text{-a}$$

$$HML = \{(S/H + B/H) - (S/L + B/L)\}/2. \quad 7\text{-b}$$

To calculate SMB and HML, equally and value weighted methods both are used for portfolio construction.

To calculate WML the KSE firms are sorted on market capitalization basis, lowest to highest. The sample is divided into two parts. The upper part of the sorted sample firms is sorted on the average of last 20 days returns and then divided into three portfolios S/W, S/N and S/L (winner-30%, neutral-40% and looser-30%). Similarly the lower part of the sorted sample firms is sorted on the average of last 20 days returns and then divided into three portfolios B/W, B/N and B/L (winner-30%, neutral-40% and looser-30%). The difference of averages of two winner portfolios S/W, B/W and two looser portfolios S/L, B/L, will give the momentum factor and is calculated as.

$$WML = \{(S/W + B/W) - (S/L + B/L)\}/2. \quad 7\text{-c}$$

For each IPO firm, to calculate expected return for matched firm, daily excess returns of matched firms are regressed against the respective risk factors. However, for long run analysis, to calculate Jensen's alpha the excess returns of each IPO is regressed against the respective risk factors after the periods of years 1, 1.5 2, 2.5 and 3, based on weekly, fortnightly & monthly basis as discussed in 3.2.2.3.

The level of underpricing is calculated with the help of five models as presented in equations 8 to 12.

The underpricing (P^u) of IPO firms using market adjusted model is calculated as:

$$P^u = \{ [(1 + R_{i,1}) / (1 + R_{m,1})] - 1 \} \times 100 \quad 8$$

The above model was initially introduced by Aggarwal Leal and Hernandez (1993) and still used by many researches to calculate the underpricing as Choi, Lee and Megginson (2010), Kayani and Amjed (2011) and Boissin and Sentis (2012) etc.

The above model has been criticized in earlier studies for not considering the risk factor assuming the unit beta. Therefore market model, CAPM, 3-FF (three factor Fama French Model) and (4-F) four factor Carhar's model are also used to measure the risk adjusted IPO performance on first trading day (equation 9, 10, 11 and 12), which are obtained by running the OLS regression of equations (3), (4), (5) and (6), on the matched firms. While running regression a number of assumptions are also made. To control the problems of heteroscedasticity and auto correlation, HAV-Newey test is used in these regression models.

In addition to model 8, the level of underpricing is calculated with the help of following four models.

By Market Model

$$P^u = \quad Ri,t - \acute{R}\,1_{\,i\,t} \qquad 9$$

By CAPM

$$P^u = \quad Ri,t - \acute{R}\,2_{\,i\,t} \qquad 10$$

By Fama-French Model

$$P^u = \quad Ri,t - \acute{R}\,3_{\,i\,t} \qquad 11$$

By Four Factor Model

$$P^u = \quad Ri,t - \acute{R}\,4_{\,i\,t} \qquad 12$$

The one sample t-statistic (equation 13) is used to test the significance of hypotheses for level of underpricing calculated by different models equations 8-12: The first hypothesis, *the level of underpricing of sample IPO Firms is different from zero is tested*.

The sample mean adjusted return on the first trading day, $\overline{P^u}_1$, on IPO investment divided equally among n IPOs:

$$\overline{P^u}_1 = \frac{1}{n} \sum_{i=1}^{n} P^u{}_{i,1} \qquad 13\text{-a}$$

The *t* statistic is computed as:

$$t = [\ \overline{P^u}_1\ ] / [\ \frac{s}{\sqrt{n}}\ ] \qquad 13\text{-b}$$

Where, S represents the cross sectional standard deviation of $\overline{P^u}_1$ for the sample n IPO firms.

3.2.2 Long-run IPO's performance

For the long run performance Ritter (1991) methodology has been followed which is being still used in the recent researches across the globe like Choi, Lee and Megginson (2010), Kayani and Amjed (2011) and Boissin and Sentis (2012) etc. The market adjusted returns are calculated for different time horizons covering 3 years period after the initial public offerings (12-month, 18-mnths, 24-months, 30-months and 36-months) as:

$$mar_{it} = r_{it} - r_{mt} \qquad 14$$

Where r_{it} is the return for each IPO "*i*" in the t[th] trading period while r_{mt} is the corresponding time period market return.

The mean market adjusted return of sample IPOs for the t[th] period are calculated using equally weighted average as:

$$\overline{mAR_t} = \frac{1}{n} \sum_{i=1}^{n} mar_{i,t} \qquad 15$$

3.2.2.1 Cumulative market adjusted returns (mCRs)

The mean mARs calculated earlier in equation 15 are cumulated in different time horizon to capture the long-run market adjusted performance of these IPOs as:

$$mCR_{p,s} = \sum_{t=p}^{s} mAR_t \qquad 16$$

Where $mCR_{p,s}$ represents the market adjusted cumulative long-run performance from event period *p* to event period *s*.

3.2.2.2 Buy and Hold Abnormal Returns (BHARs):

To capture the long-run performance of these IPOs, market adjusted BHARs Model is also used in this study.

$$BHAR_{i,T} = [\prod_{t=1}^{T}(1+r_{i,t})-1] - [\prod_{t=1}^{T}(1+r_{m,t})-1] \qquad 17$$

$BHAR_{i,T}$ is the market adjusted buy-and-hold return for each IPO firm "i" in the period "t". The average BHAR of IPOs for a period *t* is calculated as:

$$BHAR_t = \frac{1}{n}\sum_{t=1}^{n} BHAR_{i,T} \qquad 18$$

The t-statistics is also employed to test the significance of market adjusted cumulative returns (mCRs) and BHARs in different time horizon. *The second Hypotheses, "The cross sectional market adjusted cumulative returns (mCRs) and BHARs of IPO firms after the public offerings in different time horizon are different from 0" is tested.*

$$t = \frac{mCR_{i,t}}{\sigma(mCR_{i,t})/\sqrt{n_t}} \qquad 19$$

Where, $\sigma(mCR_{i,t})$ is the cross sectional standard deviation of market adjusted cumulative returns for the sample of *n* IPO firms in the t[th] period.

$$t = \frac{BAHR_t}{\sigma(BAHR_{i,T})/\sqrt{n}} \qquad 20$$

Where $\sigma(BHAR_{i,T})$ is the cross sectional standard deviation of the market adjusted buy-and-hold returns for the sample of n IPO firms in the t^{th} period.

3.2.2.3 Long-run performance using Jenson's alpha

Similarly Long-run performance is also being measured on the basis of Jensen's alpha obtained by applying the following regression models.

$$r_{i,t} - r_{f,t} = \alpha_t + (r_{mt} - r_f)\,\beta_t + \varepsilon_{it} \quad (21)$$

$$r_{i,t} - r_{f,t} = \alpha_t + (r_{mt} - r_f)\,\beta_t + (SMB_t)\,S_t + (HML)\,h_t + \varepsilon_{it} \quad (22)$$

$$r_{i,t} - r_{f,t} = \alpha_t + (r_{mt} - r_f)\,\beta_t + (SMB_t)\,S_t + (HML)\,h_t + (WML)\,m_t + \varepsilon_{it} \quad (23)$$

Where, α_t is the intercept obtained by running the above three equations in different time periods (12, 18, 24, 30 & 36 months, 24, 36, 48, 60 & 72 fortnights, 48, 72, 96, 120 and 144 weeks) for each IPO firm. For equation 22, SMB and HML, equally and value weighted methods both are used for portfolio construction to calculate size and value premium factors. The average α's in different time horizons is calculated.

On the basis of these models, The Jensen's alpha is calculated by running the 4,575 regressions with the help of e-view software. To run these large numbers of regressions the programing module is written in the e-views software and tables are created in excel by writing different modules in the form of macros.

The third Hypotheses, *"The long-run performance of IPOs in different time horizons is different from zero"* is tested. *This means that the intercept $\alpha < 0$ against $\alpha >= 0$ is tested.*

3.2.3 Regression Model for determinants of underpricing

To find the determinants of underpricing of IPOs, cross-sectional regression is conducted. These analyses are helpful to identify the effect of different variables on the magnitude of underpricing.

The regression model is based on previous theories like; agency theory, asymmetric information and signaling theory. The level of underpricing increases with the level of uncertainty about the new issue of IPO (Beatty and Ritter 1986, Baron 1982 and Ritter, 1984). Asymmetry information exists between the different participants of IPOs. As an IPO is a new firm, information about potential market demand and true value of firm is unevenly distributed amongst different stakeholders i.e. the IPO firm, the underwriter and the investor, so underpricing is done under the underwriter' umbrella to safeguard a full subscription of the new issue. Therefore, it reduces possible losses arising from ex ante uncertainty about the new IPO firm. A positive relationship between ex ante and level of underpricing variables is expected.

Similarly, in well-known Rock's model (1986), the winner-curse, only uniformed investors submit order for over-priced stocks to win 100% allocation, however, informed and uninformed investors submit purchase order for underpriced shares, as a result over-subscription arises. Therefore, a positive relation between oversubscription and level of underpricing variables is expected.

The new issue is usually valued by its offer price. Chen et al. (2004) argues that the firms with better growth perspectives have higher P/E ratio which ultimately goes towards higher risk and that further leads to more uncertainty. Allen and Faulhaber (1989) concluded in his study that the level of underpricing is judged by the intrinsic value of the IPO firm or its post-issue; higher the intrinsic value more the underpricing. Moreover, their findings are also supported by Grinblatt & Hwang (1989) and Welch (1989). In all these models, underpricing is used as a signal that the company is of high quality whereby an IPO firm that underpriced more, is considered a well company. Further, Allen & Faulhaber (1989) added that to recuperate the loss of underpricing in IPOs that was deliberately made as IPOs priced below their intrinsic value, is compensated in the

seasoned issues that offered at high prices. Therefore, the Secondary Issue (SI) is an important mechanism by which high quality companies recoup the underpricing costs. A positive relationship of Market Capitalization & SI variables with the level of underpricing variable is expected.

On the other hand, Perotti (1995) argues that Govt. prefer steady sale of IPOs to show commitment of privatization, so they issue small proposition and retained large. The lesser percentage of IPOs offered and higher percentage of IPOs retention by the original owners indicate the signal that IPO firm has high value.

Finkle (1998) argued that different stakeholders of IPOs perceive lesser uncertainty in the new issues of large firms as compared in the new issues of small firms. Fama (1993) argued that investors of small firms are more sensitive with regard to various risk factors like problem of financial flexibility and less diversification in the business as compared with larger firms. Carter, Dark, & Singh (1998) found that the larger firms have better access to different resources and they can attract more prestigious underwriters. A negative relationship between percentage of shares offered and size variables and the level of underpricing variable is expected as found in earlier studies.

The market volatility is also being considered regarding the degree of underpricing. The underwriters are involved by offering the shares of IPO firms at deep underpricing when volatility in the market is high in order to lessen the possibility of unsuccessful issues. Miller and Reilly (1987) in their studies found that deep underpricing is observed when volatility in the market is high as compared with the market where volatility in the market is low. Therefore, a positive relationship between the level of underpricing and market volatility variables is expected.

In many studies a negative relationship is found between the first day returns of IPO firms with their long run performance. This negative relationship is in response of underwriter's role as they are involved in the underpricing of IPOs to create the excess demand of new shares of IPO firms. As a result, IPO firms with higher level of

underpricing show worst underperformance in long run. This is also confirmed in the study of Ritter (1991). Shiller (1990) argues that underwriter do underpricing to excess extra demand as a result in long run IPO underperform due to high underpricing. Carter and Dark (1993) have shown greater underperformance of the IPO firms having higher underpricing as compared with the lower underpricing of IPO firms. A negative relationship between long run performance of IPO firms and the level of underpricing variables is expected.

On the basis of theories of asymmetric information, signaling and other variables as discussed above, the fourth *Hypotheses, "A positive relationship of dependent variable P^u (level of underpricing) with independent variables LMC, Ex-Ante, MV, SI, PE, OS, while negative relationship of dependent variable P^u with PSO, Year-n & LOS variables" is tested.*

The general form of above model, by using OLS regression technique is:

$$P^u{}_i = \alpha \quad \sum ß_i \; X_i \quad + \quad \varepsilon_i \qquad 24$$

$P^u{}_i$: level of underpricing of IPOi is used as dependent variable.

α : The intercept term of the model

ßs : Coefficients of the independent variables, Xs

X_i : Determinants of level of underpricing of each IPOs 'i', (Independent variables)

ε : Error Term.

The general form of regression model is transformed into the following model.

$$P^u{}_i = \alpha + \beta_1 \text{ Ex-Ante}_i + \beta_2 \text{ LMC i} + \beta_3 \text{ PSO}_i + \beta_4 \text{ MV}_i + \beta_5 \text{ SI}_i + \beta_6 \text{ PE}_i + \beta_7 \text{ OS}_i + \beta_8 \text{ LOS}_i + \beta_9 \text{ Year-n}_i + \varepsilon_i \qquad 25$$

Where:

P^u: level of underpricing / ARs calculated by different models.

Ex-Ante: This is one of the determinants of underpricing variable. It anticipates uncertainty and is measured by the standard deviation of daily returns of each IPO for a period of one month after the listing date.

SI: Secondary Issues; this is a dummy variable, if SI is made within the periods of twelve months after the IPO, is coded as 1other wise zero.

LMC: Natural Log of Market Capitalization. This variable is used to measure the intrinsic value of an IPO firm. It is obtained as the closing price at the 10^{th} day of trading.

LOS: Natural log of offer size variable. This variable is measured as offering price multiplied by the number shares offered.

MV: Market Volatility variable. It is obtained as the standard deviation of closing value of market index. To measure the standard deviation two months' period before the closing date of subscription of an IPO firm is used.

OS: Over Subscription variable.

PE: Price Earnings ratio. This variable is used to measure the quality of an IPO firm. It is calculated as the average offer price divided by average EPS for the last three years before going public.

PSO: It represents the proportion of shares offered to general public.

Year-n: This variable represents the long run performance of IPO firms measured by different models and error term is normally distributed.

3.2.4 Long run performance of matured and less matured IPO firms

In order to examine the time horizon performance of matured / less matured IPO firms GCT regression model (Generalized Calendar Time Portfolio Analysis) is used, which was initially proposed by Hoechle & Schmid (2008). Particularly, pooled OLS regressions structure by regressing excess returns of IPO firms represented individual firm's by y_{it} on a set of independent variables is estimated as:

$$y_{it} = ((p_{it} \otimes z_{it}) \otimes x_t) \; ß + u_{it} \qquad 26$$

In the above model, vector ß consists of the coefficients of regression and independent variables measured by the Kronecker product ($\otimes$) of three vectors represented by p_{it}, z_{it} and $x_{t.}$.

The risk-adjusted performance of the IPO firms is measured by vector x_t by using four factor Carhart's models as:

$$x_t = [1, RM_t, SMB_t, HML_t, MOM_t] \qquad 27$$

The measurement of all these four factors is same as discussed earlier. The characteristics of IPO firms are represented by two vectors p_{it} and z_{it}.

$$z_{it} = [1, z_{1,it}, \cdots z_{M,it}] \qquad 28$$

z_{it} represent the characteristics like leverage, liquidity, firm valuation and also includes a constant represented as: $z_{m,it}$ (m = 1, ...,M), while vector p_{it} is represented by a constant and a dummy variable (D^T_{it}), if an IPO firms occurred within the last T years is coded as 1, otherwise zero. Therefore:

$$p_{it} = [1, D^T_{it}] \qquad 29$$

Where three different definitions for IPO dummy (D^T_{it}). That is T is set to 1, 2, and 3 years respectively.

Here in this study no firm's characteristics are analyzed, that is, z_{it} is set to 1 for matured and less matured IPO firms.

$$y_{it} = ((p_{it} \otimes z_{it}) \otimes x_t) \ ß + u_{it}$$

$$y_{it} = (([1, D^T_{it}] \otimes 1) \otimes [1, RM_t, SMB_t, HML_t, MOM_t]) \ ß + u_{it}$$

After year 1, $D^T_i=1$

$$y_{it} = (([1, 1] \otimes 1) \otimes [1, RM_t, SMB_t, HML_t, MOM_t]) \ ß + u_{it}$$

$$y_{it} = [1, RM_t, SMB_t, HML_t, MOM_t] \ ß + u_{it}$$

The above model is same as discussed previously in equation number 23. It is used to further strengthen the robustness of the results of four factor model by GCT approach. The IPO performance is measured after 3 years' period for different maturity levels; as a result, the GCT regression model gets the following form.

$$y_{it} = (([1, D^T_{it}] \square 1) \square [1, RM_t, SMB_t, HML_t, MOM_t]) \ ß + v_{it} \qquad 30$$

That is:

$$\begin{aligned} y_{it} = \ & ß_0 + ß_5 \times D^T_{it} \\ & + ß_1 \times RM_t + ß_6 \times (D^T_{it} \times RM_t) \\ & + ß_2 \times SMB_t + ß_7 \times (D^T_{it} \times SMB_t) \\ & + ß_3 \times HML_t + ß_8 \times (D^T_{it} \times HML_t) \\ & + ß_4 \times MOM_t + ß_9 \times (D^T_{it} \times MOM_t) + u_{it} \end{aligned} \qquad 31$$

The above model is applied to capture the long run performance of matured and less matured IPO firms to check the robustness of results, further. The fifth Hypotheses*, "The*

long-run performance of IPOs of matured and less matured firms in different time horizons is different from zero" is tested. *This means that the intercept α < 0 against α >= 0 is tested.*

3.2.5 Data Envelopment Analysis (DEA) Model

DEA is a non-parametric method is used to measure the Pre-Post IPOs efficiency during the study period. The efficiency of different sectors; manufacturing, financial other services, SOEs (State owned enterprises) and private firms is also measured.

Farrell (1957), first time introduced this approach. This methodology was extended by Charnes, Cooper and Rhodes (1978) to introduce CCR model, later on extended by Banker, Charnes and Cooper (1984) to introduce BCC model. DEA is a performance measurement method to evaluate the efficiency of different units like banks, hospitals, police stations, defense, tax offices, education and non-profit organizations. This technique is basically used for input, output relationship and it only gives us relative efficiencies to highlight the "best" producers. In backend of DEA, linear programming is used for a frontier analysis of inputs and outputs. This DEA technique neither requires any assumption for error term nor functional form.

Harrison (2010) argued that although the Balanced Scorecard is a good approach to measure the performance, but fails to answer the questions satisfactorily like; "How well are they doing? or how can they improve?" as different messages can be observed from each ratio. To deal with these types of problems, DEA is considered to be a modern approach to answers in meaningful way by taking actual inputs and outputs to define the multiple performance indicators.

The input oriented and output oriented methodology for efficiency score comparison is used. The efficiency score for each IPO firm in the presence of multiple input and output factors is defined as:

Maximize

$$EfficiencyScore = \frac{WeightedSumofOutput}{WeightedSumofInputs} \quad 32$$

Subject to

$$\frac{WeightedSumofOutput}{WeightedSumofInput} \leq 1 \text{ for j = 1 to n (thus one such constraint for each firm)}$$

For mathematical formulation it is assumed that there is k number of IPOs each with N number of input variables to produce M output.

The relative efficiency score of an IPO firm is obtained by solving the following model proposed by Charnes et al. (1978).

$$TE_k = \sum_{i=1}^{m} u_i Y_{ik} \Big/ \sum_{j=1}^{n} v_j x_{jk} \quad 33$$

Where

y_{ik} = Amount of output *i* produced by the firm *k*
x_{jk} = Amount of input *j* utilized by firm k,
u_i = Weight given to output *i*
v_j = Weight given to input *j*

The Firm maximizes the efficiency ratio TE_k, subject to

$$\sum_{i=1}^{m} u_i Y_{ik} \Big/ \sum_{i=1}^{n} v_j x_{jk} \leq 1 \quad 34$$

In the above algebraic equation the efficiency measure of an IPO firm with the two important constraints that it cannot exceed 1, while the weights of input / output are

positive. The overall objective is to improve the efficiency by selecting the optimal weights that can be selected the techniques of linear programming specified by (Coelli, 1998; Worthington, 1999; Shiu, 2002)

Maximize TE_k

Subject to $\sum_{i=1}^{m} u_i y_{ir} - x_{jr} + w \leq 0$ r = 1, ……,K

$v_j x_{jr} - \sum_{j=1}^{n} u_j x_{jk}$ and u_j and $v_j \geq 0$

To obtain the minimize inputs, Input oriented linear method is used as suggested by Banker and Thrall (1992) and other researcher like Coelli (1998) and Shiu (2002) etc.

Minimize TE_k

Subject to $\sum_{i=1}^{m} u_i y_{ir} - y_{iF} + w \geq 0$ r = 1, ……,K

$x_{jr} - \sum_{j=1}^{n} u_j x_{jk} \geq 0$ and u_j and $v_j \geq 0$

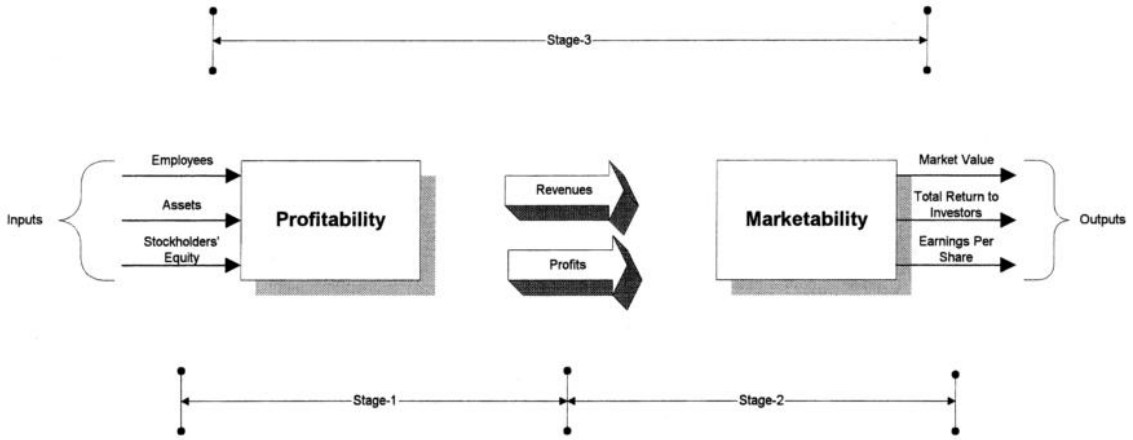
As discussed above the technical efficiency involves the conversion of physical inputs (labors, and machines) into outputs on best practice basis. An IPO firm operating at best practice is said to be 100% technically efficient firm, means, no wastage of inputs, given current technology, by giving the given quantity of output. Technical efficiency is also called managerial efficiency / practices which is based on engineering relationships but not on prices and costs.

On the other hand, in allocative efficiency, input prices, are the main focused to reduce production cost, by making an assumption that that the organization is 100% technically efficient. As in managerial efficiency, the allocative efficiency 100% score indicates that the organization is using its inputs in the proportions that would minimize costs.

The economic efficiency or cost efficiency is the combination of above two efficiencies i.e. technical and allocative efficiency. Therefore, cost efficient organizations are technical as well as allocative efficient.

This CCR model assumed that all the units were operated under CRS (constant return to scale) and achievement of such assumption could be hard. So by adding different constraints BCC improved the original model and make the evaluation of the VRS (variable returns to scale) effect possible. Here in this study BCC and CCR both models are used to measure the pre-post IPOs efficiency. The analysis of scale efficiency which is the ratio of CRS to VRS also conducted. The IPO firm is said to be scale efficient if the ratio is one. In case of less than one, the IPO firm is termed as scale inefficient. To test the statistical significance of scale efficiencies, the t statistic is employed.

For, Input and output, the two- phase methodology is followed, originally devised by Zhu (2000) and is being used by many researchers in the last decade and recently by Chen, Cook and Zhu (2009).



The Pre and post-Performance of IPOs is measured by first phase of DEA approach originally suggested by Zhu (2000) & Chen, Cook and Zhu (2009). and is being used in the later researches. In first phase, number of employees, assets and equity are used as input variables, while revenue and profits are used as output variables. In second phase,

revenue and profits are used as input variables, while market value, total returns to investors and earning per share are used as output variables. In the third phase number of employees, assets and equity are used as input variables, while market value, total returns to investors and earning per share.

To observe the efficiency of IPOs overtime i.e. change in productivity etc., a time series analysis in DEA in the form of Malmquist Productivity Index (MPI) is used. It was initiated by Caves et al. (1982) and get popularized by the work of Fare et al. (1994). It is the product of two terms; the "catching-up" and the "frontier shift". The first one is about the improving of efficiency overtime, while the latter on is about the change in the efficient frontier between the two periods of time.

$$m_0(y_s, x_s, y_t x_t) = \left[\frac{d_0^s(y_t, x_t)}{d_0^s(y_s, x_s)} \mathrm{X} \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s)} \right]^{\frac{1}{2}} \quad 34$$

As in CRS and VRS analysis of efficiency scores, MPI is presented in three stages suggesting changes in five measures; efficiency, technical, pure efficiency, scale efficiency and total factor productivity changes.

To check the relevancy, after measuring the performance of IPOs (by event study methodology by using Market adjusted model, capital asset pricing model and Fama French model) is compared with / by second phase of DEA approach suggested by Zhu (2000) and Chen, Cook and Zhu (2009).

To sum up, all these models are used to calculate level of underpricing of IPO firms, its determinants, performance of IPOs in long run and finally efficiency of these IPO firms in pre and post IPO's event.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter is divided into three main sections. Section A is about analysis and discussion of underpricing of IPOs and its determinants, in section B long run performance is discussed while section C is about the efficiency of IPOs. In all the three sections of this chapter, firstly, the descriptive statistics is discussed that is followed by quantitative analysis, testing of hypotheses and discussion of results.

4.1 SECTION A Underpricing of IPOs and its Determinants

The main objective of this section is to provide insights of the underpricing (on first trading day) of Pakistani IPOs and to find out the determinants of underpricing for these IPOs in the light of asymmetric information and signaling theories. In this section, the descriptive statistics and quantitative analysis of IPOs underpricing is discussed. First, year-wise analysis of different variables and then sector wise analysis of these variables are presented in the descriptive statistics part. Second, level of underpricing is measured with different methodologies and the determinants for this underpricing are discussed.

4.1.1 Descriptive Analysis

Table 4.1.1 contains 8-parts (a-h), showing the year-wise analysis of descriptive statistics of IPOs covering the characteristics of different variables; paid-up capital of these IPOs, offer price, total number of shares offered, total size offered to general public, employees, high net worth investors, local & foreign institutions, total size offered to general public, capital raised from general public, subscription rate and proportion of shares offered to general public. Similarly, descriptive statistics for these variables on sectoral basis is presented in appendix table A-4.1.2 in eight parts (a-h). The main descriptive statistics like central tendency (mean and median), variability (standard deviation), minimum and maximum is discussed.

The increasing trend of IPOs activity is observed from year 2000 to 2005 and then this activity is reduced in the year 2006. The decreasing pattern is also observed from year 2007 to 2009 and then from 2010 to 2012. Year 2005 shows the maximum IPO activity in the study period of 2000 to 2012.

Table 4.1.1: Descriptive Statistics regarding characteristics of IPOs on yearly basis

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Overall
IPOs	1	3	4	5	12	18	4	11	9	3	6	4	3	83
Part-a: Paid-up Capital Of IPO Firms (Rs. In millions)														
Mean	734.0	961.6	1579.6	642.7	5198.9	1427.0	1410.5	1320.0	1591.3	2851.9	5573.1	4002.7	1936.9	**2403.9**
Med.	734.0	900.0	1028.9	600.0	1576.1	547.1	1321.0	675.0	797.7	3540.9	3169.6	4035.4	2172.5	**900.0**
Min.	734.0	50.0	530.0	250.0	225.0	100.0	1000.0	100.0	250.0	1341.4	200.0	460.0	200.0	**50.0**
Max.	734.0	1934.7	3730.4	1475.6	43009.3	8802.5	2000.0	6900.0	5203.7	3673.5	20000.0	7480.0	3438.2	**43009.3**
SD	0.0	770.7	1282.3	448.1	11534.3	2179.0	429.6	1841.5	1768.5	1069.5	6752.4	2492.1	1332.4	**5261.2**
Part-b: Offer Price (Rupees)														
Mean	10.0	33.3	10.0	10.0	18.5	21.2	11.3	39.6	33.5	10.0	15.5	17.0	10.0	**21.8**
Med.	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	18.0	10.0	13.3	16.5	10.0	**10.0**
Min.	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	**10.0**
Max.	10.0	80.0	10.0	10.0	55.0	57.8	15.0	235.0	125.0	10.0	30.0	25.0	10.0	**235.0**
SD	0.0	33.0	0.0	0.0	13.4	16.3	2.2	66.8	36.5	0.0	6.6	5.6	0.0	**31.0**
Part-c: Number of shares offered (In millions)														
Mean	18.5	25.1	21.9	12.5	56.9	24.0	34.0	21.5	25.6	50.4	82.9	45.8	16.7	**34.25**
Med.	18.5	20.0	20.2	10.0	35.0	14.6	35.0	25.0	24.0	33.7	38.8	39.3	10.0	**22.50**
Min.	18.5	1.3	10.0	6.3	10.0	2.5	25.0	5.0	7.5	22.5	10.0	15.0	10.0	**1.25**
Max.	18.5	54.0	37.3	20.0	215.1	88.0	41.1	39.3	59.8	95.0	200.0	89.4	30.0	**215.05**
SD	0.0	21.8	11.0	4.9	57.9	22.5	6.8	10.8	17.7	31.9	84.6	28.4	9.4	**40.42**
Part-d: Total size Offered to G. Public, employees HNWIs, local and foreign institutions (Rs. In millions)														
Mean	185.0	280.0	219.4	124.5	1468.0	528.0	391.6	985.0	645.3	503.9	1043.0	766.0	166.7	**713.1**
Med.	185.0	200.0	202.3	100.0	525.0	225.0	350.0	250.0	325.0	336.6	646.5	828.6	100.0	**250.0**
Min.	185.0	100.0	100.0	62.5	100.0	40.0	250.0	50.0	120.0	225.0	125.0	150.0	100.0	**40.0**
Max.	185.0	540.0	373.0	200.0	6881.5	2640.8	616.5	8107.5	1620.0	950.0	2700.0	1256.7	300.0	**8107.5**
SD	0.0	188.3	109.9	49.0	2198.9	760.0	140.6	2256.6	516.9	318.7	972.7	410.9	94.3	**1334.1**
Part-e: Total size Offered to General Public (Rs. in millions)														
Mean	185.0	280.0	219.4	122.4	1434.2	445.1	368.5	831.9	619.1	503.9	443.4	454.7	73.3	**604.1**
Med.	185.0	200.0	202.3	100.0	423.8	218.8	310.0	250.0	308.8	336.6	369.0	530.9	95.0	**250.0**
Min.	185.0	100.0	100.0	62.5	100.0	40.0	250.0	50.0	91.2	225.0	56.0	50.0	25.0	**25.0**
Max.	185.0	540.0	373.0	197.5	6881.5	2072.0	604.2	6486.0	1539.0	950.0	1100.0	707.0	100.0	**6881.5**
SD	0.0	188.3	109.9	47.1	2208.6	563.4	138.4	1793.0	493.4	318.7	357.6	264.8	34.2	**1183.6**

Part-f: Total Size subscribed by the General Public (Rs in millions)

Mean	226.0	215.5	281.9	540.6	5612.4	1995.3	1973.9	2076.1	1845.4	328.2	552.9	327.4	130.2	**1943.5**
Med.	226.0	205.8	36.7	121.1	621.2	179.9	1644.7	543.3	1402.6	274.3	183.2	334.6	115.3	**270.5**
Min.	226.0	6.1	21.1	39.9	73.5	3.3	8.0	37.8	19.5	3.3	75.1	0.0	4.8	**0.010**
Max.	226.0	434.6	1033.2	1332.7	28118.4	20841.1	4598.0	15577.4	7057.1	707.0	2006.9	640.4	270.6	**28118.4**
SD	0.0	175.1	433.8	564.3	9334.9	5169.7	1950.6	4310.0	2044.2	289.8	689.7	231.5	109.0	**4938.3**

Part-g: IPOs under / oversubscribed (in millions)

Mean	1.22	1.80	0.85	3.44	3.26	2.67	4.52	2.63	5.29	0.66	1.10	0.59	1.40	**2.701**
Med.	1.22	1.03	0.24	1.21	2.25	1.10	4.18	2.17	3.16	0.74	1.10	0.66	1.15	**1.155**
Min.	1.22	0.01	0.16	0.64	0.07	0.02	0.03	0.13	0.08	0.01	0.23	0.00	0.19	**0.0002**
Max.	1.22	4.35	2.77	8.77	11.37	19.60	9.70	6.79	17.46	1.22	1.82	1.04	2.85	**19.600**
SD	-	1.85	1.11	3.24	3.09	4.87	4.21	1.97	5.73	0.50	0.48	0.43	1.10	**3.760**

Part-h: Proportion of shares offered to General Public

Mean	0.25	0.32	0.17	0.26	0.26	0.26	0.25	0.31	0.24	0.19	0.23	0.18	0.22	**0.2516**
Med.	0.25	0.25	0.17	0.25	0.28	0.25	0.25	0.35	0.24	0.25	0.20	0.17	0.14	**0.2500**
Min.	0.25	0.10	0.10	0.07	0.05	0.10	0.20	0.05	0.10	0.06	0.04	0.04	0.03	**0.0291**
Max.	0.25	0.60	0.25	0.40	0.44	0.40	0.30	0.50	0.40	0.26	0.50	0.33	0.50	**0.6000**
SD	0.0	0.21	0.06	0.11	0.10	0.08	0.04	0.15	0.11	0.09	0.15	0.11	0.20	**0.1231**

while year 2000 shows disappointing activity as only one IPO issued, even more unfavorable in 2013 (till July), where no firm can go for an IPO. In the year 1992 there were 86 IPOs which are even greater than the whole sample period of 2000-12. If the sample period is compared with the nineties decade that is in 1991-99, the total IPOs were 334. It means that overall IPO activity is reduced to 73% from one decade to other. In appendix table A-4.1.1, Equity Investment Instruments sector and Financial services sector show the highest IPO activity while in nine sectors; Food Producers, General Industrials, Industrial Transportation, None Life Insurance, Real Estate Investment & Services, Software & Computer Services, Support Services, Technology Hardware & Equipment and Travel & Leisure, lowest IPO activity is observed during the sample period of 2000-12.

Although KSE is performing an excellent price appreciation in the stocks and index has crossed the 23000 points barrier and showed the remarkable performance amongst the world's indices. However, no IPO is listed in year 2013 because of economic recession in

the country that restricts the IPO activity in the year. Globally and in Asia IPO activity is also reduced in year 2012 as compared with the previous year 2011.

The Part-a, of Table 4.1.1 represents the average paid-up capital of each year from 2000 to 2012. In the sample period, the minimum average paid-up capital of these IPO firms is Rs. 90.00 million while the maximum is Rs. 43009.3 million. The figure 4.1.1- a1 also depicts that the average paid-up capital of these IPO firms is highest in year 2010, next to highest in 2004, whilst, lowest in year 2003.

Figure 4.1.1-a1

The Part-a, of appendix Table A-4.1.1 represents the sector-wise average paid-up capital for the sample period from year 2000 to 2012. The minimum paid-up capital of these IPO firms remain at Rs. 50.00 million of an IPO firm under the chemical sector while the maximum paid-up capital remains at Rs. 43009.3 million of an IPO firm under the oil and gas producer sector. The Figure is also displayed as figure 4.1.1-a2. This Figure also depicts the average paid-up capital of these IPO firms remain at its highest level for the sector oil and gas producer sector, whilst, lowest in the software & computer services sector. The eighteen Out of twenty-one sectors, the average paid-up capital remains below Rs. 4,000 million.

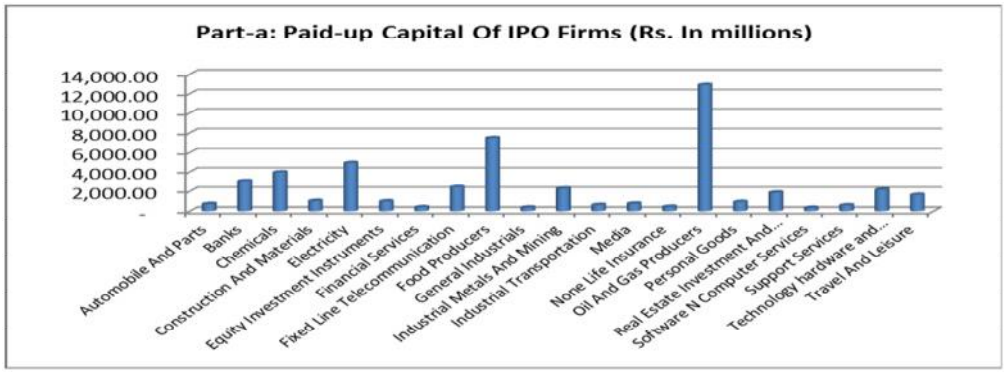


Figure 4.1.1-a2

The part-b of Table 4.1.1 shows that the mean offer price of IPOs remains at Rs.21.80, while the median offer price remains at Rs.10. The offer price varies from Rs.10.00 to Rs.235.00 during the sample period of 2000 to 2012. The overall variability in the offer price is observed to be Rs.31.04. The table also depicts the offer price of an IPO firm remains at its highest level of Rs.235.00 in year 2007, whilst, second highest of Rs.125.00 in year 2008. That is in year 2007 Habib Bank Limited issued share at premium of Rs.225.00, which is ever highest in the history of IPOs in Pakistan.

The Figure is also displayed as figure 4.1.1-b1. This Figure portrays the yearly average offer price of IPOs. The year 2007 shows the mean average offer price of Rs.39.60 which is the highest one amongst all the years. Year 2001, 2007 and 2008 show that IPOs are issued at high level of premium amount, while in the years 2000, 2002, 2003, 2006 and 2012 an average yearly price remains at Rs.10.00.

The part-b of appendix Table A-4.1.1 shows sector-wise descriptive statistics regarding the offer price. The mean offer price of IPOs remains at Rs.21.80, while the median offer price remains at Rs.10 amongst all the 21 sectors. The table also depicts the highest offer price these IPO firms remain at its highest level of Rs.235.00 in the banking sector, whilst, second highest offer price is of Rs.125.00 in the financial services sector. This indicates that overall financial sectors issued shares at its highest premium level. The only eight out of the thirteen sectors issued shares at its face value, while, other 13 sectors issued shares at its premium value.

Figure 4.1.1-b1

The Figure is also displayed as figure 4.1.1-b2. This Figure portrays the sector wise an average offer price of these IPOs. The banking, financial and oil & gas producer sectors show the mean average offer price of Rs.36.00 or greater with banking sector at the top with an average offer price of Rs.43.44. Similarly the chemicals, food producers and Software & Computer Services sectors show the mean average offer price of Rs.23.00 or greater.

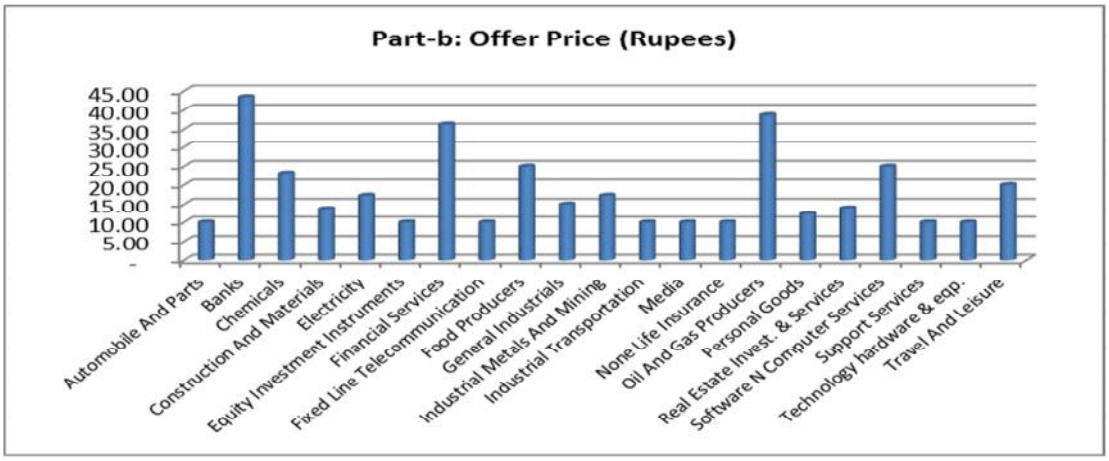


Figure 4.1.1-b2

The part-c of Table 4.1.1 shows that the mean shares offered of IPOs remains at 34.24 million. The shares offered ranges from 1.25 million to 215.05 million during the sample period of 2000 to 2012 with variability of 40.42 million. The table also depicts the shares offered by an IPO firm remains at its highest level of 215.05 in year 2004, whilst, second highest of 200.00 million in year 2010. On the other hand in year 2001, the shares offered

by Arif Habib Corporation remains at its lowest during the sample period of 2000 to 2012.

Figure 4.1.1-c1

The Figure is also displayed as figure 4.1.1-c1. This Figure portrays the yearly average shares offered of IPO firms. The year 2010 shows the mean average shares offered is 82.94 million which is the highest one amongst all the years, while, year 2003 shows the lowest one shares offered of 12.45 million.

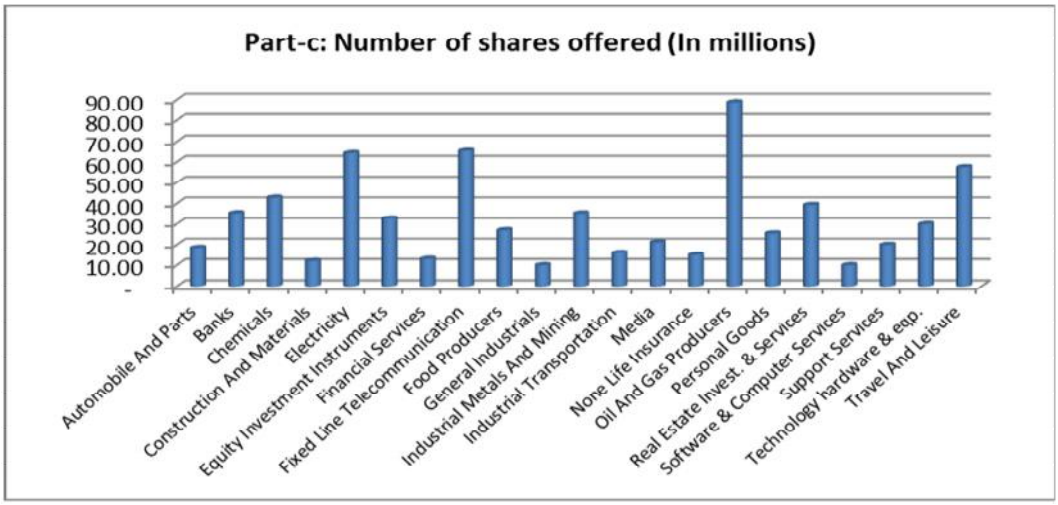


Figure 4.1.1-c2

The part-c of appendix Table A-4.1.1 shows offered shares on sector-wise basis. The mean shares offered of these IPOs remains at 34.24 million, while the median shares

offered remains at 22.50 million amongst all the 21 sectors. The table also depicts the highest shares offered by these IPO firms remain at its highest level of 215.05 million in the oil and gas producer sector. On the other hand, shares offered by the chemical sector remain at its lowest level.

The Figure is also displayed as figure 4.1.1-c2. This Figure portrays the mean average of shares offered of theses IPOs on sector-wise basis. The four sectors; construction & materials, financial services, general industries and oil & gas and software & computer services show the mean average shares offered less than 13.00 million. On the other hand, three sectors; electricity, fixed line telecommunication and oil & gas producer show the mean average shares offer of 64.30 million or greater with oil and gas producer sector at the top with an average shared of 88.79 million.

Figure 4.1.1-d1

The part-d of Table 4.1.1 shows that the mean total size remains at Rs.713.10 million that were offered to general public, employees, HNWIs (high net worth investors), local and foreign institutions, while the median total size remains at Rs. 250.00 million for the sample IPOs firms for the period 2000-12. The offer size varies from Rs.40.00 million to Rs.8107.50 million. The overall variability in the offer size is observed to be Rs.1331.40 million. The Apna Microfinance Bank Limited issued lowest size while Habib Bank Limited issued highest offer size. The table also depicts the mean yearly offer size IPO firms remain at its highest level of Rs.1,468.00 million in year 2004, whilst, lowest in 2003 that are also displayed in Figure 4.1.1-d1. The Figure also portrays that in the year

2001 to 2004 and 2012 the average yearly offer size remains below the Rs. 250.00 million.

The Part-d, of appendix Table A-4.1.1 represents the sector-wise average size offered for the sample period from year 2000 to 2012. The table also depicts the offer size of an IPO firm remain at its highest level of Rs.8,107.50 million for the banking sector and remain lowest size offered by an IPO firm of Rs.40.00 million for the banking sector as well. The results are also displayed in Figure 4.1.1-d2. This Figure also depicts the average offered size of these IPO firms remain at its highest level for the sector oil and gas producer sector, whilst, lowest in the None life insurance sector. In the twelve out of twenty one sectors, the average sector-wise size offered remains below of Rs. 372.00 million, while in the four sectors the average sector-wise size offered remains above of Rs. 1,000.00 million.

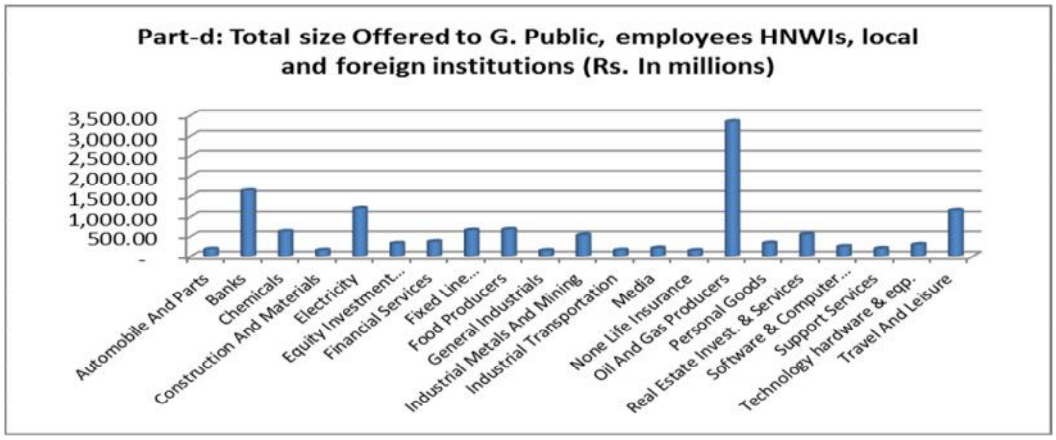


Figure 4.1.1-d2

The parts e and f of Table 4.1.1 represents the mean yearly size offered to general public only and mean yearly subscription by the general public. The year 2004 show the highest mean size of Rs. 1,434.20 million offered to general price as well as highest amount of Rs. 5,612.40 million subscribed. On average year 2004 is over-subscribed by 536%. On the other hand year 2012 show the lowest mean size offered to general price as well as lowest amount subscribed by the general public. Except, the years 2001, 2009 and 2011,

in all the other sample period years, IPOs are over-priced. The graphical view is represented as Figure 4.1.1-e1-f1.

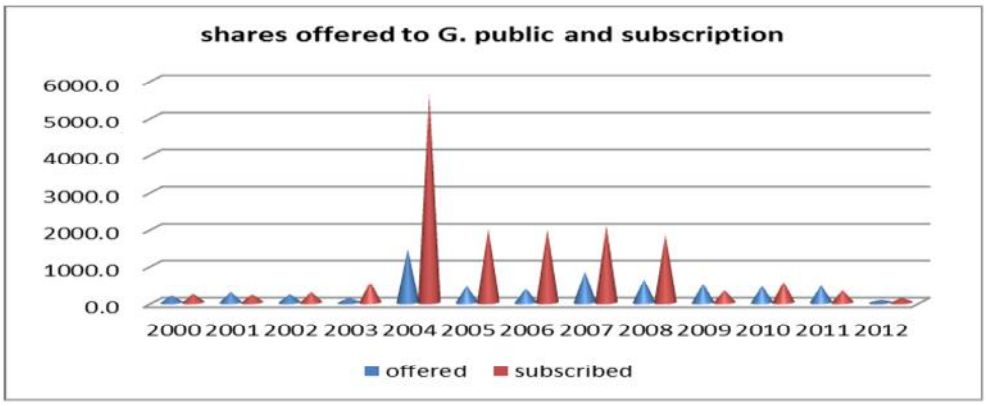


Figure 4.1.1-e1-f1

The parts e and f of appendix Table A-4.1.1 represents the mean size offered to general public only and mean yearly subscription by the general public on sector-wise basis. The sector oil and gas producers show the highest mean size of Rs. 3,340.190 million offered to general price as well as highest amount of Rs. 15,272.42 million subscribed. This sector, on average is highly over-subscribed by 457%. The electricity and banking sectors are also largely over-subscribed by the investors. On the other hand sector None life insurance show the lowest mean size offered to general price as well as lowest amount subscribed by the general public. Four out of twenty one sectors, on average, are under-subscribed. The graphical view is represented as Figure 4.1.1-e2-f2.

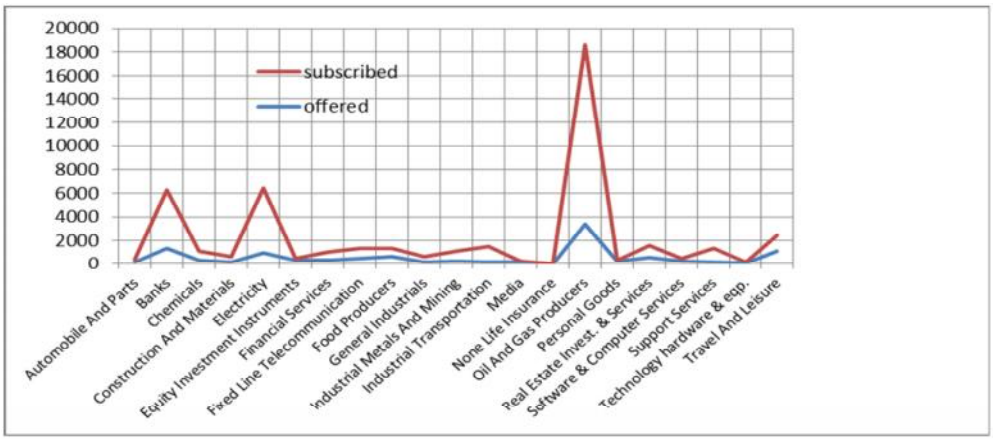


Figure 4.1.1-e1-f1

The part g of table 4.1.1 represents the yearly average subscription rate. The highest average subscription rate is to be observed in the year 2008 and second highest in the year 2006. While subscription rate remains below one in the years 2002, 2009 and 2011 with the lowest one in 2011. The graphical view is represented as Figure 4.1.1-g1

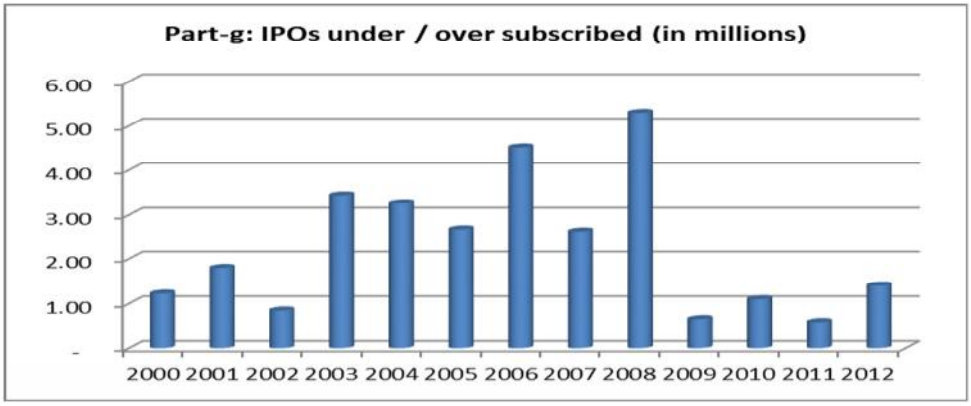


Figure 4.1.1-g1

The part g of appendix table A-4.1.1 represents the average subscription rate on sector-wise basis. The highest average subscription rate is to be observed in the industrial transportation sector and second highest in the oil and gas producer sector. While subscription rate remains below one in the food producers, equity investment, media, none-life insurance and personal goods sectors. The graphical view is represented as Figure 4.1.1-g2

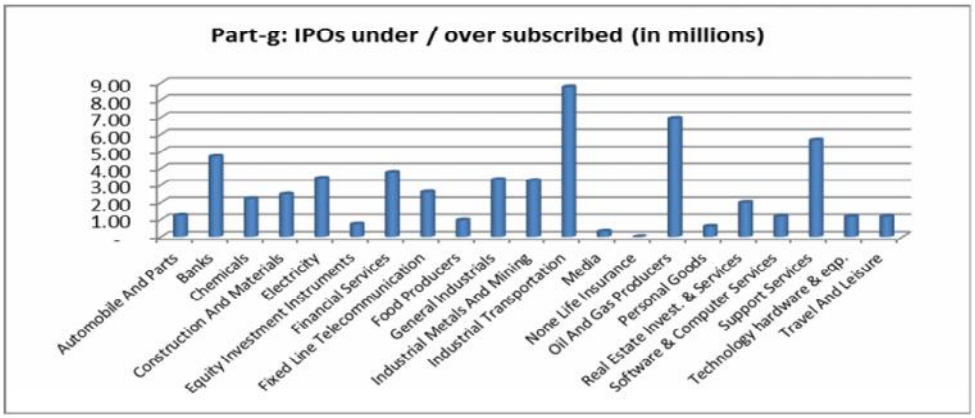


Figure 4.1.1-g2

The part h of table 4.1.1 represents the yearly average proportion of shares offered out of paid-up capital. The mean proportion of shares offered remains at 25.16% and median 25% for the whole sample period. The highest average proportion of shares offered is to be observed in the year 2001while lowest in the year 2012. Interestingly, none of the year show proportion of shares offered remains below 17 percent. The graphical view is represented as Figure 4.1.1-h1.

Figure 4.1.1-h1

The part h of appendix table A-4.1.1 represents the average proportion of shares offered out of paid-up capital on sector-wise basis. The highest proportion shares offered rate is to be observed in the equity investment sector, while lowest in the food producers sector. The graphical view is represented as Figure 4.1.1-h2

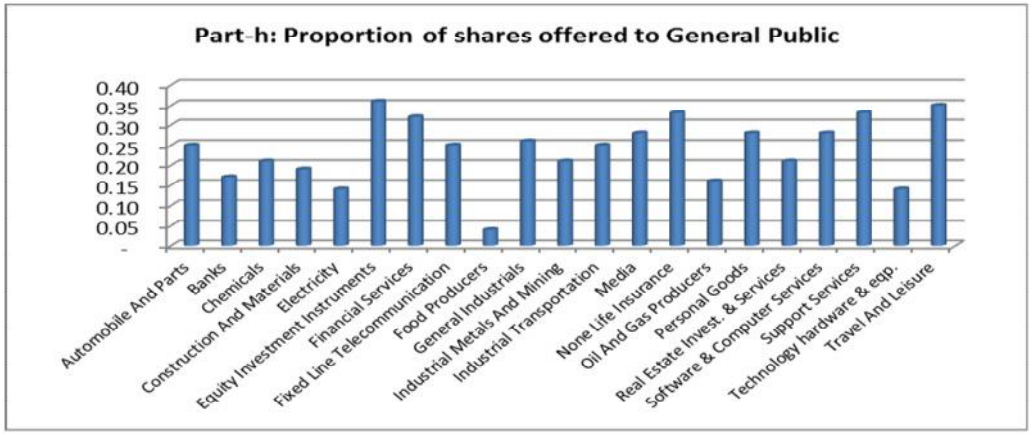


Figure 4.1.1-h2

To sum up the descriptive statistics, the increasing trend of IPOs activity is observed from year 2000 to 2005at KSE and then this activity is reduced in the year 2006. The decreasing pattern is also observed from year 2007 to 2009 and then from 20010 to 2012, while year 2005 showed the peaked IPO activity at KSE in the study period of 2000 to 2012. Equity Investment Instruments sector and Financial services sector show the highest IPO activity while in nine sectors; Food Producers, General Industrials, Industrial Transportation, None Life Insurance, Real Estate Investment & Services, Software & Computer Services, Support Services, Technology Hardware & Equipment and Travel & Leisure, lowest IPO activity is observed.

The mean total size remains at Rs.713.10 million that were offered to general public, employees, HNWIs. The Apna Microfinance Bank Limited issued lowest size while Habib Bank Limited issued highest offer size. The mean yearly offer size IPO firms remain at its highest level of Rs.1,468.00 million in year 2004, whilst, lowest in 2003. The shares offered ranges from 1.25 million to 215.05 million during the sample period of 2000 to 2012.

4.1.2 Underpricing and its determinants

In this part, firstly the characteristics of variables that are used in the regression models are discussed. Secondly determinants of underpricing are discussed; the level of underpricing is determined by different models.

Table 4.1.2: Descriptive Statistics of variables used in regression analysis

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
Underpricing	0.33	0.06	0.61	(0.36)	3.22
Ex_Ante	1.90	0.91	3.59	0.00	29.25
Ln_Mkt_Cap	21.37	21.26	1.51	18.49	26.15
SI	0.05	0.00	0.22	0.0	1.00
Mkt_Volt	403.19	282.84	302.01	56.30	1,341.36
Ln_Size	19.61	19.34	1.11	17.50	22.82
P_O_G	0.25	0.25	0.12	0.03	0.60
O_U_Subs	2.70	1.16	3.78	0.00	19.60
P_E	1.95	4.26	76.88	(250.00)	500.00

The table 4.1.2 represents the central tendency (mean and median), variability (SD), minimum and maximum values of variables that are used to regression model. The table depicts that mean underpricing remains at 33%, the minimum -36% and maximum 322%.

4.1.2.1 Measurement of underpricing

The level of underpricing (adjust returns on first trading day) is measured with the help of two models i.e. by market adjusted return model and by matched firm adjusted return model. First, the underpricing analysis and then these analyses on year-wise and sector-wise basis are discussed.

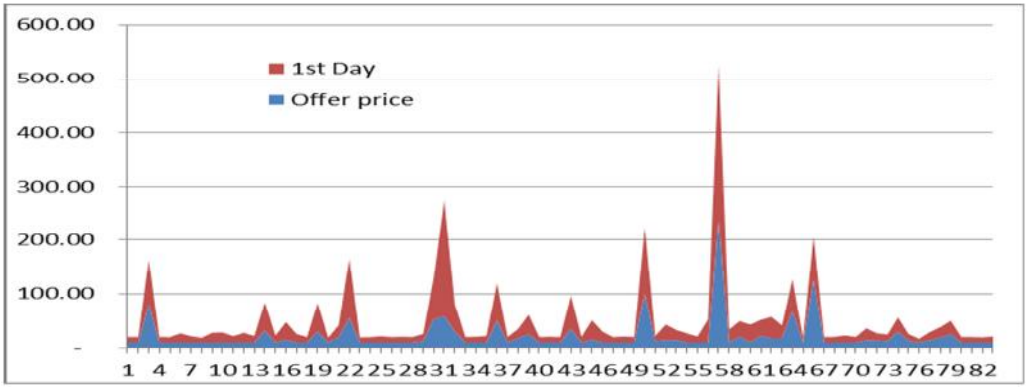


Figure 4.1.2.1.1.a: Offer price vs first day return

4.1.2.1.1 Underpricing

The underpricing is the difference between the offer price and the market price at the first trading day of an IPO firm. The Figure 4.1.2.1.1.a shows the substantial underpricing of these IPO firms is observed during the entire sample period from 2000 to 2012. The first day market price has dominated the offer price entirely except for the first and last ten IPOs out of 83 IPOs. The issuers suffer the loss due to this underpricing. The Figure 4.1.2.1.1.b and table 4.1.2.1.1.a represents the year wise while Figure 4.1.2.1.1.c and table 4.1.2.1.1.b represents the sector-wise underpricing / overpricing of these IPOs.

Table 4.1.2.1.1.a: Year-wise underpricing analysis

Year	Offer price	1st Day price	Underpricing
2000	10.00	9.95	(0.01)
2001	33.33	34.35	0.01
2002	10.00	11.64	0.16
2003	10.00	15.43	0.54
2004	18.50	28.86	0.37
2005	21.15	35.58	0.32
2006	11.25	18.89	0.59
2007	39.59	53.10	0.64
2008	33.50	34.44	0.43
2009	10.00	11.08	0.11
2010	15.50	15.37	0.00
2011	17.02	17.10	0.01
2012	10.00	10.15	0.02
Average	21.76	29.12	0.33

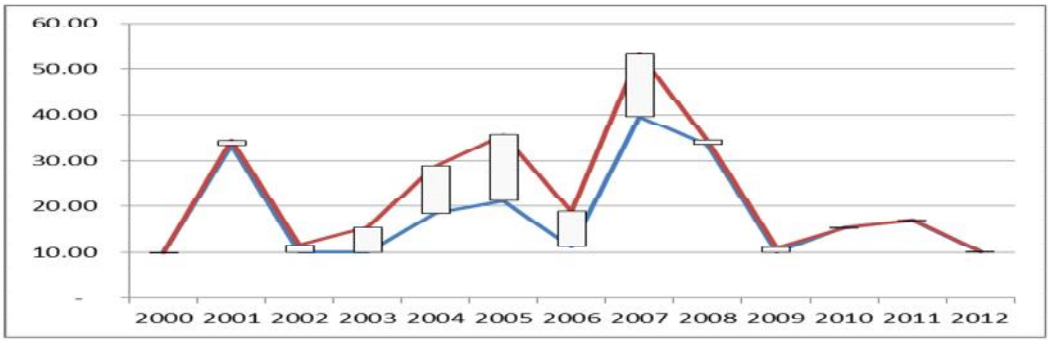


Figure 4.1.2.1.1.b: Year-wise underpricing analysis

The year-wise analysis shows that underpricing is observed in all the years except in year 2000 and 2010. The overpricing is observed in the years 2000 and in year 2010. The increasing pattern is observed from year 2001 to 2003. From 2004 to 2005 the amount of underpricing is decreased to some extent as compared with the year 2003. Again, increasing trend is noticed from year 2005 to 2007. The highest underpricing is observed in year 2007. In year 2009, 2011 and 2012, the amount of underpricing remains minimal. The years 2004, 2005 and 2007 also show higher underpricing with reference to size that can be viewed in the form bar in the Figure 4.1.2.1.1.b.

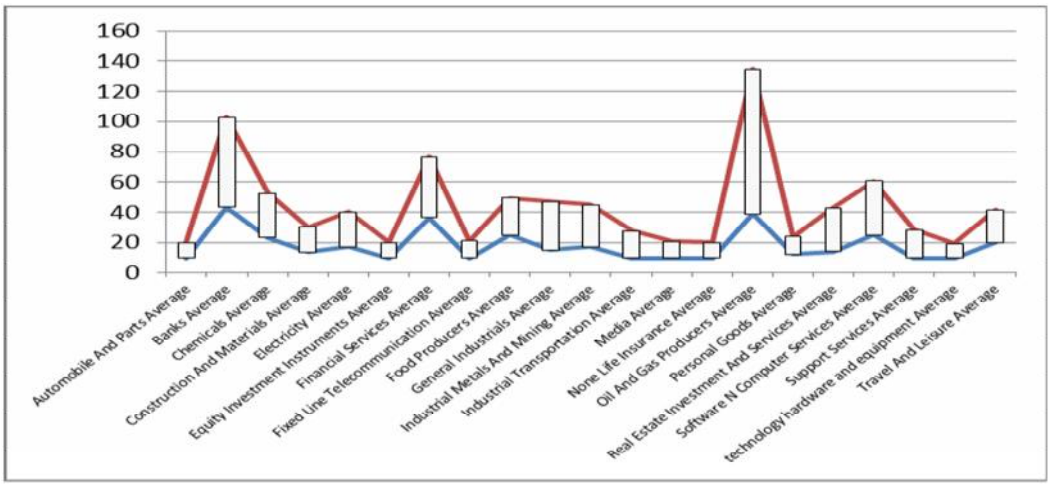


Figure 4.1.2.1.1.c: Sector-wise underpricing analysis

Table 4.1.2.1.1.b: Sector-wise underpricing analysis

Sector	Offer price	1st Day price	Underpricing
Automobile And Parts Average	10.00	9.95	(0.01)
Banks Average	43.44	59.28	0.55
Chemicals Average	23.19	29.61	0.59
Construction And Materials Average	13.80	16.28	0.15
Electricity Average	17.25	23.08	0.24
Equity Investment Instruments Average	10.00	10.11	0.01
Financial Services Average	36.25	40.03	0.37
Fixed Line Telecommunication Average	10.00	10.99	0.10
Food Producers Average	25.00	24.71	(0.01)
General Industrials Average	15.00	32.25	1.15
Industrial Metals And Mining Average	17.27	27.78	0.57
Industrial Transportation Average	10.00	17.80	0.78
Media Average	10.00	10.75	0.08
None Life Insurance Average	10.00	9.96	(0.00)
Oil And Gas Producers Average	38.69	96.16	1.05
Personal Goods Average	12.25	11.62	(0.04)
Real Estate Investment And Services Average	14.00	28.90	1.06
Software N Computer Services Average	25.00	35.75	0.43
Support Services Average	10.00	18.30	0.83
Technology hardware and equipment Average	10.00	9.42	(0.06)
Travel And Leisure Average	20.00	21.70	0.09
Grand Average	21.76	29.12	0.33

The sector wise analysis shows that underpricing is also observed in all the sectors except Technology hardware and equipment, personal goods, none life insurance, food producers and automobile & parts sectors. More than 100% underpricing is observed in the sectors of Oil & Gas Producers, Real Estate Investment & Services and General Industrials. The sector oil and gas also show the higher underpricing with reference to size that can be viewed in the form of bigger bar in the Figure 4.1.2.1.1.b.

4.1.2.1.2 Level of underpricing

The level of underpricing means adjusted returns of IPOs on their first trading day. Generally, market adjusted returns are used to represent the level of underpricing. Here, in this study, first time, matched firm technique is used to calculate adjusted returns on first trading day in addition to the market adjusted returns. Although matched firm technique is previously used to observe the long run performance of IPOs, but no one study exist (to the best of our knowledge) in which matched firm methodology is used to calculate the adjusted returns on the first trading day. The matched firm technique is used on reduced sample of sixty one IPOs only as in determining the reasons for underpricing one of the variables is long run performance and in long run performance sample is reduced to sixty one IPOs.

The difference of the statistical significance of the two methods is also tested with the help of t statistic of difference of two sample means, which explain; that: is there any difference between the two methods?

4.1.2.2 First day Market Adjusted Returns

The significant level of underpricing is observed in the KSE for the sample period of 2000 to 2012, which validates the underpricing phenomena in the globe. The results are displayed in table 4.1.2.2-A. The level of underpricing is found to be 28.28%, significant at 1% level with an associated t statistic of 4.621, while the median level of underpricing remains at 7.80%. The significant average raw return of IPOs is observed to be 32.76% while the significant average market returns remains at 3.48%.

The amount of level of underpricing is decreased compared as reported in the earlier studies on KSE market. Sohail and Nasr (2007) reported level of underpricing as 35.66% for the sample of 50 IPOs, while Sohail et al (2010) reported level of underpricing as 42.17%. It shows the efficiency of issuing firms of IPOs as underpricing is ultimate loss to the issuer firm. The results of underpricing at KSE confirm the early studies across different countries in the globe like US, UK, Europe, other developed countries, Asian countries and south Asian countries as discussed in detail in the literature part of thesis.

This table also depicts that 32.53% IPOs (27 from 83 IPO firms) offer the investors with negative market adjusted returns of 11.34% on the first trading day, showing the overpricing of IPOs, while 67.47% IPOs (56 from 83 IPO firms) offer the investors with positive market adjusted return of 47.39% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 83 IPOs offer the investors with positive market adjusted return.

Table 4.1.2.2-A: Level of underpricing (full sample)

Returns	**IPO firms**	**Market (Index)**	**Level of underpricing**
Number of observations	83	83	83
Average	0.3276*	0.0348*	0.2828*
Median	0.0600	0.0206	.0780
Standard Deviation	0.6154	0.1170	0.5576
Standard Error Mean	0.0676	0..128	.0612
t-statistic	4.849	2.714	4.621
No of +ve Returns with mean	58, 0.5035	52, 0.0992	56, 0.4739
No of -ve Returns with mean	25, -0.0803	31, -0.0741	27, -0.1134
Maximum	3.2200	0.4473	3.1635
Minimum	-0.3576	-0.2538	-0.2956

*Significant at 1% level. The average level of underpricing on first trading day is 28.28% with an associated t-statistic of 4.621. The average raw return is 32.76% with an associated t-statistic of 4.849. The average market return is 2.06% with an associated t-statistic of 2.714.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 28.28% with an associated *t*-statistic of 4.621, which is highly significance at 1% level of significance. This also prove that investors can make a market adjusted profit of 28.28% while investing in the new issues of the firms. The level of underpricing ranges from -29.56% (minimum return) to 316.35 % (maximum return) with a standard deviation of 55.56%. The graphical view is presented as Figure 4.1.2.2-a representing the plot of raw returns, market returns and level of underpricing of all the eighty three IPOs for the whole sample.

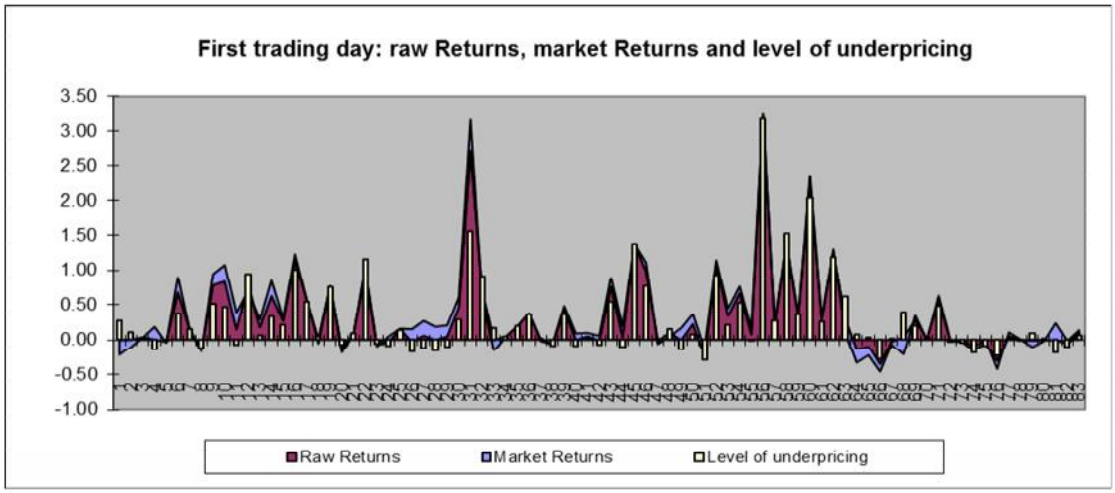


Figure 4.1.2.2-a

The analysis in the table 4.1.2.2-B and Figure 4.1.2.2-b shows that on average investors who have purchased the shares in the primary market can make profit (market adjusted) at least 24.95%, even if they sell the shares at its lowest prices at the first trading day of these IPO firms. Likewise, investors can make an average market adjusted profit of 35.16%, if they manage to sell the shares at its highest prices at the first trading day. If investors are worried that share prices may fall from the opening prices, and if the investors sell the shares in the opening session on first trading day, even they can earn market adjusted profit of 24.95%.

These results further depict that there is also some profit opportunity for the day traders if they manage to purchase the shares in the opening session and sell them at the close of first trading day. These results are contrary to the study of Cheng, Cheung and Po (2004). However, the amount of profit is not significant for the day traders if transaction cost and other cost are considered. Even the day traders can lose the money if they attempt to sell these shares during the trading hours of first trading of these newly listed IPO firms. It implies that the day traders have no such vibrant opportunity to grasp the profit. Investors can make money only when they purchase the new issues at the offer price from the primary market and sell them in the first trading day.

Table 4.1.2.2-B: Level of underpricing

(Opening, closing, highest & lowest share prices and market index)

Variable	N	Mean	Std. Deviation	S. E. Mean	t	Sig. (2-tailed)	95% CI Lower	95% CI Upper
Ri_c	83	.3276*	.61544	.06755	4.849	.000	.1932	.4620
Rm_c	83	.0348*	.11689	.01283	2.714	.008	.0093	.0603
Up_c	**83**	**.2828***	**.55738**	**.06118**	**4.622**	**.000**	**.1611**	**.4045**
Ri_o	83	.3007*	.62339	.06843	4.395	.000	.1646	.4368
Rm_o	83	.0331*	.11377	.01249	2.653	.010	.0083	.0580
Up_o	**83**	**.2598***	**.57501**	**.06312**	**4.116**	**.000**	**.1342**	**.3853**
Ri_h	83	.4116*	.67116	.07367	5.587	.000	.2650	.5581
Rm_h	83	.0427*	.11598	.01273	3.350	.001	.0173	.0680
Up_h	**83**	**.3516***	**.59932**	**.06578**	**5.344**	**.000**	**.2207**	**.4824**
Ri_l	83	.2798*	.59339	.06513	4.295	.000	.1502	.4093
Rm_l	83	.0253**	.11599	.01273	1.987	.050	.0000	.0506
Up_l	**83**	**.2495***	**.55245**	**.06064**	**4.115**	**.000**	**.1289**	**.3701**

*Significant at 1% level, ** Significant at 5% level. The average level of underpricing on first trading day is; 28.28% with an associated t-statistic of 4.622 (on closing prices), 25.98% with an associated t-statistic of 4.116 (on opening prices), 35.16% with an associated t-statistic of 5.344 (on highest prices), 24.95% with an associated t-statistic of 4.115 (on lowest prices)

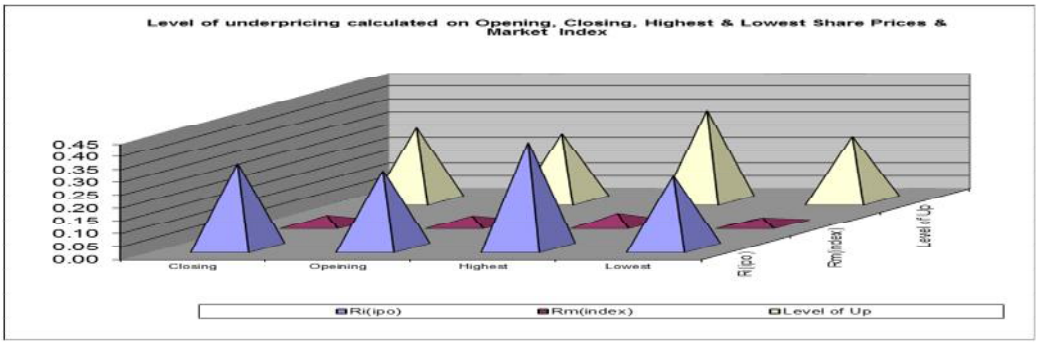


Figure 4.1.2.2: Level of underpricing (Opening, closing, highest & lowest share prices)

4.1.2.3 Year wise first day market adjusted returns

The year wise analysis of level of underpricing is presented in the table 4.1.2.3 and graphical view is presented as Figure 4.1.2.3.a and Figure 4.1.2.3.b. The trend line of year-wise level of underpricing shows that the overall amount of level of underpricing decreased over the years for the sample period of year 2000 to 2102. All the years show underpricing except the year 2010 and 2011. On the other hand year 2007 has shown highest level of underpricing.

Table 4.1.2.3: Year-wise level of underpricing analysis

S#	Year	No. of IPOs	Ri_c	Rm_c	Up_c
1	2000	1	(0.0050)	(0.2186)	0.2733
2	2001	3	0.0142	0.0251	0.0019
3	2002	4	0.1638	0.0465	0.0957
4	2003	5	0.5430	0.1353	0.3849
5	2004	12	0.3651	0.0192	0.3390
6	2005	18	0.3166	0.0796	0.2049
7	2006	4	0.5929	0.0576	0.5162
8	2007	11	0.6446	0.0578	0.5836
9	2008	9	0.4261	(0.0605)	0.4762
10	2009	3	0.1083	(0.0656)	0.2023
11	2010	6	0.0021	0.0129	(0.0174)
12	2011	4	0.0087	(0.0101)	0.0208
13	2012	3	0.0150	0.1054	(0.0748)
	Average	83	0.3277	0.0345	0.2828

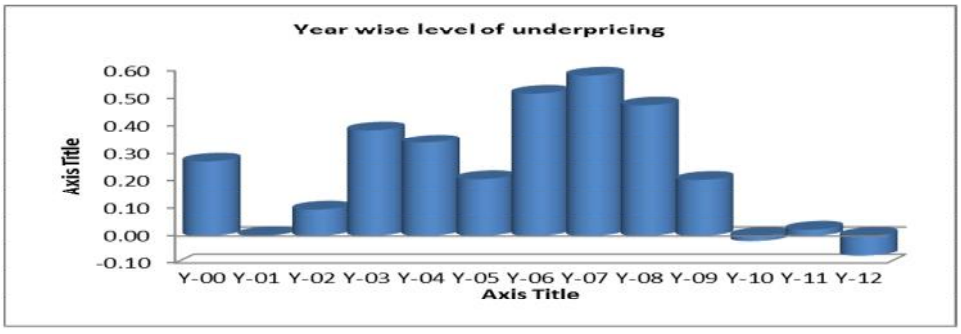


Figure 4.1.2.3.a

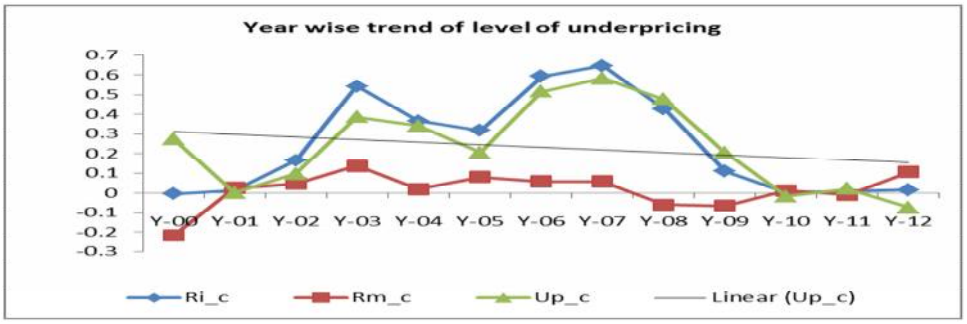


Figure 4.1.2.3.b

4.1.2.4 Sector wise first day market adjusted returns

The sector wise analysis of level of underpricing is presented in the table 4.1.2.4 and graphical view is presented as Figure 4.1.2.4.

Table 4.1.2.4: Sector-wise level of underpricing analysis

S#	Sector	Ri_c	Rm_c	Up_c
1	Automobile And Parts	(0.0050)	(0.2186)	0.2733
2	Banks	0.5488	0.0834	0.4521
3	Chemicals	0.5886	0.0085	0.5765
4	Construction And Materials	0.1501	0.0109	0.1358
5	Electricity	0.2420	(0.0134)	0.2806
6	Equity Investment Instruments	0.0112	0.0611	(0.0382)
7	Financial Services	0.3728	0.0446	0.3076
8	Fixed Line Telecommunication	0.0994	0.0047	0.0880
9	Food Producers	(0.0116)	(0.0908)	0.0871
10	General Industrials	1.1500	0.0732	1.0034
11	Industrial Metals And Mining	0.5742	0.0417	0.5347
12	Industrial Transportation	0.7800	(0.0838)	0.9429
13	Media	0.0750	(0.1028)	0.2117
14	None Life Insurance	(0.0040)	(0.0132)	0.0093
15	Oil And Gas Producers	1.0470	0.1426	0.7304
16	Personal Goods	(0.0419)	0.0300	(0.0661)
17	Real Estate Investment And Services	1.0643	0.0732	0.9235
18	Software N Computer Services	0.4300	0.0507	0.3610
19	Support Services	0.8300	0.2437	0.4714
20	Technology hardware and equipment	(0.0580)	0.0465	(0.0998)
21	Travel And Leisure	0.0850	0.0000	0.0850
	Average	**0.3277**	**0.0345**	**0.2828**

The level of underpricing is observed in all the sectors except Equity Investment Instruments, Technology hardware and equipment and personal goods. The General Industries sector has shown the highest level of underpricing as 100.34%. Next to this, the second highest level of underpricing of 94.29% is observed in the Industrial Transportation sector.

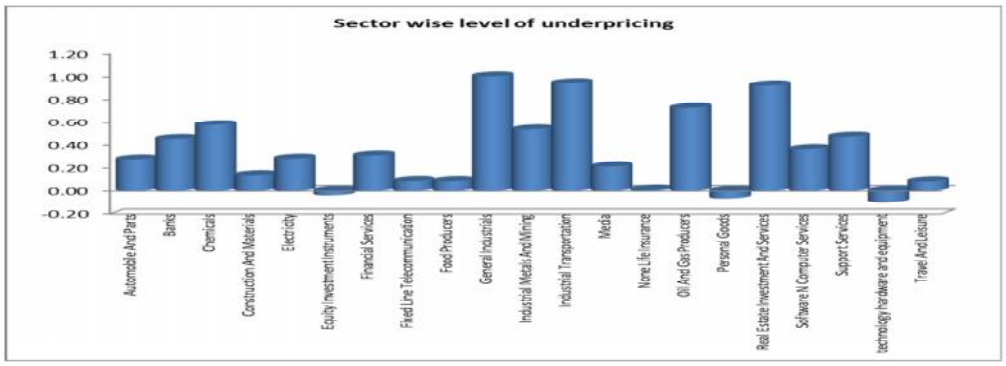


Figure 4.1.2.4

4.1.2.5 First day Market Adjusted Returns-Reduced sample

The analysis on reduced sample of sixty one IPOs is also made and presented in table 4.1.2.5. For long-run performance the sample size is reduced to sixty one IPOs that are discussed in the succeeding section. This reduced sample cover the period of at least three years to meet the criterion to observe the long run performance on three year basis. In addition, while finding the determinants of IPO underpricing one of the variables is long run performance, that is why, analysis on reduced sample is also required.

The significant level of underpricing is also observed in the KSE for the reduced sample. The level of underpricing is found to be 39.64%, significant at 1% level with an associated t statistic of 5.117, while the median level of underpricing remains at 19.44%. The significant average raw return of IPOs is observed to be 44.30% while the significant average markets return remains at 3.03%. The amount of level of underpricing is increased as compared with the full sample of 83 IPOs and decreased Sohail and Nasr (2007) study on KSE.

This table also depicts that 18.03% IPOs (11 from 61 IPO firms) offer the investors with negative market adjusted returns of 9.48% on the first trading day, showing the overpricing of IPOs, while 81.97% IPOs (50 from 61 IPO firms) offer the investors with positive market adjusted return of 51.22% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 61 IPOs of reduced sample offer the investors with positive market adjusted return.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 39.64% with an associated *t*-statistic of 5.117, which is highly significance at 1% level of significance.

After discussing the level of underpricing by market adjusted model, the level of underpricing with the help of matched firm adjusted model is presented in the next section.

Table 4.1.2.5: Level of underpricing by market adjusted model

Returns	IPO firms	Market (Index)	Level of underpricing
Number of observations	61	61	61
Average	.4430*	.0303***	.3964*
Median	0.1900	0.0136	0.1944
Standard Deviation	.6754	.1254	.6050
Standard Error Mean	.0865	.0161	.0775
t-statistic	5.123	1.889	5.117
p-values	0.0000	0.0640	0.0000
No of +ve Returns with mean	49, 0.5747	36, 0.1066	50, 0.5122
No of -ve Returns with mean	12, -0.0948	25, 0.0795	11, -0.1298
Maximum	3.2200	0.4473	3.1635
Minimum	-0.3576	-0.2539	-0.2956

*Significant at 1% level, *** Significant at 5% level. The average level of underpricing on first trading day is 39.64% with an associated t-statistic of 5.117. The average raw return is 44.30% with an associated t-statistic of 5.123. The average market return is 3.03% with an associated t-statistic of 1.889.

4.1.2.6 Matched Firms

For measurement of level of underpricing, generally, first day returns of IPO firms are adjusted by using the market adjusted model. The main drawback of this model is

assuming the betas of newly issued stocks as one. So to tackle this problem matched firm adjusted returns are used to measure the level of underpricing. As, IPO firms have no past history of market prices so it is not possible to predict its future prices or returns, therefore matched firms are used to predict the future returns and are considered as true proxies for IPO firms. Here question arises that how true proxy firms are selected? Kim and Ritter (1999) reported difficulties in selecting the comparable firms for valuation of IPO firms. They used multiple of P/E ratio as one of the method to value the matched firms. In contrast to Kim and Ritter (1999) studies, How, Law and Yeo (2007) used Australian firms by applying an algorithm as selecting either on size and industry membership, industry and growth, or industry, growth and size basis.

All these studies were related to valuation of an IPO firm, none of the study is used to calculate expected return on matched firm technique basis. The following algorithm is used to choose matched firm as true proxy for an IPO firm.

- The sector of an IPO firm and the matched firm is same. The classification of sector is based on new KSE classification of sectors incorporated in year 2008. However, in case of only single IPO firm in the sector, the matched firm is selected on the basis of old classification of sectors at KSE before 2008.
- As expected return is based on capital asset pricing models, therefore those firms are selected that have same size and capital structure to calculate systematic risk (Beta).
- In case of different capital structure, adjusted betas are used for CAPM and market model to calculate the expected returns for the matched firms (proxy companies) as discussed in the methodology chapter.
- The firm's assets are used to measure the size of an IPO firm and matched firm.
- Tracking error[2] technique is modified to check the similarity of an IPO firm with that of matched firm.

[2] Tracking error technique is used in passive portfolio strategy. Fund manager replicate equity portfolio with that of bench mark portfolio i.e. how closely the constructed portfolio of fund manager with the bench mark index. The tracking error less than five percent is considered to be best proxy portfolio of the bench mark index.

As discussed earlier that the sample is reduced to sixty one IPOs, therefore analysis on matched firm adjusted returns are carried on reduced sample. Before doing analysis first algorithm is tested to check the similarity of an IPO firm with that of matched firm.

4.1.2.6.1 Tracking Error of IPOs and Matched Firms

The tracking error (based on revised methodology) is found to be 0.0196. The results of tracking error are displayed as table in appendix table A-4.1.2.6.1. The tracking error of IPOs and matched firms is less than 0.05 which depicts that matched firms are true proxy of IPO firms based on asset selection criterion. The bars in the line graph Figure 4.1.2.6.1 also show matched firms are alike the IPO firms as in fifty four out of the sixty one IPOs, the assets of matched firms are same as assets of IPO firms.

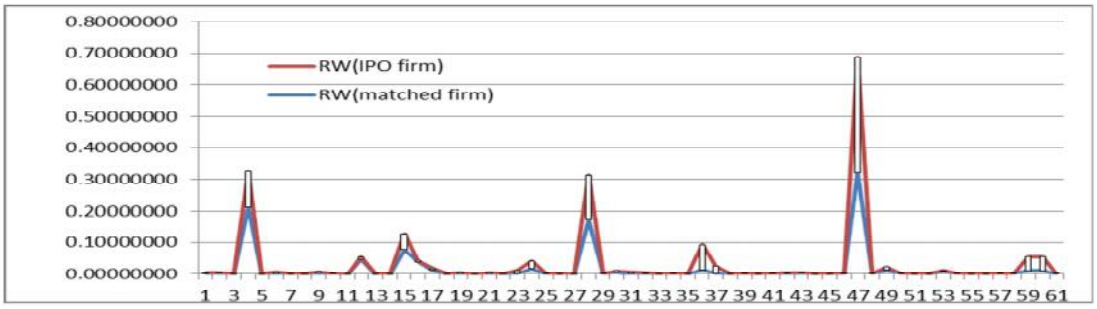


Figure 4.1.2.6.1: Tracking Error of IPOs and Matched Firms

4.1.2.6.2 t statistics of difference of means of IPOs and Matched Firms

The results are displayed in the table 4.1.2.6.2. The null hypothesis regarding no difference of means of assets of IPO firms and matched firms is accepted. It's further strengthening the selecting of matched firms as true proxies companies based on assets criterion.

Table 4.1.2.6.2: t statistics of difference of means of IPOs and Matched Firms

	IPO_Matched_group	N	Mean	Std. Dev.	Std. Error Mean
IPO_Matched_Firms_ Assets	1	61	33461.68	109088.65	13967.37
	2	61	34136.84	109230.80	13985.57

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
IPO_Matched_Firms_ Assets	Equal variances assumed	.004	.950	-.034	120	.973	-675.16	-39809.91	38459.58
	Equal variances not assumed			-.034	120	.973	-675.16	-39809.91	38459.59

After validating the selection criterion, the study proceed to find level of underpricing through adjusting raw returns by matched firm returns. In the table 4.1.2.6.2, the results of Leven's Test also prove our assumption of equal variances. The value of t statistic is -0.034 with p value of 0.973 which support our null hypothesis that there is no difference of asset's means of IPO and matched firm's assets means.

4.1.2.7 First day Matched Firm Adjusted Returns of IPO firms

After calculating the level of underpricing through market adjusted model, the capital asset pricing model, Fama French three factor model and four factor model are used to calculate the expected returns for matched firms as discussed in the methodology part. The matched firm adjusted returns (level of underpricing) are then calculated on first trading day of these IPOs.

To calculate expected returns an event window is required. The estimation window consists of six months period using daily data. On the basis of this event period Beta's are calculated by market model and Capital Asset Pricing Model. As an IPO firm has different capital structure with that of matched firm, these levered betas are calculated in absence of debt, called un-levered Betas. Again, levered Betas (adjusted) are calculated according to the capital structure of IPO firms. Now with the help of these adjusted Betas expected returns are calculated on offer date of IPOs and adjusted for 20-days period as on average there is difference of 20 day between the offer date and first trading day.

The level of underpricing with the help of matched firms is calculated as presented in the succeeding session.

4.1.2.7.1 Matched Firms Expected Returns by Market Model

The analysis of expected returns of matched firm based on market model is presented in Appendix Table A-4.1.2.7.1. The each matched firm expected returns is calculated by regressing six months' daily returns against market returns of the corresponding period before the offer date of an IPO firm. The average expected return of matched firms remains at 1.66% which is lower than the market return calculated on the reduced sample of sixty one firms. The average D/E ratio of IPO firms is observed to be 1.6842 while average D/E ratio of matched firms remains at 2.1010. As there is difference in the capital structure of IPO firms with that of matched firms, the betas of matched firms are adjusted. The average beta of matched firm remains at 0.6301 less volatile than market, unleveled beta remains at 0.3612 while adjusted beta is observed to be 0.6183. In the market adjusted model the beta of IPO firm is assumed to be one that is not considered to be accurate. This supports the matched firm technique to calculate the true beta of an IPO firm.

Table 4.1.2.7.1: Level of underpricing by market model

Returns	IPO firms	Expected return of Matched Firm by Market Model	Level of underpricing
Number of observations	61	61	61
Average	0.4430*	0.0166	0.4263*
Median	0.1900	0.0007	0.1939
Standard Deviation	.6754	.4127	.7545
Standard Error Mean	.0865	.0528	.0966
t-statistic	5.123	.315	4.413
p-values	0.0000	0.754	0.0000
No of +ve Returns with mean	49, 0.5747	31, 0.2325	49, 0.5955
No of -ve Returns with mean	12, -0.0948	30, 0-.2064	12, -0.2644
Maximum	3.22000	1.92398	3.13796
Minimum	-0.35760	-1.07045	-1.16398

*Significant at 1% level, *** Significant at 5% level. The average level of underpricing on first trading day is 42.63% with an associated t-statistic of 4.4113. The average raw return is 44.30% with an associated t-statistic of 5.123. The average matched firm return is 1.66% with an associated t-statistic of 0.315.

The significant level of underpricing is also observed in the KSE using matched firms for the reduced sample. The level of underpricing is found to be 42.63%, significant at 1% level with an associated t statistic of 4.413, while the median level of underpricing remains at 19.39%. The significant average raw return of IPOs is observed to be 44.30% while the average matched firm return remains at 1.66%. The amount of level of underpricing is increased as compared with the market adjusted returns and with full sample of 83 IPOs.

This table also depicts that 19.67% IPOs (12 from 61 IPO firms) offer the investors with negative matched firm adjusted returns of 26.44% on the first trading day, showing the overpricing of IPOs, while 79.33% IPOs (49 from 61 IPO firms) offer the investors with positive matched firm adjusted returns of 59.55% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 61 IPOs of sample offer the investors with positive matched firm adjusted returns by using market model.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 42.63% with an associated *t*-statistic of 4.413, which is highly significance at 1% level of significance. It further elaborates that investors can earn significant risk adjusted return of 42.63% or greater from the same type of matched firms while investing in IPO firms.

4.1.2.7.2 Matched Firms Expected Returns by CAPM

The analysis of expected returns of matched firm calculated by CAPM is presented in Appendix table A-4.1.2.7.2. The excess matched firm returns are calculated by subtracting daily three month Treasury bill rates from the matched firm returns of the corresponding period. Similarly, the excess market returns are calculated by subtracting daily three month Treasury bill rates from market returns of the corresponding period. The each matched firm expected returns is calculated by regressing six months excess daily returns of each matched firm against excess market returns of the corresponding period before the offer date of an IPO firm. The average D/E ratio of IPO firms is

observed to be 1.6842 while average D/E ratio of matched firm remains at 2.1010. As there is difference in the capital structure of IPO firm with that of matched firms, the betas of matched firms are adjusted. The average beta of matched firm remains at 0.63006 less volatile than market, unleveled beta remains at 0.3612 while adjusted beta is observed to be 0.6183. The average expected return of matched firms remains at 1.99% which is lower than the market return but slightly higher than the expected return calculated by market model.

The significant level of underpricing is also observed in the KSE using matched firms under CAPM. The level of underpricing is found to be 42.31%, significant at 1% level with an associated t statistic of 4.380, while the median level of underpricing remains at 18.63%. The significant average raw return of IPOs is observed to be 44.30% while the average matched firm return remains at 1.99%. The amount of level of underpricing is increased as compared with the market adjusted returns and with full sample of 83 IPOs.

Table 4.1.2.7.2: Level of underpricing by CAPM

Returns	**IPO firms**	**Expected return of Matched Firm by CAPM**	**Level of underpricing**
Number of observations	61	61	61
Average	0.4430*	0.0199	0.4231*
Median	0.1900	0.0064	0.1863
Standard Deviation	.6754	.4123	.7545
Standard Error Mean	.0865	.0528	.0966
t-statistic	5.123	.376	4.380
p-values	0.0000	.7080	0.0000
No of +ve Returns with mean	49, 0.5747	34, 0.2150	49, 0.5920
No of -ve Returns with mean	12, -0.0948	27, 0-.2258	12, -0.2666
Maximum	3.22000	1.92187	3.13292
Minimum	-0.35760	-1.07565	-1.16187

*Significant at 1% level, *** Significant at 5% level. The average level of underpricing on first trading day is 42.31% with an associated t-statistic of 4.380. The average raw return is 44.30% with an associated t-statistic of 5.123. The average matched firm return is 1.99% with an associated t-statistic of 0.708.

This table also depicts that 19.67% IPOs (12 from 61 IPO firms) offer the investors with negative matched firm adjusted returns of 26.66% on the first trading day, showing the

overpricing of IPOs, while 79.33% IPOs (49 from 61 IPO firms) offer the investors with positive matched firm adjusted returns of 59.20% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 61 IPOs of sample offer the investors with positive matched firm adjusted returns by using CAPM.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 42.31% with an associated *t*-statistic of 4.380, which is highly significance at 1% level of significance. It further elaborates that investors can earn significant risk adjusted return of 42.31% or greater from the same type of matched firms while investing in IPO firms.

4.1.2.7.3 Matched Firms Expected Returns by 3-Factor FF Model

The analysis of expected returns of matched firm calculated by Fama French three factor model is presented in Appendix table A-4.1.2.7.3. To calculate the additional two risk factors i.e. size and value premium the sample firms (not IPO sample firms, the sample firms required for additional two factors for 3-FF model) were changed each year from year 2000 to 2010, as changing of small firms, big firms and value firm each year. The book value per share is taken at the end of each year from 2000 to 2010.

The excess matched firm returns are calculated by subtracting daily three-month Treasury bill rates from the matched firm returns of the corresponding period. The first factor, the excess market returns are calculated by subtracting daily three-month Treasury bill rates from market returns of the corresponding period.

The size factor i.e. SMB is calculated by sorting six month daily returns data of the sample firms on market capitalization basis, lowest to highest. The sample is divided into two parts. The upper part of the sorted sample firms is called the small firms with three portfolios S/H, S/M and S/L (High BMR-30%, Medium BMR-40% and low BMR-30%) whilst the lower part of the sorted sample firms with three portfolios B/H, B/H and B/H (High BMR-30%, Medium BMR-40% and low BMR-30%) is called the big firms. The

difference of averages of small and big portfolios will give the size factor. The size factor is calculated both on value weighted basis and equally weighted basis averages.

The value factor i.e. HML is calculated by sorting the six month daily returns data of the sample firms on book to market ratio basis, highest to lowest (high-30%, medium-40% and low-30% of each lowest and upper part of samples firms in the size factor). The difference of averages of two high book to market ratio S/H, B/H and two low book to market ratio S/L, B/L, will give the value factor.

To test the significance of factor loadings, the regression is run for each matched firm by taking excess matched firm return as dependent variables and Market, SMB and HML factors as independent variables of the corresponding period before the offer date of an IPO firm. The expected returns are calculated based on six months' daily returns of each matched firm against Market, SMB and HML factors.

Table 4.1.2.7.3: Level of underpricing by 3-FF model

Returns	**IPO firms**	**Expected return of Matched Firm by FF(VAL)**	**Level of underpricing**
Number of observations	61	61	61
Average	.4430*	.0146	.4284*
Median	0.1900	0.0010	0.2370
Standard Deviation	.6754	.3987	.7350
Standard Error Mean	.0865	.0511	.0941
t-statistic	5.123	.286	4.552
No of +ve Returns with mean	49, 0.5747	30, 0.2437	46, 0.6500
No of -ve Returns with mean	12, -0.0948	31, 0-.2645	15, -0.2514
Maximum	3.22000	1.48198	3.17892
Minimum	-0.35760	-0.75455	-0.72198

*Significant at 1% level, *** Significant at 5% level. The average level of underpricing on first trading day is 42.84% with an associated t-statistic of 4.552. The average raw return is 44.30% with an associated t-statistic of 5.123. The average matched firm return is 1.46% with an associated t-statistic of 0.286.

The average beta of matched firm under market factor remains at 0.6337, slightly higher than the CAPM beta (0.63006) but less volatile than market. The significant market beta of thirty eight out of sixty one firms is to be observed. On the other hand the average

betas for size and value factors remain at 0.0456 and 0.0466 respectively. The only 9 betas for size factors and 4 betas for value factors remain significant. The results also confirm the study of Nawazish (2008) for testing of FF model in KSE. On the basis of significance of Betas the expected returns of matched firms calculated. The average expected return of matched firms remains at 1.46% which is lower than the market return but slightly higher than the expected return calculated by market model and CAPM.

The significant level of underpricing is also observed using matched firms under three factor Fama French model. The level of underpricing is found to be 42.84%, significant at 1% level with an associated t statistic of 4.552, while the median level of underpricing remains at 23.70%. The significant average raw return of IPOs is observed to be 44.30% while the average matched firm return remains at 1.46%. The amount of level of underpricing is increased as compared with the market adjusted model, market model and CAPM.

This table also depicts that 24.59% IPOs (15 from 61 IPO firms) offer the investors with negative matched firm adjusted returns of 25.14% on the first trading day, showing the overpricing of IPOs, while 75.41% IPOs (46 from 61 IPO firms) offer the investors with positive matched firm adjusted returns of 65.00% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 61 IPOs of sample offer the investors with positive matched firm adjusted returns by using three factor Fama French model.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 42.84% with an associated *t*-statistic of 4.552, which is highly significance at 1% level of significance. It further elaborates that investors can earn significant risk adjusted return of 42.84% or greater from the same type of matched firms by taking the three risk factors; market, size and value factors

4.1.2.7.4 Matched Firms Expected Returns by Four Factor Model

The analysis of expected returns of matched firm calculated by four factor model is presented in Appendix table A-4.1.2.7.4. One additional momentum factor i.e. winner

minus looser, WML addition to three risk factors i.e. market, size and value premium is calculated from year 2000 to 2010.

The market, size and value factors are calculated according to Fama French model. To calculate WML the six month daily returns data of sample firms are sorted on market capitalization basis, lowest to highest. The sample is divided into two parts. The upper part of the sorted sample firms is sorted on the average of last 20 days returns and then divided into three portfolios S/W, S/N and S/L (winner-30%, neutral-40% and looser-30%). Similarly the lower part of the sorted sample firms is sorted on the average of last 20 days returns and then divided into three portfolios B/W, B/N and B/L (winner-30%, neutral-40% and looser-30%). The difference of averages of two winner portfolios S/W, B/W and two looser portfolios S/L, B/L, will give the momentum factor.

Table 4.1.2.7.4: Level of underpricing by 4-F model

Returns	**IPO firms**	**Expected return of Matched Firm by 4-F(VAL)**	**Level of underpricing**
Number of observations	61	61	61
Average	.4430*	.0130	.4299*
Median	0.1900	-0.0081	0.2565
Standard Deviation	.6754	.4121	.7468
Standard Error Mean	.0865	.0528	.0956
t-statistic	5.123	.247	4.496
No of +ve Returns with mean	49, 0.5747	30, 0.2882	46, 0.6583
No of -ve Returns with mean	12, -0.0948	31, 0-.2533	15, -0.2705
Maximum	3.22000	1.47362	3.25277
Minimum	-0.35760	-0.84487	-0.71362

*Significant at 1% level, *** Significant at 5% level. The average level of underpricing on first trading day is 42.99% with an associated t-statistic of 4.596. The average raw return is 44.30% with an associated t-statistic of 5.123. The average matched firm return is 1.30% with an associated t-statistic of 0.247.

Like FF three factor model, in four factor model, to test the significance of factor loadings, the regression is run for each matched firm by taking excess matched firm return as dependent variables and Market, SMB, HML and WML factors as independent variables of the corresponding period before the offer date of an IPO firm. The expected

returns is calculated based on six months daily returns of each matched firm against Market, SMB and HML and WML factors.

The analysis in the table reveals that the average beta of matched firm under market factor remains at 0.6271. The significant market beta of thirty seven out of sixty one firms is to be observed. On the other hand the average betas for size, value and momentum factors remain at 0.0598, 0.0569 and -0.0155 respectively. The only 10 betas for size factors, 5 betas for value factors and 5 betas for momentum factors remain significant. On the basis of significance of Betas the expected returns of matched firms are calculated. The average expected return of matched firms remains at 1.30% which is lower than the expected returns calculated by other models.

The significant level of underpricing is also observed using matched firms under four factor model. The level of underpricing is found to be 42.99%, significant at 1% level with an associated t statistic of 4.496, while the median level of underpricing remains at 25.65%. The significant average raw return of IPOs is observed to be 44.30% while the average matched firm return remains at 1.46%. The amount of level of underpricing is increased as compared with other models accounting for all risk factors.

This table also depicts that 24.59% IPOs (15 from 61 IPO firms) offer the investors with negative matched firm adjusted returns of 27.05% on the first trading day, showing the overpricing of IPOs, while 75.41% IPOs (46 from 61 IPO firms) offer the investors with positive matched firm adjusted returns of 65.83% on the first trading day, showing the underpricing of IPOs. Nevertheless, together, all 61 IPOs of sample offer the investors with positive matched firm adjusted returns.

The analysis in the table prove the rejection of our null hypothesis as level of underpricing is found to be 42.99% with an associated *t*-statistic of 4.496, which is highly significance at 1% level of significance. It further elaborates that investors can earn significant risk adjusted return of 42.99% or greater from the same type of matched firms

while investing in IPO firms by taking four factors of risk; market, size, value and momentum.

4.1.2.8 Comparisons of different models

The level of underpricing is observed to be more than 39% on the basis of the entire five models. The level of underpricing is observed to be 39.64% for market adjusted model, 42.63% for market model, 42.31% for CAPM, 42.84% for three Factor Fama French and 42.99% for four Factor models. All the five models on average give some consistent and significant results. The amount of level of underpricing increases accounting for taking more risk factors size, value and momentum.

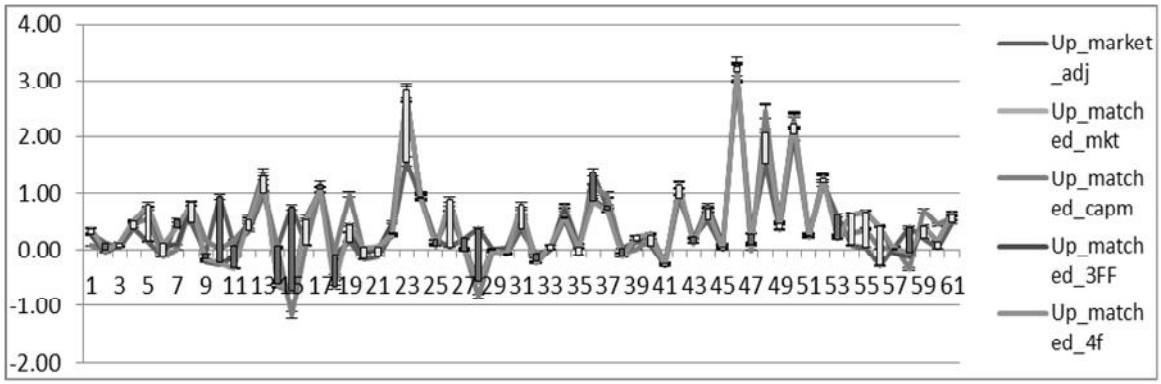


Figure 4.1.2.8: Comparison of different models

Conversely, individually, level of underpricing is found to be different while comparing all the five models as shown in the graph. These deviations in the level of underpricing is presented as bar at 5% level. Although choice of model is highly debated for long run performance of IPOs as discussed in the literature review part. The inconsistent results are to be observed in the long run performance of IPOs due to choice of model. However, in the short run, the choice of model does not matter while measuring the risk adjusted returns of IPO firms on the first trading day of their listing.

4.1.2.9 Regression analysis for determinants of level of underpricing

The regression analysis is made to explain the determinants of level of underpricing. Table 4.1.2.9-A represents the regression analysis of 83 IPOs in which market adjusted

returns is used as dependent variable for level of underpricing and is represented by P^u. While Ex-Ante (Ex_Ante), Natural Log of Market Capitalization (Ln_Mkt_Cap), Incidence of secondary market issues (SI), Market Volatility (Mkt_Volt), Natural Log of Offer Size (Ln_Size), the proportion of shares offered to general public (P_O_G), Over / Under Subscription (O_U_Subs) and Price Earnings ratio (P_E) used as independent variables. As in the previous section the level of underpricing is calculated by five different models, the regression analysis is also made on reduced sample by taking dependent variable separately. The results of these five regression models are presented in table 4.1.2.9-B.

Table 4.1.2.9-A: Regression analysis (full sample)

Variables	***Coefficients***	***Standard Error***	***t Stat***	***P-value***
Intercept	-1.708524	0.89565	-1.90758	0.06033
Ex_Ante	0.021345***	0.02129	1.65128	0.09710
Ln_Mkt_Cap	0.497286**	0.10226	4.86319	0.00001
SI	-0.277566	0.20236	-1.37167	0.17431
Mkt_Volt	0.000300**	0.00014	2.16842	0.03334
Ln_Size	-0.487736*	0.10845	-4.49751	0.00003
P_O_G	2.440226*	0.56379	4.32826	0.00005
O_U_Subs	0.077491*	0.01366	5.67170	0.00000
P_E	-0.000227	0.00054	-0.41920	0.67629
Market Adjusted Model	***Multiple R***	0.794563	***SS***	16.09684
	R Square	0.631330	***MS***	2.01211
	Adjusted R Square	0.591474	***F-statistic***	15.84022
	Standard Error	0.356406	***P-value***	0.00000
	Observations	83		

*Significant at 1% level, ** Significant at 5% level and *** Significant at 10% level

The regression analysis reveals that there is positive relationship between the level of underpricing and Ex Ante variable, significant at ten percent level. It validates the results of Baron (1982), Ritter (1984) and Beatty and Ritter (1986) studies and confirms that the level of underpricing increases with the level of uncertainty about the new issue of IPO. The results are also agreement with the results of earlier studies on KSE by Sohail and Nasr (2007) and Sohail and Raheman (2008). As an IPO is a new firm, information about potential market demand and true value of firm is unevenly distributed amongst different

stakeholders i.e. the IPO firm, the underwriter and the investor, so underpricing is done under the underwriter' umbrella to safeguard a full subscription of the new issue and thus to reduce possible losses arising from ex ante uncertainty about an issuing firm's value.

This significant result is in accordance with the asymmetric information theories; the uncertainty about the value of recently established firms such as new issues (IPOs) is higher than that about well-known firms. This finding supports Beatty and Ritters (I986) argument that investors seek higher returns to compensate for their anxiety about future performance of IPOs.

The positive relationship between market capitalization and level of underpricing is observed. The result is significant at five percent level. On the other hand insignificant relationship is found between SI and level of underpricing, that is contrary to the earlier studies. Further the result of relationship is also negative. The one reason for insignificant and negative relationship may be that there were only six secondary issues out of 83 for the sample period i.e. lesser number of secondary issues.

Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989), suggest that underpricing may itself be a signal of the intrinsic value of the issuing firm or post-issue. In all these models, underpricing is used as a signal that the company is of high quality whereby an IPO firm that underpriced more is considered a well company. Allen and Faulhaber (1989) argued that firms sometimes offer IPOs priced below their intrinsic value to signal their quality to investors, thus expecting to have a better chance at offering subsequent seasoned issues at high prices. In KSE, the results also suggest strong support for the signaling theories.

A positive relationship between market volatility and the level of underpricing is observed. This result is also significant at five percent level. The result is also accordance with the prior studies. The market volatility is considered the degree of underpricing. When the market volatility is high, the regulatory authorities try to minimize the probability of unsuccessful issues by lowering prices as compared with low market

volatility period. In prior studies, Miller and Reilly (1987) indicated that IPO issues following a rising market experience higher underpricing levels than IPOs following a falling market.

The results on KSE are interesting as KSE experienced high volatility as compared with other markets of the world. During the study period from 2000 to 2012, KSE index remains at 1333 to 15470. In previous study on KSE by Sohail and Nasr (2007) and Sohail and Raheman (2008), the results of market volatility variable were not significant, may be lesser number of IPOs in the sample. However, in the present study the results are significant.

The variable offer size show highly significant negative relationship with level of underpricing variable. Finkle (1998) argued the larger firms, as compared to smaller firms, present less uncertainty for different stakeholders and particularly for the potential investors. Larger firms, for example, have greater access to resources essential for firm survival and profitability. Consistent with this, several studies have found a negative association between firm size and underpricing (e.g., Carter, Dark, & Singh, 1998). Another factor is that larger firms tend to attract more prestigious underwriters (Carter, Dark, & Singh, 1998). As, larger firms reducing the level of uncertainty in the IPO process, this was also confirmed in KSE. As a result a negative relationship is also observed in KSE between size and level of underpricing variables.

Perotti (1995) argues that Govt. prefer steady sale of IPOs to show commitment of privatization, so they issue small proposition and retained large. The percentage of shares retained by the original owners and insiders would logically signal high value. A negative relationship between level of underpricing and PSO (proportion of shares offered to general public) variable is observed in the previous studies. However in case of IPOs in KSE, on average, proportion of shares offered to general public remains at 25%, which is a high offered rate as compared with other markets in the world. As a result highly positive significant relationship of this variable is observed with the level of

underpricing. The results are contrary to the Perotti (1995) study, but accordance with the IPO phenomena in KSE, where high offered rate exist.

The well-known Rock's model (1986), the winner-curse describes that only uniformed investors submit order for over-priced stocks to win 100% allocation, however for underpriced shares, both informed and uninformed submit purchase order for allocation as a result over-subscription arises. The same phenomena is also observed and highly significant positive relation is observed between level of underpricing and oversubscription variable.

Table 4.1.2.9-B: Regression Analysis (different models)

1.Market Adjusted Model (Full Sample)				**2. Market Adjusted Model (reduced Sample)**				**3. Market Model**			
Multiple R	0.794563	**Standard Error**	0.356406	**Multiple R**	0.795628	**Standard Error**	0.393675	**Multiple R**	0.845956	**Standard Error**	0.379530
R Square	0.631330	**F**	15.840216	**R Square**	0.633024	**F**	11.212335	**R Square**	0.715642	**F**	16.358534
Adjusted R Square	0.591474	**P-value**	0.000000	**Adjusted R Square**	0.576566	**P-value**	0.000000	**Adjusted R Square**	0.671895	**P-value**	0.000000
Variables	**Coefficients**	**t Stat**	**P-value**	**Variables**	**Coefficients**	**t Stat**	**P-value**	**Variables**	**Coefficients**	**t Stat**	**P-value**
Intercept	-1.708524	-1.907579	0.060326	Intercept	-2.063422	-1.765866	0.083289	Intercept	-1.140656	-1.012548	0.315964
Ex_Ante	0.021345***	1.651279	0.097102	Ex_Ante	0.020014***	1.645944	0.097212	Ex_Ante	0.024725	1.572528	0.121894
Ln_Mkt_Cap	0.497286*	4.863187	0.000006	Ln_Mkt_Cap	0.564166*	4.398663	0.000054	Ln_Mkt_Cap	0.590001*	4.771528	0.000015
SI	-0.277566	-1.371668	0.174312	SI	-0.369203	-1.593178	0.117181	SI	-0.313240	-1.402065	0.166837
Mkt_Volt	0.000300**	2.168419	0.033341	Mkt_Volt	0.000272	1.555591	0.125871	Mkt_Volt	0.000166	0.986213	0.328596
Ln_Size	-0.487736*	-4.497514	0.000025	Ln_Size	-0.546201*	-3.741701	0.000458	Ln_Size	-0.621295*	-4.414748	0.000051
P_O_G	2.440226*	4.328263	0.000046	P_O_G	3.043197*	4.193667	0.000107	P_O_G	3.013708*	4.307810	0.000073
O_U_Subs	0.077491*	5.671704	0.000000	O_U_Subs	0.074572*	4.683033	0.000021	O_U_Subs	0.074906*	4.879315	0.000010
P_E	-0.000227	-0.419196	0.676287	P_E	-0.000023	-0.023634	0.981235	P_E	-0.000351	-0.367829	0.714494
4. CAPM				**5. Fama French 3 Factor Model**				**6. 4-Factor Model**			
Multiple R	0.731914	**Standard Error**	0.552237	**Multiple R**	0.736187	**Standard Error**	0.534325	**Multiple R**	0.725675	**Standard Error**	0.551955
R Square	0.535698	**F**	7.499506	**R Square**	0.541971	**F**	7.691241	**R Square**	0.526604	**F**	7.230563
Adjusted R Square	0.464267	**P-value**	0.000001	**Adjusted R Square**	0.471505	**P-value**	0.000001	**Adjusted R Square**	0.453773	**P-value**	0.000002
Variables	**Coefficients**	**t Stat**	**P-value**	**Variables**	**Coefficients**	**t Stat**	**P-value**	**Variables**	**Coefficients**	**t Stat**	**P-value**
Intercept	0.226836	0.138387	0.890469	Intercept	-1.215482	-0.766392	0.446908	Intercept	-0.780259	-0.476259	0.635885
Ex_Ante	0.038764***	1.694379	0.096175	Ex_Ante	0.040684***	1.837918	0.071790	Ex_Ante	0.044178***	1.932041	0.058811
Ln_Mkt_Cap	0.632502*	3.515503	0.000919	Ln_Mkt_Cap	0.583855*	3.353908	0.001493	Ln_Mkt_Cap	0.594435*	3.305612	0.001722
SI	-0.386882	-1.190116	0.239406	SI	-0.356337	-1.132904	0.262451	SI	-0.343860	-1.058314	0.294804
Mkt_Volt	0.000460***	1.876096	0.066260	Mkt_Volt	0.000483**	2.039599	0.046486	Mkt_Volt	0.000514**	2.097765	0.040804
Ln_Size	-0.746440*	-3.645221	0.000618	Ln_Size	-0.621251*	-3.135570	0.002820	Ln_Size	-0.654983*	-3.200230	0.002342
P_O_G	3.284978*	3.227070	0.002166	P_O_G	3.422764*	3.475151	0.001039	P_O_G	3.372236*	3.314485	0.001677
O_U_Subs	0.056041**	2.508838	0.015269	O_U_Subs	0.052451*	2.426807	0.018734	O_U_Subs	0.049277**	2.207140	0.031742
P_E	-0.000847	-0.610099	0.544453	P_E	0.000496	0.369247	0.713443	P_E	0.000465	0.334987	0.738982

*Significant at 1% level, ** Significant at 5% level and *** Significant at 10% level

The new issue is usually valued by its offer price. Chen et al. (2004) argues that the firms with better growth perspectives have higher P/E ratio which ultimately goes towards higher risk and that further leads to more uncertainty. The KSE is not confirming the positive relationship of variable P/E ratio with level of underpricing and found to be insignificant. The overall, regression model is found to be highly significant with adjusted R square of 59.15% representing the larger portion of explanatory variables.

The results of regression models presented in table 4.1.2.9-B are almost same and agreement with the regression model 1, with a negligible variation in the significance of explanatory variables. In these five models the explanatory variables remain the same while dependent variable i.e. level of underpricing is obtained through five different models; market adjusted model, market model, CAPM, three factor Fama French and 4 factor model. All these models validate the asymmetry theory, signaling theory and winner curse hypothesis.

Table 4.1.2.9-C: Regression analysis - Extended model

Variables	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.079328	1.67834	-0.04727	0.96249
Ex_Ante	0.035001***	0.02433	1.60131	0.09139
Ln_Mkt_Cap	0.674723*	0.18646	3.61865	0.00068
SI	-0.452778	0.33410	-1.35522	0.18132
Mkt_Volt	0.000491***	0.00025	1.98067	0.05303
Ln_Size	-0.778777*	0.20840	-3.73691	0.00047
P_O_G	3.542842*	1.06060	3.34041	0.00157
O_U_Subs	0.054021**	0.02250	2.40107	0.02003
P_E	-0.000808	0.00139	-0.58026	0.56429
mBHAR_36	0.053481	0.06026	0.88753	0.37896
	Multiple R	0.736723	SS	18.53798
	R Square	0.542760	MS	2.05978
	Adjusted R Square	0.462071	F-statistic	6.72654
	Standard Error	0.553368	P-value	0.00000
	Observations	61		

*Significant at 1% level, ** Significant at 5% level and *** Significant at 10% level

The regression model is also used to find the relationship of level of underpricing with long run performance of IPOs. The long run performance of these IPOs is presented in the next section. The various models are used to find the long run performance. Here in this regression model three years after the IPO is used as long run performance variable and is calculated on monthly basis by buy and hold abnormal return (BHARs) model.

As for the relationship between the initial returns of IPOs and their long-run price performance, most studies have revealed that IPOs are underpriced by investment bankers to create the outer shell of excess demand. As a result, companies with higher initial returns should have lower subsequent returns. The KSE does not support the significant negative relationship of level of underpricing and long run performance variables. Ritter (1991) notes that, firms that are more underpriced than others perform worse in the long-run. Carter and Dark (1993) have observed the correlation between initial returns and 18 month aftermarket returns and found that firms having higher initial returns tended to provide slightly lower long-run returns than firms having lower initial returns. Although the results of level of underpricing and long run performance variable are contrary to the asymmetric information theory supported by Welch (1989) and Grinblatt and Hwang (1989) etc.

To summarize this section, the level of underpricing is also observed in KSE during the study period of 2000-12. Further, the choice of model does not matter while measuring the risk adjusted returns of IPO firms on first trading day. The determinants of level of underpricing are observed in the KSE in the light of asymmetric and signaling theories and the results of regression model validate the prior theories of asymmetric and signaling theories in KSE. The regression analysis also explain these determinants of level of underpricing with the help of Ex-Anti, Market Capitalization, Incidence of secondary market issues, Market Volatility, Offer Size, the proportion of shares offered to general public, Over / Under Subscription and Price Earnings ratio variables.

4.2 SECTION B Long run performance of IPOs

The main objective of this section is to provide insights of the long run performance of IPOs and to compare the results of matured and less matured IPO firms in the long run. The objectives also include to provide insights of the long run performance on broader categories of sectors; financial, manufacturing, other services, small, medium and large IPO firms.

In this section, the descriptive statistics and quantitative analysis of long-run performance of IPOs is discussed. First, year-wise and sector wise analysis are discussed in the descriptive statistics part. Second, long run performance is measured with the help of different methodologies. As choice of methodology is a controversial and debated by several researchers, this study precede the discussion further by taking the samples in different time intervals to evaluate the long run performance. The analysis is carried out using different methodologies such as CARs (cumulative abnormal returns), BHARs (buy and hold abnormal returns), CAPM (capital asset pricing model), three factor Fama French model, 3-FF (equally and valued weighted) and four factor Carhart model (4-F).

In all these methodologies (CARs, BHARs, and Jensen's alpha) the basic question; that is; whether an investor earn abnormal return on monthly basis? Researches investigate this question. However, considering the volatile nature of the KSE, question is answered by taking the sample on weekly and fortnightly basis as well.

4.2.1 Descriptive Analysis

Table 4.2.1 represents descriptive statistics of different variables like IPO return, market return, abnormal return, excess IPO return, market, size, value and momentum factors used in the long run analysis of IPOs for the period 2000 to 2010.

The descriptive statistics include the average, median, variability and range of variables minimum to maximum. Part-A of the table is about returns of IPOs calculated on monthly, fortnightly and weekly basis from year 2000 to 2010. On average these returns show downward trend when moving monthly to fortnightly and fortnightly to weekly

analysis as observed to 0.41%, 0.15% and 0.09% respectively. The monthly median returns remain at -0.81%. The variability of returns across different time interval also turns to downward direction. The minimum monthly IPO return remains at -0.67.96% while maximum return remains at 268.8%.

Table 4.2.1 Descriptive Analysis

Time Interval	Mean	Median	S. Dev.	Minimum	Maximum
A. IPO Firm Returns					
Monthly	0.004071	-0.008113	0.175467	-0.679600	2.688000
Fortnightly	0.001541	-0.002186	0.117651	-0.632479	1.028000
Weekly	0.000920	-0.002392	0.084472	-0.692683	0.880282
B. Market Returns					
Monthly	0.015586	0.023472	0.090237	-0.505244	0.391973
Fortnightly	0.007348	0.012778	0.057648	-0.464400	0.226097
Weekly	0.003579	0.007838	0.039242	-0.401123	0.168447
C. Abnormal Returns					
Monthly	-0.011515	-0.027460	0.152294	-0.758178	2.574085
Fortnightly	-0.005811	-0.014762	0.106477	-0.662383	0.979427
Weekly	-0.002659	-0.008900	0.077974	-0.606908	0.946614
D. Excess IPO Returns					
Monthly	-0.003472	-0.016360	0.183893	-0.691146	2.684550
Fortnightly	-0.002204	-0.006500	0.120917	-0.637571	1.026368
Weekly	-0.000955	-0.002560	0.086784	-0.695567	0.877855
E. Market Factor					
Monthly	0.008043	0.014150	0.092835	-0.516790	0.388059
Fortnightly	0.003603	0.009229	0.059271	-0.469562	0.224140
Weekly	0.001704	0.005870	0.040180	-0.403704	0.167468
F. Size Factor					
Monthly	-0.000464	-0.001111	0.035268	-0.121044	0.153317
Fortnightly	0.001316	-0.001953	0.036830	-0.110941	0.443815
Weekly	0.000469	-0.000459	0.025705	-0.076019	0.464931
G. Value Factor					
Monthly	-0.003131	-0.006745	0.044121	-0.101715	0.277754
Fortnightly	0.000012	-0.003356	0.044246	-0.109048	0.637118
Weekly	-0.000037	-0.000058	0.031695	-0.107865	0.571583
H. Momentum Factor					
Monthly	0.023960	0.019524	0.061109	-0.281589	0.314957
Fortnightly	0.011569	0.010358	0.030449	-0.106395	0.151983
Weekly	0.005672	0.004009	0.020601	-0.092465	0.108205

The part B of the table represents the market returns. KSE-100 index is used as proxy for market returns. In all the measures of descriptive statistics, downward trend is observed from monthly to fortnightly and fortnightly to weekly analysis. The median monthly market return remains at 2.35% quite high than monthly median IPO return. The part C is about abnormal return's descriptive statistics, while, part D describes the excess IPO return statistics and are with the same trend as market returns. The median market and momentum factors remain positive while median size and value factors remain negative.

4.2.2 Cumulative Abnormal Returns (CARs) Analysis

In long-run analysis of IPOs the sample size is reduced to sixty one. To observe the three years long-run performance those IPOs are taken which covers the period at least three years after listing. In first model, CARs are calculated using market adjusted returns. To tackle the effect of underpricing issues, first day of IPOs is not included in the long-run performance. The analysis is made on monthly, fortnightly and weekly basis. The long-run performance is observed after one year, one and half year, two years, two and half years and three years basis. The summary is displayed in table 4.2.2, while detailed week-wise, fortnight-wise and month-wise performance is displayed as Appendix tables (A-4.2.2-1, A-4.2.2-2 and A-4.2.2-3).

The panel-A of table 4.2.2 portrays that after one year the long-run performance is negative but not significant. The result is contrary to earlier study of Sohail and Nasr (2007), in which these IPOs underperform and significant negative returns was reported after one year. They selected a very small sample and evaluated the performance after one year only of going public of these IPOs. In majority studies the long run performance is evaluated more than one year after going public. However, the results of this study also confirm the underperformance of these IPOs after one year going to public.

The average market-adjusted cumulative abnormal returns are found to be negative and significant after listing of one & half years, two years, two & half years and three years period from year 2000 to 2010. The results are found to be -19.44%, -21.84%, -27.91%

and -41.45% with associated *t*-statistic of (1.92055), (1.99300), (2.24547) and (3.30723) respectively. The results are significant at 10% level for the period one & half years, at 5% for the periods two years and two & half years and at 1% for the period three years of going after public. These results get higher significance level as performance period of IPOs increased.

Table 4.2.2: Analysis of Cumulative Abnormal Returns

Panel-A: Monthly CARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
mCAR_12	1-year	(0.12400)	0.72115	(1.34290)	0.18436	(0.30869)	0.06070
mCAR_18	1.5-year	(0.19438)***	0.79047	(1.92055)	0.05954	(0.39683)	0.00807
mCAR_24	2-years	(0.21839)**	0.85585	(1.99300)	0.05082	(0.43759)	0.00080
mCAR_30	2.5-year	(0.27914)**	0.97091	(2.24547)	0.02843	(0.52780)	(0.03048)
mCAR_36	3-years	(0.41453)*	0.97894	(3.30723)	0.00160	(0.66524)	(0.16381)

Panel-B: Fortnightly CARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
fCAR_24	1-year	(0.14730)***	0.65069	(1.76801)	0.08214	(0.31395)	0.01935
fCAR_36	1.5-year	(0.20874)**	0.71053	(2.29453)	0.02527	(0.39072)	(0.02677)
fCAR_48	2-years	(0.23088)**	0.78459	(2.29833)	0.02504	(0.43183)	(0.02994)
fCAR_60	2.5-year	(0.29049)**	0.90529	(2.50614)	0.01493	(0.52234)	(0.05863)
fCAR_72	3-years	(0.41808)*	0.91716	(3.56022)	0.00073	(0.65297)	(0.18318)

Panel-C: Weekly CARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
wCAR_48	1-year	(0.14708)***	0.61319	(1.87340)	0.06589	(0.30413)	0.00996
wCAR_72	1.5-year	(0.20224)**	0.67337	(2.34579)	0.02231	(0.37470)	(0.02979)
wCAR_96	2-years	(0.20814)**	0.75987	(2.13938)	0.03648	(0.40275)	(0.01353)
wCAR_120	2.5-year	(0.26023)**	0.87985	(2.31004)	0.02434	(0.48557)	(0.03489)
wCAR_144	3-years	(0.38291)*	0.89864	(3.32794)	0.00150	(0.61306)	(0.15276)

*significant at 1% level, **significant at 5% level and ***significant at 10% level

The panel-B of table 4.2.2 portrays long-run performance of IPOs on fortnightly basis. The average market-adjusted cumulative abnormal returns are found to be negative and significant after listing of one year, one & half years, two years, two & half years and three years period from year 2000 to 2010. The results are found to be -14.73%, -20.87%, -23.09%, -29.05% and -41.81% with associated *t*-statistic of -1.768015, -2.294533, -2.298333, -2.506139 and -3.560222 respectively. All the results are significant at 10% level for the period one year, at 5% for the periods one & half years, two years and two &

half years and at 1% for the period three years of after going public. Considering the volatile nature of KSE these results are made on fortnightly basis. All these results confirm the underperformance of IPOs in KSE and in accordance with the prior studies.

Similarly, the panel-C of table 4.2.2 portrays long-run performance of IPOs on weekly basis. The average market-adjusted cumulative abnormal returns are found to be negative and significant after listing of one year, one & half years, two years, two & half years and three years period from year 2000 to 2010. The results are found to be -14.71%, -20.22% -20.81%, -26.02% and -38.29% with associated *t*-statistic of -1.87340, -2.34579, -2.13938, -2.31004 and -3.32794 respectively. All the results are significant at 10% level for the period one year, at 5% level for the periods one & half years, two years and two & half years and at 1% level for the period three years of after going public. Considering the volatile nature of KSE these results are also made on weekly basis. All these results confirm the underperformance of IPOs in KSE and are in accordance with the prior studies. The results are also displayed in figure 4.2.2-A.

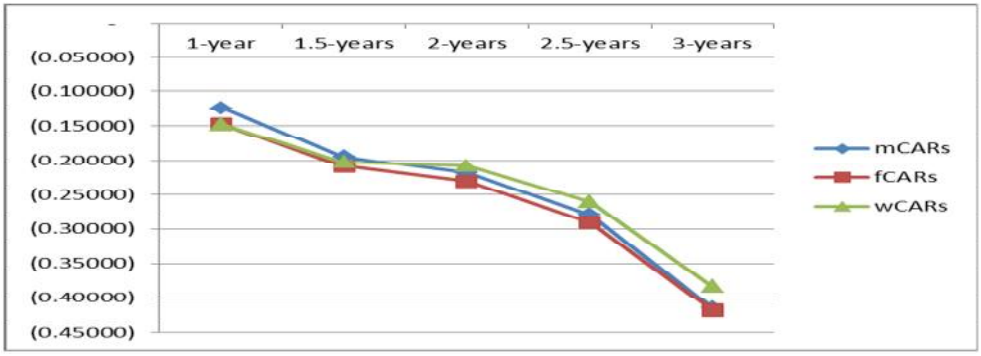


Figure: 4.2.2-A: Long-run performance in different time horizons

By comparing the analysis on weekly, fortnightly and monthly basis, the results are little bit different after two & half years and three years periods. Specifically, after three years period, the slightly less underperformance is observed in weekly analysis as compared with fortnightly and monthly analysis that can be viewed in the figure.

The null hypothesis is rejected in all the cases except after one year for monthly analysis of IPOs. The results suggest that IPOs do not sustain their initial level of underpricing

and provide investors with negative abnormal returns over a long period of one to three years after listing.

The overall long run market adjusted CARs of IPOs are in accordance with the earlier studies as discussed in the literature part of thesis in detail. However, long run market adjusted CARs of IPOs are higher than the US, UK, Canada and some Asian countries. As Brau (2012) showed -17.11% after the period of three years in USA. In UK, Gregory et al., (2009) selected a large sample of 2499 IPO firms during the period 1975 to 2004 and showed the underperformance of -12.6% after the period of three years. In Japan, Kirkulak (2008) observed the underperformance of IPOs by -18.3% after the period of three years. In Australia, Lee, Taylor, and Walter (1996) investigated the sample of Australian IPO firms that went into initial public offerings during the period of 1976 to 1989. They reported significant underperformance of -46.5% after the period of three year after initial public offerings. In Hong Kong, MacGiuinness (1993) showed underperformance of -18.3% by taking the 72 IPO firms in 1980-1990.

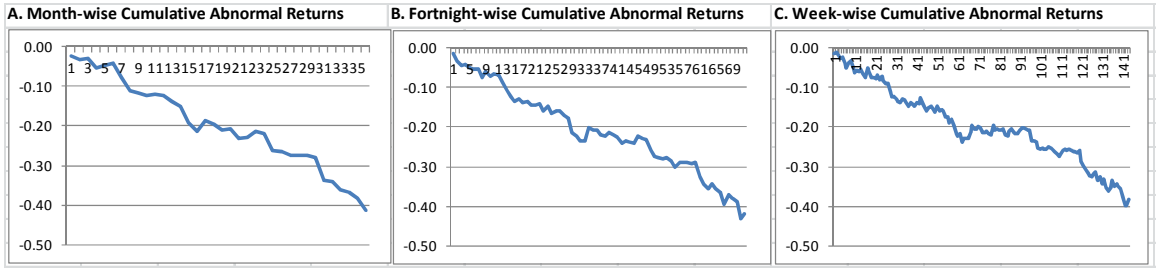


Figure: 4.2.2-B: Month, Fortnight and Week-wise underperformance of IPOs

The results of month-wise, fortnight-wise and week-wise cumulate abnormal returns based on market adjusted model are presented in appendix tables (A-4.2.2-1, A-4.2.2-2 and A-4.2.2-3) and graphically displayed in figure 4.2.2-B & C. These results represent that none of the IPOs show positive returns for the entire sample of sixty one for the period 2000 to 2010. However, these cumulative abnormal returns are not significant for the months 1 to 14 out of 36 months, fortnight 1 to 14 out of 72 fortnights and weeks 1 to 27 out of 144 weeks. The significant cumulative abnormal returns are observed after 14

months in month-wise analysis, after 7 months in fortnight-wise analysis and after 6 months in week-wise analysis.

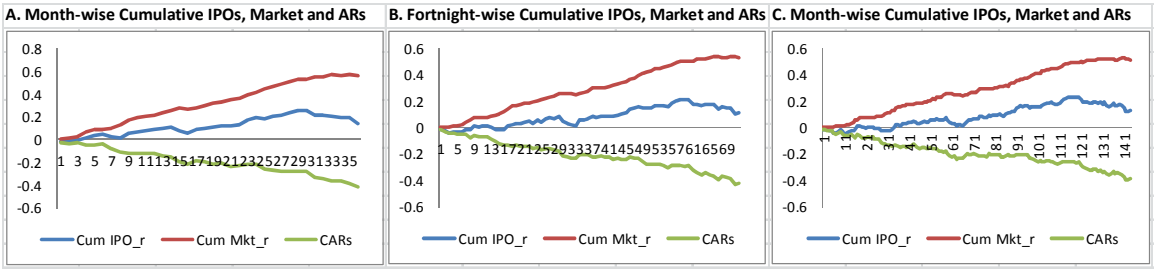


Figure: 4.2.2-C: Month, Fortnight and Week-wise Cum Returns (IPOs, Mkt. & AR)

4.2.2.1 Sector-wise Cumulative Abnormal Returns (CARs) Analysis

Table 4.2.2.1 represents the sector-wise analysis of cumulative abnormal returns of IPOs on monthly, fortnightly and weekly basis for the period of one year, one & half years, two years, two & half years and three years from year 2000 to 2010.

The sectors are divided into broad category of manufacturing, financial and other services. Manufacturing sector includes; Chemicals, Automobile & Parts, Construction & Materials, Oil & Gas Producers, Personal Goods and Industrial Metals & Mining sectors, Financial Services includes; Banks, Equity Investment Instruments sectors and Other services includes; Support Services, Industrial Transportation, General Industrials, Media, Travel & Leisure, Electricity, Software & Computer Services, Fixed Line Telecommunication and Real Estate Investment & Services sectors.

The IPOs of manufacturing sector underperforms in the long run at KSE that can also be viewed in the figure 4.2.2.1. The cumulative abnormal returns are negative and significant at the end of two & half years and three years in monthly and fortnightly analysis. These results are also significant at the end of two and half years in weekly analysis. The amount of level of underperformance is decreased as compared to full sample.

Table 4.2.2.1: Sector-wise analysis of Cumulative Abnormal Returns

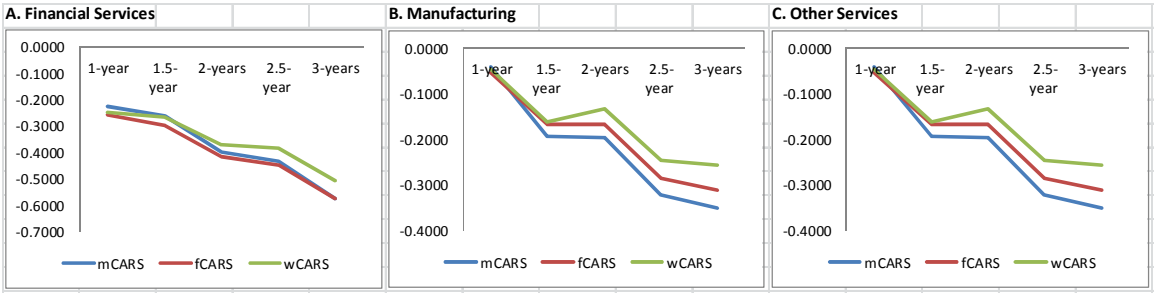
S#	Variable	CARs	t	P value	S#	Variable	CARs	t	P value
A. Financial Services (1-15)					8	F_fCAR_48	-0.4163**	-2.291	.031
1	F_mCAR_12	-0.2239	-1.409	.172	9	F_fCAR_60	-0.4460**	-2.376	.026
2	F_mCAR_18	-0.2606	-1.418	.169	10	F_fCAR_72	-0.5731*	-2.850	.009
3	F_mCAR_24	-0.3963***	-1.973	.060	11	F_wCAR_48	-0.2461***	-1.923	.066
4	F_mCAR_30	-0.4353**	-2.151	.042	12	F_wCAR_72	-0.2648***	-1.693	.103
5	F_mCAR_36	-0.5742**	-2.649	.014	13	F_wCAR_96	-0.3699**	-2.068	.050
6	F_fCAR_24	-0.2582***	-1.889	.071	14	F_wCAR_120	-0.3854**	-2.069	.049
7	F_fCAR_36	-0.2975***	-1.840	.078	15	F_wCAR_144	-0.5076**	-2.549	.018
B. Manufacturing Services (16-30)					23	M_fCAR_48	-0.1682	-1.316	.203
16	M_mCAR_12	-0.0415	-.347	.732	24	M_fCAR_60	-0.2856***	-2.007	.058
17	M_mCAR_18	-0.1948	-1.517	.145	25	M_fCAR_72	-0.3109***	-1.909	.071
18	M_mCAR_24	-0.1954	-1.454	.161	26	M_wCAR_48	-0.0463	-.416	.682
19	M_mCAR_30	-0.3219**	-2.158	.043	27	M_wCAR_72	-0.1625	-1.383	.182
20	M_mCAR_36	-0.3508**	-2.072	.051	28	M_wCAR_96	-0.1331	-1.023	.319
21	M_fCAR_24	-0.0532	-.459	.651	29	M_wCAR_120	-0.2454***	-1.692	.106
22	M_fCAR_36	-0.1665	-1.340	.195	30	M_wCAR_144	-0.2561	-1.506	.148
C. Other Services (31-45)					38	O_fCAR_48	-0.0097	-.048	.962
31	O_mCAR_12	-0.0731	-.341	.738	39	O_fCAR_60	-0.0382	-.131	.898
32	O_mCAR_18	-0.0834	-.382	.708	40	O_fCAR_72	-0.3097	-1.198	.251
33	O_mCAR_24	0.0460	.207	.839	41	O_wCAR_48	-0.1232	-.671	.513
34	O_mCAR_30	0.0410	.131	.897	42	O_wCAR_72	-0.1537	-.869	.399
35	O_mCAR_36	-0.2376	-.858	.405	43	O_wCAR_96	-0.0437	-.237	.816
36	O_fCAR_24	-0.0941	-.482	.637	44	O_wCAR_120	-0.0723	-.263	.796
37	O_fCAR_36	-0.1200	-.624	.543	45	O_wCAR_144	-0.3525	-1.489	.159

*significant at 1% level, **significant at 5% level and ***significant at 10% level

The IPOs under financial services also underperform in the long run, however this underperformance increased as compared to manufacturing sector and full sample. The cumulative abnormal returns are negative and significant at the end each period in monthly fortnightly and weekly analysis except at the end of one year and one and half years. The results are displayed in table 4.2.2.1 and figure 4.2.2.1.

On the other hand no significant cumulative abnormal returns are observed under other services. That may be the less number of IPOs in this sector. However the cumulative abnormal returns are negative and amount of level of underperformance is decreased in monthly analysis. The results are displayed in table 4.2.2.1 and figure 4.2.2.1.

Figure 4.2.2.1: Sector-wise analysis of Cumulative Abnormal Returns



4.2.3 Buy and Hold Abnormal Returns (BHARs) Analysis

As in case of CARs, BHARs are calculated using market adjusted model. To tackle the effect of underpricing issues, first day of IPOs is also not included in the long-run performance in BHARs methodology. The BHARs analysis is made on monthly, fortnightly and weekly basis. The period covered in the long-run performance is after one year, one and half year, two years, two and half years and three years. The period-wise summary of BHARs is displayed in table 4.2.3, while detailed week-wise, fortnight-wise and month-wise performance is displayed as Appendix tables (A-4.2.3-1, A-4.2.3-2 and A-4.2.3-3).

The panel-A of table 4.2.3 portrays that in all periods the long-run performance is negative. The long run BHARs after one year and two and half years are not significant. The results of BAHRs is contrary to earlier study of Sohail and Nasr (2007), in which these IPOs underperform and significant negative returns was reported after one year. They selected the very small sample and evaluated the performance after one year only of going public of these IPOs. However, overall results of this study confirm the underperformance of these IPOs.

The average market-adjusted buy and hold abnormal returns are found to be negative and significant after listing of one & half years, two years and three years period from year 2000 to 2010. The amount of level of underperformance is increased in BHARs as compared with the CARs. The results are found to be-18.63%, -24.98% and -42.66% with associated *t*-statistic of -1.69816, -2.29090 and -2.60354 respectively. The results

are significant at 10% level for the period one & half years and at 5% level for the periods two years and three years of going after public.

Table 4.2.3: Analysis of Buy and Hold Abnormal Returns (BHAR)

Panel-A: Monthly BHARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
mBHAR_12	1-year	(0.07967)	0.84063	(0.74022)	0.46205	(0.29497)	0.13562
mBHAR_18	1.5-year	(0.18628)***	0.85674	(1.69816)	0.09466	(0.40570)	0.03314
mBHAR_24	2-years	(0.24984)**	0.85176	(2.29090)	0.02550	(0.46798)	(0.03169)
mBHAR_30	2.5-year	(0.20277)	1.62111	(0.97694)	0.33252	(0.61796)	0.21241
mBHAR_36	3-years	(0.42663)**	1.27982	(2.60354)	0.01161	(0.75441)	(0.09885)

Panel-B: Fortnightly BHARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
fBHAR_24	1-year	(0.10864)	0.78041	(1.08728)	0.28126	(0.30852)	0.09123
fBHAR_36	1.5-year	(0.18625)***	0.87758	(1.65758)	0.10262	(0.41101)	0.03851
fBHAR_48	2-years	(0.22894)***	0.91489	(1.95444)	0.05531	(0.46326)	0.00537
fBHAR_60	2.5-year	(0.22268)	1.49769	(1.16124)	0.25014	(0.60625)	0.16090
fBHAR_72	3-years	(0.45811)*	1.25367	(2.85397)	0.00592	(0.77919)	(0.13703)

Panel-C: Weekly BHARs in Different Time Horizons

Variables	Period	Mean	S. D.	t	P values	Lower limit	Upper limit
wBHAR_48	1-year	(0.08956)	0.80392	(0.87005)	0.38774	(0.29545)	0.11634
wBHAR_72	1.5-year	(0.18109)***	0.86592	(1.63336)	0.10763	(0.40286)	0.04068
wBHAR_96	2-years	(0.23728)**	0.89460	(2.07159)	0.04261	(0.46640)	(0.00817)
wBHAR_120	2.5-year	(0.20086)	1.70993	(0.91747)	0.36257	(0.63880)	0.23707
wBHAR_144	3-years	(0.45933)*	1.24330	(2.88546)	0.00542	(0.77775)	(0.14091)

*significant at 1% level, **significant at 5% level and ***significant at 10% level

The panel-B of table 4.2.3 portrays long-run performance of IPOs on fortnightly basis. The average market-adjusted buy and hold abnormal returns are found to be negative and significant after listing of one & half years, two years and three years period from year 2000 to 2010. The buy and hold abnormal returns are found to be highly significant at 1% level of significance. The level of underperformances reaches at -45.81% which is higher than the underperformance level under CARs model. All these results confirm the underperformance of IPOs in KSE and are in accordance with the prior studies.

Similarly, the panel-C of table 4.2.3 portrays long-run performance of IPOs on weekly basis. The average market-adjusted buy and hold abnormal returns are found to be

negative and significant after listing of one & half years, two years and three years period from year 2000 to 2010. The level of underperformance of these IPOs increased to (-45.93%). The results are also displayed in figure 4.2.3-A.

The comparison among weekly, fortnightly and monthly basis shows that the results are little bit different after two & half years and three years periods. Specifically, after three years period, the slightly less underperformance is observed in weekly analysis as compared with fortnightly and monthly analysis that can viewed in the figure.

The null hypothesis is rejected in all the cases except after one year and two and half years for monthly, fortnightly and weekly analysis of IPOs. The results suggest that IPOs not sustain their initial level of underpricing and provide investors with negative abnormal returns over a long period of one to three years after listing.

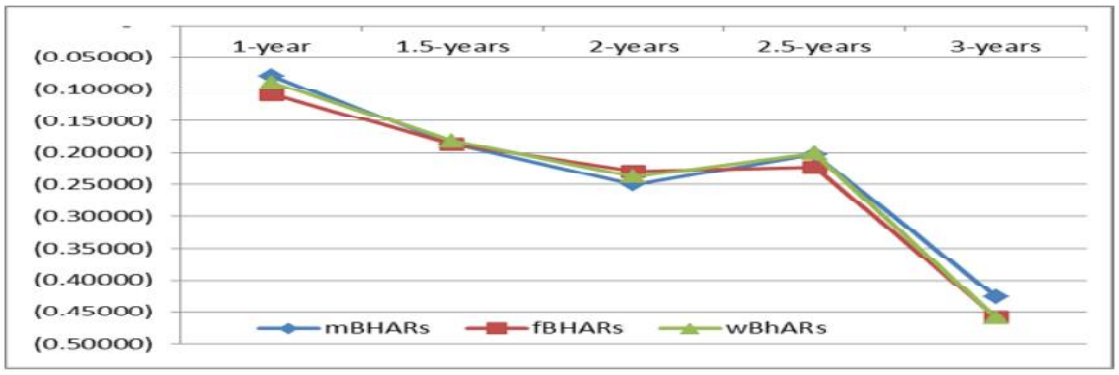


Figure: 4.2.3-A: BHAR: Long-run performance in different time horizons

The results of month-wise, fortnight-wise and week-wise buy and hold abnormal returns based on market adjusted model are presented in appendix tables (A-4.2.3-1, A-4.2.3-2 and A-4.2.3-3) and graphically displayed in figure 4.2.3-B & C. These month-wise BHARs represent that none of the IPOs show positive returns for the entire sample of sixty one for the period 2000 to 2010. However, in fortnightly basis BHARs, one fortnightly return in fortnight 9 and in weekly basis BHARs, two weekly returns in weeks 17 & 18 are observed to be positive but remains insignificant. Alternatively, these buy and hold abnormal returns are not significant for the months 1 to 15 and 30 out of 36

months, fortnights 1 to 31, 35, 39, 59, and 60 out of 72 fortnights and weeks 1 to 62, 70, 71, 78, 117 to 119 out of 144 weeks.

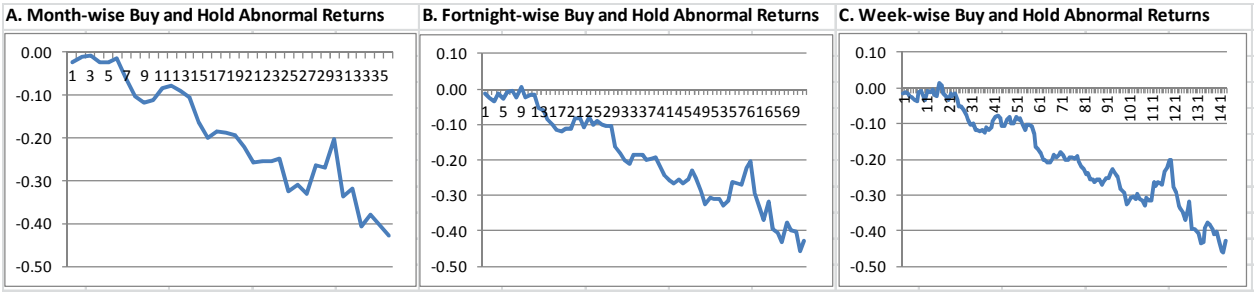


Figure: 4.2.3-B: BHARs: Month, Fortnight and Week-wise underperformance of IPOs

The overall long run market adjusted BHARs of IPOs are accordance with the earlier studies as discussed in the literature part of thesis in detail. However, long run market adjusted BHARs of IPOs are higher than the US, UK, Canada and some Asian countries as in CARs analysis. Komenkul et al. (2012) the underperformance of IPOs in Thailand by selecting the 136 IPO firms during the period of 2001 to 2012 and showed -16.6% BHARs. In USA, Brau (2012) selected a large IPO sample of 3547 during the period of 1985 to 2003 and documented the BHARs of -17.1% after the period of three years.

4.2.3.1 Sector-wise Buy and Hold Abnormal Returns (BHARs) Analysis

Table 4.2.3.1 represents the sector-wise analysis of buy and hold abnormal returns of IPOs on monthly, fortnightly and weekly basis for the period of one year, one & half years, two years, two & half years and three years from year 2000 to 2010. The sectors are divided into broad category of manufacturing, financial and other services.

The IPOs of manufacturing sector underperforms in the long run at KSE that can also be viewed in the figure 4.2.3.1. The buy and hold abnormal returns are negative and significant at the end of one and half years, two years and three years in monthly at 10% and 5% level of significance. In the monthly buy and hold return analysis the level of underperformance increases from year to year two and half year and then start decrease at the end of three years. In the fortnightly analysis of buy and hold abnormal returns, the negative and significant results are observed only at the end of two years. These results

also remain significant at the end of two years and two and half years in weekly analysis. The amount of level of underperformance is decreased as compared to full sample and remains at -26%.

Table 4.2.3: Sector-wise analysis of Buy and Hold Abnormal Returns (BHAR)

S#	Variable	BHARs	t	P value	S#	Variable	BHARs	T	P value
A. Financial Services (1-15)					8	F_fBHAR_48	-0.3071***	-1.690	.104
1	F_mBHAR_12	-0.1558	-1.062	.299	9	F_fBHAR_60	-0.3512	-1.541	.136
2	F_mBHAR_18	-0.1917	-1.088	.287	10	F_fBHAR_72	-0.5325**	-2.425	.023
3	F_mBHAR_24	-0.3462**	-2.095	.047	11	F_wBHAR_48	-0.1470	-1.020	.318
4	F_mBHAR_30	-0.3643	-1.632	.116	12	F_wBHAR_72	-0.1786	-.976	.339
5	F_mBHAR_36	-0.4709***	-1.991	.058	13	F_wBHAR_96	-0.3347***	-1.918	.067
6	F_fBHAR_24	-0.1434	-1.039	.309	14	F_wBHAR_120	-0.3754	-1.653	.111
7	F_fBHAR_36	-0.2011	-1.105	.280	15	F_wBHAR_144	-0.5031**	-2.320	.029
B. Manufacturing Services (16-30)					23	M_fBHAR_48	-0.2561***	-1.775	.091
16	M_mBHAR_12	-0.0592	-.426	.675	24	M_fBHAR_60	-0.4539	-3.195	.005
17	M_mBHAR_18	-0.2208***	-1.881	.075	25	M_fBHAR_72	-0.2832	-1.198	.245
18	M_mBHAR_24	-0.2734***	-1.881	.075	26	M_wBHAR_48	-0.0865	-.694	.496
19	M_mBHAR_30	-0.4101*	-2.720	.013	27	M_wBHAR_72	-0.2032	-1.666	.111
20	M_mBHAR_36	-0.2672	-1.165	.258	28	M_wBHAR_96	-0.2675**	-1.866	.077
21	M_fBHAR_24	-0.1394	-1.314	.204	29	M_wBHAR_120	-0.4414*	-3.006	.007
22	M_fBHAR_36	-0.1912	-1.587	.128	30	M_wBHAR_144	-0.2961	-1.294	.210
C. Other Services (31-45)					38	O_fBHAR_48	-0.0607	-.192	.851
31	O_mBHAR_12	0.0185	.058	.954	39	O_fBHAR_60	0.3152	.484	.636
32	O_mBHAR_18	-0.1289	-.422	.679	40	O_fBHAR_72	-0.5790	-1.312	.211
33	O_mBHAR_24	-0.0563	-.195	.848	41	O_wBHAR_48	0.0018	.006	.995
34	O_mBHAR_30	0.3566	.488	.633	42	O_wBHAR_72	-0.1544	-.518	.612
35	O_mBHAR_36	-0.5760	-1.293	.217	43	O_wBHAR_96	-0.0326	-.105	.918
36	O_fBHAR_24	-0.0077	-.025	.981	44	O_wBHAR_120	0.4267	.548	.593
37	O_fBHAR_36	-0.1546	-.498	.626	45	O_wBHAR_144	-0.6149	-1.382	.189

*significant at 1% level, **significant at 5% level and ***significant at 10% level

In the buy and hold abnormal returns analysis, the IPOs under financial services also underperform in the long run, however this underperformance increased as compared to manufacturing sector and full sample. The buy and hold abnormal returns are observed to be negative and significant at the end two and three years in monthly fortnightly and weekly analysis. The results are displayed in table 4.2.3.1 and figure 4.2.3.1. In monthly

analysis the underperformance of IPOs remain at -47.09%, in fortnightly analysis it remains at -53.25% while in weekly analysis it remains at -50.31%

Conversely, no significant buy and hold abnormal returns are observed under other services. That may be the less number of IPOs in this sector. However, the buy and hold abnormal returns remain positive but insignificant at the end of one year and two & half years in monthly analysis. The buy and hold abnormal returns also remain positive but insignificant at the end of one and half years in fortnightly analysis. In the same way, the buy and hold abnormal returns remain positive but insignificant at the end of one year and two and half years in weekly. The results are displayed in table 4.2.3.1 and figure 4.2.3.1.

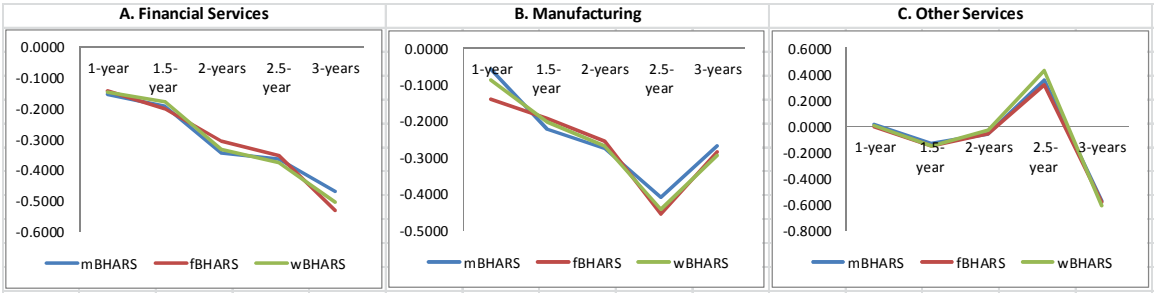


Figure 4.2.3.1: Sector-wise analysis of Buy and Hold Abnormal Returns

4.2.4 Long-run performance analysis using Jensen's alpha

The long-run performance is observed using Jenson's alpha after the period of one year, one and half year, two years, two and half years and three years basis. To better valuation of these IPOs in long run, the weekly as well as fortnightly analysis are also made along with the monthly analysis. The Jensen's alpha is obtained by using three models:

- Capital Assets Pricing Model
- Three factors Fama French Model
- Four factors Carhart Model.

The analysis is made both on equally and value weighted average basis in Fama French three factor model.

4.2.4.1 Long-run performance using Jensen's alpha by CAPM, 3-FF and 4-F Models

The results of IPOs which were selected for long run performance are displayed in 4.2.4.1 (A, B and C) tables. Table 4.2.4.1-A represents the Jensen's alphas calculated on monthly basis for time series data, while table 4.2.4.1-B represents the Jensen's alphas calculated on fortnightly basis and table 4.2.4.1-C represents the Jensen's alphas calculated on weekly basis. Further the column headings represent the long run performance in five different time intervals i.e. after 1, 1.5, 2, 2.5 and 3 years. In these tables, the results of three models extended to five models under CAPM (Capital Asset Pricing Model), FF_Eq (three factor Fama French model calculated on equally weighted basis), FF_Val (three factor Fama French model calculated on value weighted basis), 4F_Eq (four factor Carhart model calculated on equally weighted basis) and 4F_Val (four factor Carhart model calculated on value weighted basis).

Generally all the models represent the risk adjusted underperformance of these IPOs in long run in context of asset pricing models. In all these regression models the intercept term i.e. Jensen's alpha is observed to be negative but insignificant after the periods of one and half years to three years under monthly, fortnightly and weekly basis analysis. However, under model 4F_Val for monthly analysis and under models 4F_Eq and 4F_Val for fortnightly and weekly analysis, Jensen's alpha after one year is observed to be zero (or positive and less than 0.002) but remains insignificant.

As in KSE, the controversial results with regard to underperformance of IPOs were presented in the study of Ritter and Welch (2002). Norli (2005) in his study used Fama-French 3-factor model and came with different results. In his study Jensen's alpha was found to be insignificant to show that IPOs don not underperform in long run after adjusting the risk factors of market, size and value. However, Gompers and Lerner (2003) used the larger set of IPO firms from 1936 to 1976 and showed underperformance by using Fama-French 3-factor model.

Different studies such as Kothari and Warner (1997); Barber and Lyon (1997); Fama (1998); Lyon et al. (1999); and Loughran and Ritter (2000) have shown different underperformance results of IPO firms depending upon the choice of method. Contrary to Barber and Lyon (1997) study, Fama (1998) preferred the CARs model to observe long run performance of IPOs. He argued that CARs can easily observe the linearity pattern of averages with the long run period of time.

The Jensen's alpha envisage the amount of monthly underperformance after three years -1.0%, -1.2%, -1.1%, -1.0%, and -1.0% in all the five models respectively. Similarly, the fortnightly underperformance after three years remains at -0.5%, -0.5%, -0.5%, -0.4% and -0.4% in all the five models respectively while weekly underperformance after three years remains at -0.2% by all the models showing some consistent performance by all the five models. The results are also displayed graphically in the figure 4.2.4 (a, d, g, j and m). The under performance remains at deep downwards on monthly basis analysis as compared with fortnightly analysis from year one to year three in all the models except 4F_Eq and FF_Eq after one year. In addition the amount of under performance remains less in four factor Corhart model with that of CAPM and three factor Fama French Model and can be easily noticed in the figure.

Conversely, betas are found to be statistically significant after 2.5 years and 3 years in all the models. These betas remain at 0.95 to 0.97 in monthly analysis, 0.85 to 0.86 in fortnightly analysis and 0.81 in weekly analysis after three years. All these betas show less volatility of IPO portfolios after the period of three years. Overall, market effects are significant in CAPM, three factor Fama French model and four factor Carhart's Model.

On the other hand after period of one year, in monthly analysis, these betas are a little bit higher than market betas but remain insignificant. The tendency of betas in different time intervals from year 1 to year 1.5, then year 1.5 to year 2 and onward up to year 3 drift downward under all the five models. The same tendency of betas is also observed from monthly analysis to fortnightly analysis and from fortnightly analysis to weekly analysis in all the models.

Table 4.2.4.1-A: Long run performance under different models (monthly basis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**T**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
m_CAPM										
Alpha	-0.010	-0.819	-0.011	-0.728	-0.009	-0.585	-0.010	-0.666	-0.010	-0.716
Beta	1.056	3.323	0.980	3.467	0.961	3.437	0.957***	3.904	0.961***	4.014
r^2	0.339		0.329		0.298		0.298		0.302	
Adj. r^2	0.273		0.287		0.266		0.273		0.282	
m_FF_Eq										
Alpha	-0.003	-0.599	-0.011	-0.630	-0.010	-0.580	-0.011	-0.688	-0.012	-0.755
Beta	1.041	3.321	0.967	3.624	0.958	3.357	0.964***	3.778	0.969***	3.948
S	-0.037	-0.198	-0.052	-0.208	0.043	-0.189	0.077	-0.037	0.105	-0.021
H	-0.321	-0.405	-0.272	-0.353	-0.205	-0.238	-0.256	-0.340	-0.238	-0.340
R^2	0.467		0.407		0.362		0.348		0.342	
Adj. R^2	0.268		0.280		0.266		0.273		0.281	
m_FF_Val										
Alpha	-0.006	-0.749	-0.011	-0.708	-0.008	-0.561	-0.009	-0.666	-0.011	-0.732
Beta	1.050	3.218	0.967	3.614	0.952	3.363	0.948***	3.793	0.958***	3.918
S	-0.011	-0.472	0.029	-0.222	0.058	-0.184	0.052	-0.061	0.063	-0.023
H	-0.143	-0.310	-0.131	-0.295	-0.090	-0.235	-0.175	-0.354	-0.182	-0.383
R^2	0.460		0.403		0.357		0.347		0.340	
Adj. R^2	0.258		0.276		0.260		0.272		0.278	
m_4F_Eq										
Alpha	-0.003	-0.153	-0.010	-0.386	-0.009	-0.384	-0.008	-0.472	-0.010	-0.571
Beta	1.089	2.886	0.982	3.438	0.976	3.305	0.979***	3.746	0.975***	3.940
S	0.263	-0.185	0.032	-0.221	0.076	-0.164	0.126	-0.013	0.136	-0.018
H	-0.532	-0.318	-0.338	-0.253	-0.232	-0.136	-0.231	-0.206	-0.194	-0.219
M	-0.009	-0.391	0.024	-0.191	0.036	-0.247	-0.023	-0.332	-0.038	-0.214
R^2	0.537		0.449		0.401		0.378		0.364	
Adj. R^2	0.272		0.280		0.275		0.279		0.282	
m_4F_val										
Alpha	0.001	-0.152	-0.009	-0.445	-0.007	-0.310	-0.006	-0.416	-0.010	-0.574
Beta	1.080	2.501	0.988	3.403	0.97***	3.255	0.966***	3.737	0.966***	3.914
S	0.087	-0.445	0.070	-0.103	0.077	-0.132	0.077	-0.036	0.082	-0.043
H	-0.323	-0.247	-0.195	-0.251	-0.144	-0.192	-0.183	-0.305	-0.173	-0.317
M	-0.134	-0.540	-0.049	-0.377	-0.020	-0.392	-0.065	-0.445	-0.063	-0.287
R^2	0.526		0.446		0.400		0.377		0.363	
Adj. R^2	0.255		0.276		0.273		0.277		0.280	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

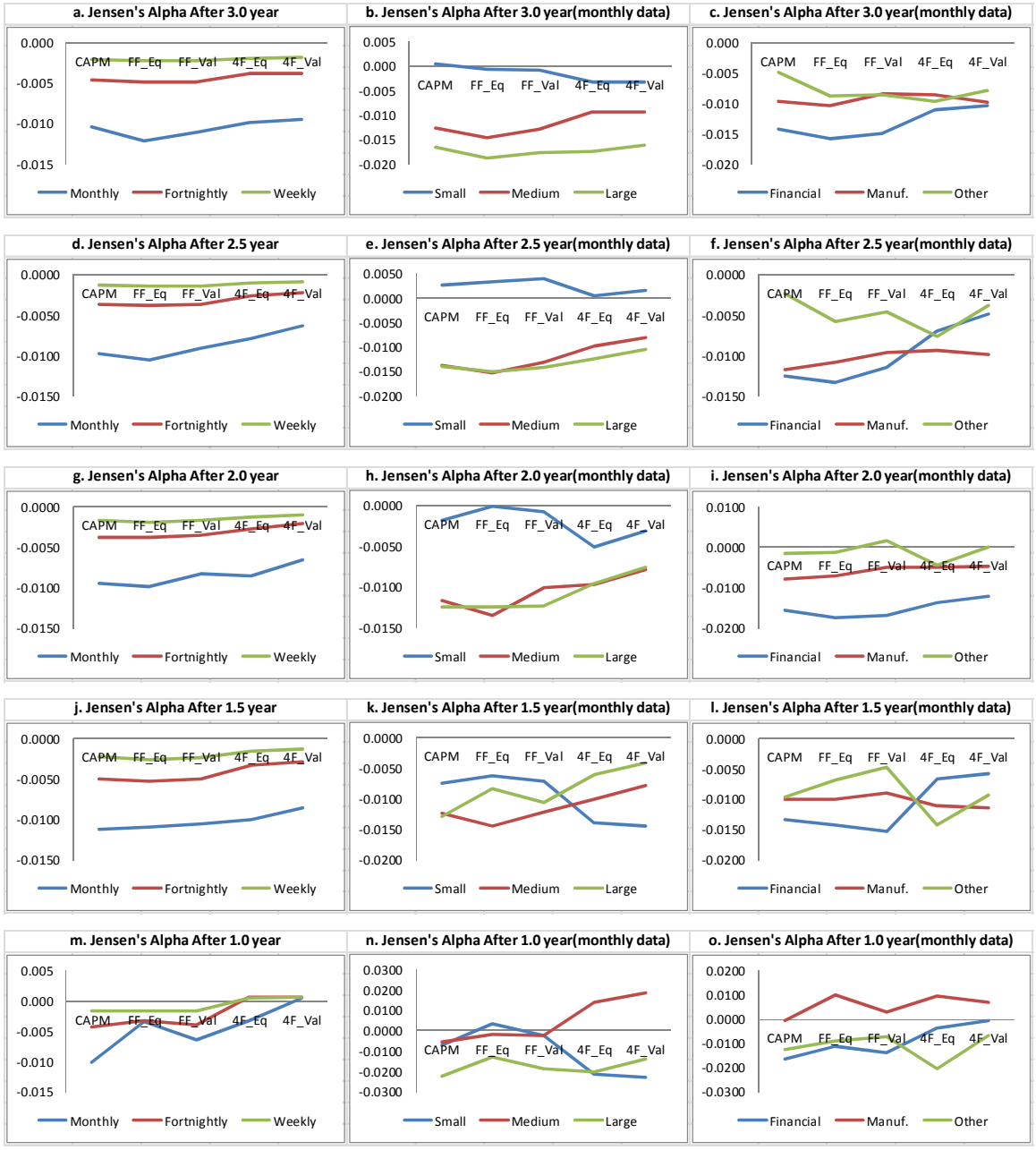


Figure 4.2.4: Jensen's alpha

Table 4.2.4.1-B: Long run performance under different models (fortnightly basis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
f_CAPM										
Alpha	-0.004	-0.502	-0.005	-0.541	-0.004	-0.423	-0.004	-0.424	-0.005	-0.532
Beta	0.872	3.058	0.855	3.505	0.855	3.701	0.854***	4.007	0.851***	4.046
r^2	0.240		0.240		0.227		0.225		0.224	
Adj. r^2	0.205		0.218		0.210		0.212		0.212	
f_FF_Eq										
Alpha	-0.003	-0.482	-0.005	-0.575	-0.004	-0.450	-0.004	-0.432	-0.005	-0.538
Beta	0.852	2.876	0.831***	3.304	0.849	3.548	0.855***	3.850	0.855***	3.979
S	-0.043	-0.064	0.077	0.052	0.061	0.076	0.032	0.084	0.067	0.146
H	-0.170	-0.166	-0.095	-0.092	-0.041	-0.031	-0.080	-0.127	-0.077	-0.096
R^2	0.306		0.280		0.262		0.251		0.245	
Adj. R^2	0.202		0.213		0.211		0.211		0.211	
f_FF_Val										
Alpha	-0.004	-0.511	-0.005	-0.573	-0.004	-0.429	-0.004	-0.408	-0.005	-0.535
Beta	0.849	2.848	0.839	3.278	0.848	3.515	0.85***	3.850	0.852***	3.971
S	0.021	-0.086	0.082	0.029	0.044	0.025	0.030	0.048	0.047	0.090
H	-0.046	-0.023	-0.048	-0.068	-0.026	-0.054	-0.053	-0.125	-0.059	-0.110
R^2	0.297		0.280		0.260		0.251		0.243	
Adj. R^2	0.192		0.212		0.209		0.211		0.210	
f_4F_Eq										
Alpha	0.001	-0.177	-0.003	-0.326	-0.003	-0.341	-0.003	-0.346	-0.004	-0.469
Beta	0.845	2.677	0.818	3.262	0.839	3.463	0.847***	3.789	0.847***	3.944
S	-0.013	-0.049	0.080	0.056	0.056	0.074	0.030	0.072	0.070	0.124
H	-0.135	-0.066	-0.085	-0.017	-0.028	0.025	-0.061	-0.075	-0.064	-0.053
M	-0.146	-0.323	-0.097	-0.298	-0.074	-0.292	-0.083	-0.313	-0.081	-0.299
R^2	0.338		0.313		0.284		0.267		0.257	
Adj. R^2	0.198		0.224		0.217		0.214		0.213	
f_4F_Val										
Alpha	0.001	-0.166	-0.003	-0.302	-0.002	-0.280	-0.002	-0.291	-0.004	-0.440
Beta	0.847	2.666	0.829	3.258	0.841	3.442	0.845***	3.813	0.845***	3.948
S	0.016	-0.121	0.072	0.000	0.034	-0.006	0.025	0.016	0.047	0.067
H	-0.029	0.032	-0.029	-0.037	-0.016	-0.038	-0.049	-0.126	-0.056	-0.123
M	-0.166	-0.365	-0.110	-0.355	-0.089	-0.333	-0.096	-0.354	-0.095	-0.344
R^2	0.331		0.313		0.283		0.268		0.256	
Adj. R^2	0.191		0.225		0.216		0.214		0.212	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table 4.2.4.1-C: Long run performance under different models (weekly basis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
w_CAPM										
Alpha	-0.002	-0.364	-0.002	-0.368	-0.002	-0.282	-0.001	-0.299	-0.002	-0.430
Beta	0.819	3.624	0.812***	3.897	0.798***	4.192	0.805***	4.557	0.811**	4.824
r^2	0.199		0.200		0.191		0.190		0.190	
Adj. r^2	0.181		0.188		0.182		0.183		0.184	
w_FF_Eq										
Alpha	-0.002	-0.358	-0.003	-0.397	-0.002	-0.308	-0.001	-0.309	-0.002	-0.437
Beta	0.802	3.533	0.804***	3.777	0.798***	4.116	0.809***	4.515	0.814**	4.768
S	0.060	0.103	0.089	0.180	0.066	0.184	0.061	0.255	0.065	0.266
H	-0.097	-0.124	-0.063	-0.137	-0.044	-0.121	-0.058	-0.217	-0.036	-0.148
R^2	0.232		0.220		0.207		0.204		0.203	
Adj. R^2	0.180		0.186		0.182		0.184		0.186	
w_FF_val										
Alpha	-0.002	-0.373	-0.002	-0.391	-0.002	-0.287	-0.001	-0.299	-0.002	-0.434
Beta	0.802	3.561	0.803***	3.788	0.793***	4.135	0.803***	4.540	0.809**	4.803
S	0.043	-0.001	0.086	0.168	0.067	0.193	0.063	0.241	0.068	0.249
H	-0.072	-0.106	-0.057	-0.182	-0.044	-0.193	-0.055	-0.250	-0.036	-0.181
R^2	0.230		0.218		0.206		0.203		0.201	
Adj. R^2	0.178		0.183		0.180		0.182		0.184	
w_4F_Eq										
Alpha	0.001	-0.112	-0.002	-0.216	-0.001	-0.224	-0.001	-0.233	-0.002	-0.382
Beta	0.809	3.468	0.803***	3.791	0.796***	4.128	0.805***	4.518	0.81**	4.758
S	0.069	0.133	0.105	0.228	0.077	0.224	0.071	0.290	0.075	0.300
H	-0.075	-0.075	-0.055	-0.100	-0.035	-0.090	-0.050	-0.191	-0.031	-0.145
M	-0.146	-0.419	-0.096	-0.400	-0.071	-0.316	-0.066	-0.313	-0.060	-0.282
R^2	0.249		0.235		0.219		0.212		0.208	
Adj. R^2	0.179		0.190		0.184		0.184		0.185	
w_4F_val										
Alpha	0.001	-0.105	-0.001	-0.222	-0.001	-0.185	-0.001	-0.209	-0.002	-0.365
Beta	0.810	3.498	0.802	3.790	0.793***	4.139	0.799***	4.528	0.806***	4.788
S	0.043	0.018	0.092	0.201	0.070	0.204	0.067	0.257	0.073	0.265
H	-0.067	-0.091	-0.051	-0.161	-0.038	-0.180	-0.051	-0.243	-0.038	-0.206
M	-0.149	-0.400	-0.102	-0.422	-0.086	-0.352	-0.079	-0.343	-0.071	-0.320
R^2	0.247		0.233		0.217		0.210		0.206	
Adj. R^2	0.177		0.187		0.183		0.183		0.183	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

The size effect in three factor Fama French model (equally and value weighted) and four factor Carhart's model is insignificant. The results indicate that there is no co movement of IPO portfolios with that of small and large firm's portfolio. Further the sign of size factor is positive in weekly analysis in all the time intervals from year 1 to year 3, confirming the results of previous studies like Brave and Gompers (1997). The sign is also positive in fortnightly analysis in all the time intervals except after one year. However, the sign is mixed i.e. positive or negate from year 1 to year 2.5 in monthly analysis, but remains positive after one year, which is somewhat contradictory to previous research. The negative and insignificant result is also reported by earlier researchers like Saleh and Ahmad (2008) etc.

The value factor is also insignificant in three factor Fama French model (equally and value weighted) and four factor Carhart's model. The results indicate that there is no co movement of IPO portfolios with that of value portfolio (high book to market ratio firms) and growth's portfolio (low book to market ratio firms). However, the sign of value factor is negative in all the time intervals from year 1 to year 3 in monthly, fortnightly and weekly analysis and is in accordance with the previous studies.

The momentum factor effect is also insignificant and in accordance with some of the previous studies. The sign of value factor is negative in all the time intervals from year 1 to year 3 in monthly, fortnightly and weekly analysis. The results indicate that there is no co movement of IPO portfolios with that of winners and looser portfolios.

4.2.4.2 Sector and size wise long-run performance of IPOs using Jensen's alpha

The monthly analysis of sector-wise and size-wise long run performance of IPOs after three years are displayed in table 4.2.4.2. The detailed monthly, fortnightly and weekly analyses of size-wise long run performance of IPOs in different time intervals are displayed in appendix tables (9 tables A-4.4.4.4-1 to 9). The column headings represent the long run performance in five different time intervals i.e. after 1, 1.5, 2, 2.5 and 3 years. In these tables, the results of three models extended to five models under CAPM

(Capital Asset Pricing Model), FF_Eq (three factor Fama French model calculated on equally weighted basis), FF_Val (three factor Fama French model calculated on value weighted basis), 4F_Eq (four factor Carhart model calculated on equally weighted basis) and 4F_Val (four factor Carhart model calculated on value weighted basis).

Generally all the models represent the risk adjusted underperformance of these IPOs in long run in context of asset pricing models on sector-wise and size-wise basis. In all these regression models the intercept term i.e. Jensen's alpha is observed to be negative but insignificant after three years under manufacturing, financial services and other services sectors. However, no underperformance of these IPOs is observed after one year in manufacturing sector by all the models except CAPM. Similarly, no underperformance of these IPOs is observed after 2 years in other services sector by 4F_Val and 3 FF_val models. The results are also displayed graphically in the figure 4.2.4 (c, f, i, l and o). The under performance remains at deep downwards on monthly basis in financial services sector as compared with manufacturing and other services sectors.

In size analysis, small firms IPO portfolio show less underperformance as compared to medium and large firms IPO portfolios in different time horizons. Even, after two and half years, small firms IPO portfolio show no underperformance measured by all the models. The results are displayed graphically in the figure 4.2.4 (b, e, h, k and n). The medium firms IPO portfolio also show no underperformance after one year by four factor model.

Conversely, generally, betas are found to be statistically significant for monthly sector-wise and size-wise analysis after the period of 3 years by all the models. Overall, market effect is significant in CAPM, three factor Fama French model and four factor Carhart's Model. These betas remain greater than market beta in manufacturing sector showing greater volatility than market. In financial services sector, these betas remain at 0.88 to 0.90 in monthly analysis after the period of three years showing less volatility. On the other in other services sector the beta is significant only in the CAPM.

Table 4.2.4.2: Sector and size wise Long run performance of IPOs

	Financial		Manufacturing		Other		Small		Medium		Large	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
m_CAPM												
Alpha	-0.014	-0.961	-0.010	-0.617	-0.005	-0.446	0.000	-0.413	-0.013	-0.749	-0.017	-0.950
Beta	0.882***	3.936	1.025**	4.834	1.001***	2.996	0.861***	3.237	0.95***	3.728	1.082*	5.382
r^2	0.301		0.353		0.233		0.183		0.290		0.448	
Adj. r^2	0.280		0.334		0.211		0.158		0.269		0.432	
m_FF_Eq												
Alpha	-0.016	-0.954	-0.010	-0.671	-0.009	-0.542	-0.001	-0.421	-0.015	-0.781	-0.019	-1.037
Beta	0.89***	3.669	1.051**	4.822	0.986	3.192	0.854***	2.938	0.97***	3.702	1.081**	5.469
S	0.010	-0.092	0.140	0.092	0.216	-0.060	0.059	0.019	0.217	0.112	-0.078	-0.333
H	-0.041	-0.121	-0.071	-0.135	-0.801	-0.992	-0.123	-0.170	-0.336	-0.487	-0.150	-0.206
R^2	0.335		0.388		0.291		0.215		0.336		0.484	
Adj. R^2	0.273		0.331		0.224		0.141		0.273		0.435	
m_FF_Val												
Alpha	-0.015	-0.958	-0.008	-0.618	-0.009	-0.513	-0.001	-0.476	-0.013	-0.725	-0.018	-1.002
Beta	0.869***	3.655	1.054**	4.833	0.969	3.074	0.837***	2.931	0.959***	3.695	1.075**	5.363
S	-0.008	-0.195	0.076	0.065	0.162	0.140	0.066	-0.097	0.125	0.127	-0.071	-0.260
H	-0.004	-0.153	-0.106	-0.349	-0.583	-0.817	-0.094	-0.187	-0.225	-0.426	-0.179	-0.491
R^2	0.335		0.393		0.275		0.220		0.329		0.484	
Adj. R^2	0.272		0.336		0.207		0.147		0.266		0.436	
m_4F_Eq												
Alpha	-0.011	-0.632	-0.009	-0.654	-0.010	-0.353	-0.003	-0.434	-0.009	-0.476	-0.017	-0.904
Beta	0.908***	3.652	1.055**	4.814	0.976	3.196	0.862***	2.914	0.974***	3.750	1.09**	5.357
S	0.127	-0.021	0.091	0.072	0.213	-0.137	0.125	-0.036	0.260	0.142	-0.109	-0.329
H	-0.063	-0.079	0.056	0.073	-0.761	-0.861	-0.043	-0.057	-0.273	-0.224	-0.181	-0.371
M	-0.182	-0.437	0.050	0.106	0.079	-0.289	0.212	0.089	-0.134	-0.349	-0.088	-0.238
R^2	0.363		0.401		0.315		0.245		0.355		0.502	
Adj. R^2	0.281		0.324		0.227		0.148		0.272		0.437	
m_4F_val												
Alpha	-0.010	-0.656	-0.010	-0.674	-0.008	-0.299	-0.003	-0.443	-0.009	-0.506	-0.016	-0.847
Beta	0.89***	3.696	1.055**	4.783	0.970	3.062	0.851***	2.927	0.965***	3.740	1.085*	5.262
S	0.042	-0.193	0.064	0.072	0.173	0.049	0.104	-0.121	0.142	0.079	-0.066	-0.216
H	-0.060	-0.185	-0.053	-0.155	-0.530	-0.764	-0.059	-0.199	-0.213	-0.238	-0.204	-0.598
M	-0.192	-0.484	0.041	0.068	0.007	-0.455	0.161	-0.050	-0.155	-0.417	-0.095	-0.254
R^2	0.365		0.403		0.302		0.248		0.349		0.504	
Adj. R^2	0.283		0.326		0.212		0.151		0.265		0.440	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

In size analysis, the betas are found to be greater than one in large firm portfolio of IPOs showing greater volatility than market. In small firm portfolio of IPOs these betas remain at 0.84 to 0.86 in all the models after the period of three years showing less volatility. On the medium size portfolio of IPOs, these betas remain at 0.95 to 0.97. The tendency of betas from large firm IPO portfolios to medium firm IPO portfolios, then medium firm IPO portfolios to small firm IPO portfolios drift downward, under all the five models. The same tendency of betas is also observed from monthly analysis to fortnightly analysis and from fortnightly analysis to weekly analysis in all the models represented in the appendix tables (9 tables A-4.4.4.4-1 to 9).

The size effect, value effect in three factor Fama French model (equally and value weighted) and momentum effect in four factor Carhart's model is observed to be insignificant. The results indicate that there is no co movement of IPO portfolios with that of small and large firm's portfolio, value portfolio, growth's portfolio, winners and looser portfolios.

4.2.4.3 Year wise long-run performance analysis of IPOs using Jensen's alpha

The year-wise monthly analyses of long run performance of IPOs after three years are displayed in table 4.2.4.3 (A & B). The year-wise analysis of all the models is represented in two tables, table 4.2.4.3-A represents the results from year 2000 to 2005, while table 4.2.4.3-B represent the results from year 2006 to 2010. The last two column of table 4.2.3.4-B represent the summary of year-wise analysis. In all these regression models the intercept term i.e. monthly Jensen's alpha is observed to be negative but insignificant in all the years except in year 2000, 2001 and 2002. The results are visualized in the figure 4.2.4.3. On the other hand, the Jensen's alpha in year 2010 is found to be negative and significant in different time intervals, the result are not presented due to limitation of the thesis.

Table 4.2.4.3-A: Year wise Long run performance of IPOs (2000 to 2005)

	2000		2001		2002		2003		2004		2005	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	T	Coeff.	t	Coeff.	t
m_CAPM												
Alpha	-0.016	-0.361	0.033	1.406	0.006	0.418	-0.014	-1.059	-0.016	-0.892	-0.001	-0.475
Beta	1.166*	5.409	0.346	1.878	1.015**	2.805	0.791**	3.155	1.026	3.894	0.888**	3.898
r^2	0.370		0.063		0.315		0.244		0.292		0.255	
Adj. r^2	0.351		0.035		0.295		0.221		0.271		0.233	
m_FF_Eq												
Alpha	-0.024	-0.608	0.036	1.306	0.009	0.550	-0.017	-1.019	-0.017	-0.899	-0.003	-0.545
Beta	1.216*	5.339	0.349	1.771	0.97**	3.011	0.772**	3.166	1.046	3.882	0.9**	3.916
S	0.530	0.786	0.068	-0.716	-0.363	-0.614	0.320	0.080	0.261	0.280	0.108	0.103
H	-0.299	-0.558	-0.195	-0.631	0.040	0.507	-0.406	-0.477	-0.190	-0.282	-0.435	-0.718
R^2	0.392		0.084		0.393		0.294		0.315		0.303	
Adj. R^2	0.335		-0.002		0.336		0.228		0.250		0.238	
m_FF_Val												
Alpha	0.011	0.326	0.038	1.328	0.010	0.603	-0.014	-0.753	-0.016	-0.880	-0.004	-0.597
Beta	1.232*	5.805	0.343	1.823	0.973**	2.979	0.801**	3.224	1.008	4.021	0.887**	3.694
S	0.372	0.833	-0.090	-0.301	-0.367	-0.877	0.167	0.014	0.176	0.058	0.066	0.062
H	-0.316	-0.872	-0.183	-0.773	0.272	0.773	0.007	0.082	-0.132	-0.403	-0.367	-0.677
R^2	0.407		0.110		0.395		0.275		0.319		0.300	
Adj. R^2	0.351		0.027		0.338		0.208		0.255		0.235	
m_4F_Eq												
Alpha	0.018	0.548	0.038	1.464	0.010	0.578	-0.021	-0.975	-0.018	-0.770	-0.001	-0.327
Beta	1.22*	5.344	0.338	1.756	1.012**	3.067	0.755**	3.004	1.029	3.769	0.922**	3.902
S	0.568	0.891	0.021	-0.741	-0.320	-0.524	0.257	-0.041	0.337	0.073	0.130	0.143
H	-0.398	-0.368	-0.069	-0.131	0.130	0.762	-0.504	-0.590	-0.226	-0.243	-0.400	-0.613
M	0.082	0.100	-0.104	-0.230	-0.146	-0.398	0.173	0.511	0.104	-0.505	-0.092	-0.416
R^2	0.392		0.086		0.406		0.311		0.347		0.323	
Adj. R^2	0.314		-0.032		0.329		0.222		0.262		0.236	
m_4F_val												
Alpha	-0.009	-0.198	0.040	1.606	0.012	0.634	-0.016	-0.683	-0.017	-0.764	0.000	-0.328
Beta	1.263*	5.872	0.341	1.802	1.027**	3.100	0.79**	3.155	0.981	3.908	0.918**	3.680
S	0.448	1.105	-0.105	-0.452	-0.307	-0.928	0.146	-0.153	0.219	-0.103	0.083	0.122
H	-0.642	-1.026	-0.110	-0.204	0.352	0.858	-0.051	-0.128	-0.155	-0.428	-0.371	-0.740
M	0.386	0.536	-0.086	-0.191	-0.175	-0.430	0.083	0.304	0.079	-0.526	-0.147	-0.606
R^2	0.415		0.111		0.412		0.292		0.354		0.322	
Adj. R^2	0.340		-0.004		0.336		0.200		0.271		0.234	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table 4.2.4.3-A: Year wise Long run performance of IPOs (2006 to 2010)

	2006		2007		2008		2009		2010		2000-2010	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**T**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
m_CAPM												
Alpha	-0.014	-0.671	-0.014	-0.789	-0.030	-1.752	0.000	-0.085	-0.023	-1.340	-0.010	-0.716
Beta	0.615	3.328	1.192*	5.834	0.993***	4.285	1.32***	3.064	1.519*	4.983	0.961***	4.014
r^2	0.341		0.415		0.358		0.219		0.313		0.302	
Adj. r^2	0.322		0.398		0.339		0.196		0.292		0.282	
m_FF_Eq												
Alpha	-0.011	-0.562	-0.020	-1.053	-0.032	-1.748	-0.002	-0.047	-0.019	-1.098	-0.012	-0.755
Beta	0.592	2.749	1.221*	6.045	1.029***	3.805	1.259	3.279	1.571*	5.087	0.969***	3.948
S	0.287	0.677	0.127	0.227	-0.107	-0.480	0.092	-1.167	-0.345	-0.561	0.105	-0.021
H	0.381	0.383	-0.490	-0.615	-0.098	-0.309	-0.302	0.110	0.406	1.053	-0.238	-0.340
R^2	0.397		0.447		0.386		0.266		0.339		0.342	
Adj. R^2	0.340		0.395		0.328		0.197		0.277		0.281	
m_FF_Val												
Alpha	-0.011	-0.618	-0.020	-1.056	-0.031	-1.753	-0.004	-0.083	-0.017	-1.045	-0.011	-0.732
Beta	0.576	2.884	1.215*	5.900	1.028***	3.930	1.199	3.054	1.537*	4.828	0.958***	3.918
S	0.024	0.171	0.082	0.223	0.027	-0.253	0.182	-0.209	-0.166	-0.435	0.063	-0.023
H	0.251	0.177	-0.486	-0.904	-0.082	-0.443	-0.438	-0.119	0.489	1.279	-0.182	-0.383
R^2	0.374		0.452		0.386		0.251		0.346		0.340	
Adj. R^2	0.316		0.400		0.328		0.181		0.285		0.278	
m_4F_Eq												
Alpha	-0.003	-0.194	-0.021	-1.084	-0.025	-1.351	-0.007	-0.124	-0.012	-0.834	-0.010	-0.571
Beta	0.599	3.049	1.221*	6.099	1.075**	3.608	1.150	3.278	1.603*	6.128	0.975***	3.940
S	0.430	0.922	0.095	0.226	-0.096	-0.449	0.450	-0.933	-0.795	-1.244	0.136	-0.018
H	0.388	0.371	-0.353	-0.244	0.022	-0.199	-0.180	0.204	0.229	0.593	-0.194	-0.219
M	-0.337	-0.672	0.095	0.347	-0.233	-0.212	0.493	0.074	-0.606***	-1.827	-0.038	-0.214
R^2	0.409		0.467		0.420		0.280		0.385		0.364	
Adj. R^2	0.333		0.399		0.345		0.187		0.306		0.282	
m_4F_val												
Alpha	-0.005	-0.283	-0.020	-1.091	-0.024	-1.406	-0.009	-0.232	-0.012	-0.896	-0.010	-0.574
Beta	0.580	3.125	1.208*	6.046	1.076**	3.735	1.114	2.896	1.554*	5.422	0.966***	3.914
S	0.103	0.372	0.086	0.294	-0.037	-0.343	0.466	-0.201	-0.416	-1.082	0.082	-0.043
H	0.229	0.116	-0.478	-0.521	0.007	-0.243	-0.306	0.050	0.328	0.846	-0.173	-0.317
M	-0.266	-0.502	0.010	0.131	-0.241	-0.303	0.498	0.270	-0.448	-1.338	-0.063	-0.287
R^2	0.385		0.473		0.421		0.262		0.374		0.363	
Adj. R^2	0.305		0.405		0.347		0.167		0.293		0.280	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

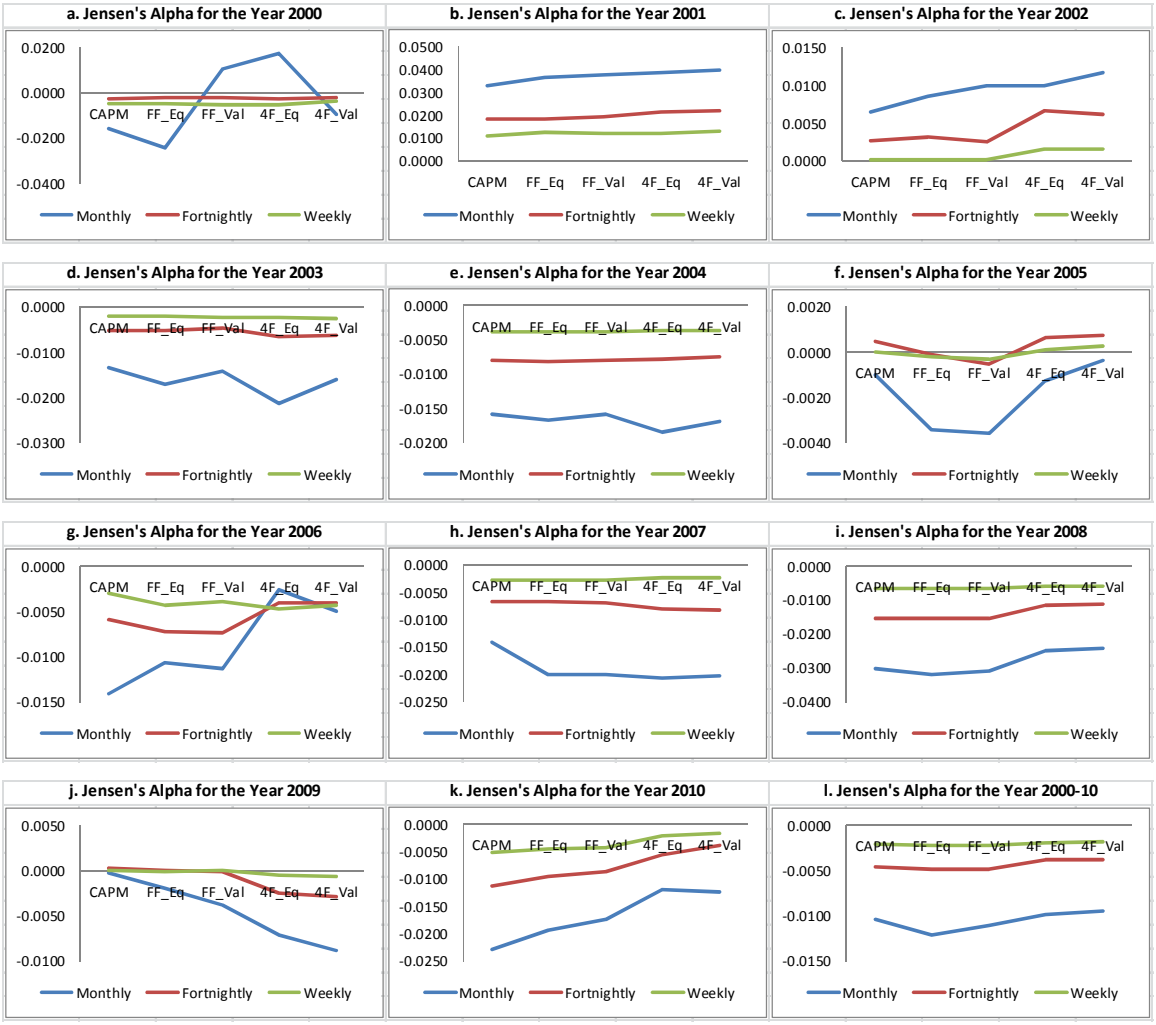


Figure: **4.2.4.3: Year wise Long run performance of IPOs (2000 to 2010)**

The underperformance of these IPOs remains at deep downwards on monthly basis as compared with fortnightly and weekly basis. In the same way CAPM reports less underperformance relative to three factor and four factor models from year 2003 to 2010. Overall, betas are found to be statistically significant for monthly year-wise analysis after the period of 3 years by all the models. The market factor effect is significant in CAPM, three factor Fama French model and four factor Carhart's Model. The size factor effect, value factor effect in three factor Fama French model (equally and value weighted) and momentum effect in four factor Carhart's model is observed to be insignificant in all the years except in year 2010. The results indicate that there is no co movement of year-wise

IPO portfolios with that of small and large firm's portfolio, value portfolio, growth's portfolio, winners and looser portfolios.

4.2.5 Long-run performance of IPOs analysis by maturity level

The long-run risk adjusted performance is also measured by various maturity levels of IPO firms to examine whether less matured IPO firm underperform than more matured IPO firms. For this purpose, three different definitions of IPO firm are used as discussed in the methodology part. By setting D^{T}_{it} equal to one two and three, where t=1 represents the firm going public at the age of five years or less and termed as 1st level of maturity, t=2 represents the firm going public at the age of 10 years or less but greater than five years and termed as 2nd level of maturity, while t=3 represents the firm going public at the age of 15years or greater and termed as 3rd level of maturity. The Hoechle & Schmid (2008) methodology is followed with only change of Drsicoll and Karay standard errors by replacing them with HAV-Newey test of standard errors.

Table 4.2.5.1: The result of GCT regression model (1st level of maturity)

	R Square	0.243822	*Observations*	2196
	Adjusted R Square	0.240708	*F-statistic*	78.31689
	Standard Error	0.160276	*P-value*	0
Variables	***Coefficients***	***Standard Error***	***t Stat***	***P-value***
Alpha	-0.01339*	0.004191	-3.19487	0.0014
Mkt	0.980709*	0.084449	11.6131	0.0000
SMB	-0.01251	0.120691	-0.10367	0.9174
HML	-0.25001***	0.134212	-1.86282	0.0626
WML	-0.01898	0.106027	-0.17901	0.8579
D5	0.003237	0.006864	0.471586	0.6373
*D5*Mkt*	-0.00898	0.117586	-0.07638	0.9391
*D5*SMB*	0.290787***	0.178111	1.632618	0.1027
*D5*HML*	0.118589	0.176325	0.67256	0.5013
*D5*WML*	0.013951	0.134263	0.103911	0.9172

*significant at 1% level, **significant at 5% level and ***significant at 10% level

In table 4.2.5.1, the results of regression model at 1st maturity level are presented. The overall level of underperformance remains at -1.134%, which represent the risk adjusted performance of IPO firms in the sample with other risk factors of Market, Size (SMB),

Value (HML) and Momentum (WML) after the period of three years. The interaction terms of less matured IPO firms are represented as D5 (risk adjusted performance of less matured IPO firms), D5*Mkt, D5*SMB, D5*HML and D5*WML (other risk factors of less matured IPO firms) representing how the underperformance of less matured IPO firms differ from overall IPO firms on long run basis.

In these analyses the primary objective is to observe whether the coefficient of D5 is negative and significant to capture the effect that less matured IPO firms perform worst after the period of three years as compared with the overall IPO firms. However, the result of the dummy variable D5 is found to be insignificant indicates that there is no change in risk adjusted performance of less matured IPO firms than overall IPO firms. Further, no change is observed to other risk factors except Size factor.

Table 4.2.5.2: The result of GCT regression model (2nd level of maturity)

	R Square	0.24725	*Observations*	2196
	Adjusted R Square	0.244151	*F-statistic*	79.77972
	Standard Error	0.159912	*P-value*	0
Variables	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Alpha	-0.01154*	0.003772	-3.05833	0.0023
Mkt	1.030095*	0.06082	16.93669	0.0000
SMB	0.133405	0.100904	1.3221	0.1863
HML	-0.12637	0.085004	-1.48663	0.1373
WML	0.014611	0.067352	0.21693	0.8283
D10	-0.00278	0.008942	-0.31102	0.7558
*D10*Mkt*	-0.28769***	0.156374	-1.83978	0.0659
*D10*SMB*	0.005524	0.219798	0.025132	0.98
*D10*HML*	-0.24528	0.241577	-1.01533	0.3101
*D10*WML*	-0.08215	0.21329	-0.38514	0.7002

*significant at 1% level, **significant at 5% level and ***significant at 10% level

In table 4.2.5.2, the results of regression model at 2nd maturity level are presented. The interaction terms of 2nd level matured IPO firms are represented as D10 (risk adjusted performance of 2nd level matured IPO firms), D10*Mkt, D10*SMB, D10*HML and D10*WML (other risk factors of 2nd level matured IPO firms) representing how the underperformance of 2nd level matured IPO firms differ from overall IPO firms on long run basis.

As in the first case of 1st level of maturity of IPO firms, here also the primary objective is to observe whether the coefficient of D10 is negative and significant to capture the effect that 2nd level matured IPO firms perform worse than the overall IPO firms after the period of three years. Although, the result of the dummy variable D10 is found to be negative but insignificant indicates that there is no change in risk adjusted performance of 2nd level matured IPO firms than overall IPO firms. Interestingly, the beta of 2nd level matured firms increased to 1.030095. Further, no change is observed to other risk factors except SMB factor.

Table 4.2.5.3: The result of GCT regression model (3rd level of maturity)

	R Square	0.246622	*Observations*	2196
	Adjusted R Square	0.24352	*F-statistic*	79.51092
	Standard Error	0.159979	*P-value*	0
Variables	*Coefficients*	*Standard Error*	*t Stat*	*P-value*
Alpha	-0.01121**	0.004603	-2.43432	0.015
Mkt	0.908559*	0.073249	12.40372	0.0000
SMB	0.248317**	0.109675	2.26411	0.0237
HML	-0.20279***	0.10771	-1.88273	0.0599
WML	-0.0328	0.083127	-0.3946	0.6932
D15	-0.00276	0.006348	-0.43451	0.664
*D15*Mkt*	0.217639***	0.11946	1.821863	0.0686
*D15*SMB*	-0.37653**	0.178813	-2.10574	0.0353
*D15*HML*	0.107539	0.165987	0.64788	0.5171
*D15*WML*	0.072707	0.13959	0.520866	0.6025

*significant at 1% level, **significant at 5% level and ***significant at 10% level

In table 4.2.5.3, the results of regression model at 3rd level of are presented. The interaction terms of 3rd level matured IPO firms are represented as D15 (risk adjusted performance of 3rd level matured IPO firms), D15*Mkt, D15*SMB, D15*HML and D15*WML (other risk factors of 3rd level matured IPO firms) representing how the underperformance of 3rd level matured IPO firms differ from overall IPO firms on long run basis. As in the first two cases i.e. 1st and 2nd levels of maturity of IPO firms, here also the primary objective is to observe whether the coefficient of D15 is negative and significant to capture the effect that 3rd level matured IPO firms perform worse than the

overall IPO firms after the period of three years. The result of the dummy variable D15 is found to be negative but insignificant indicates that there is no change in risk adjusted performance of 3rd level matured IPO firms than overall IPO firms. Interestingly, the beta of 3rd level matured firms decreased to 0.908559. Further, no change is observed to other risk factors except SMB factor.

In the analysis of GCT regression model, the Jensen's alpha is found to negative and significant under the three level of maturity of firms showing the significant underperformance of IPOs in Carhart four factor model. The overall, the risk adjusted performance is worst after the period of three years irrespective of IPO maturity levels. In all the three cases of maturity levels, the risk adjusted performance marginally found to be higher from 1st to 2nd level and then 2nd to 3rd level of maturity by -1.339%, -1.154% and -1.121% respectively after the period of three years.

To sum up this section, after analyzing the long run performance, now it is obvious to answer the question that if investors purchased the shares from primary market and held it for longer period like one year, one and half years, two years, two and half years and three years. The results suggest that IPOs do not sustain their initial level of underpricing and provide investors with negative abnormal returns over a long period of one to three years after listing. The investors earn market adjusted negative returns as well as risk adjusted negative returns accounting for market, size, value and momentum factors for these longer periods irrespective of different maturity level of IPO firms after going public. In sector wise analysis, the underperformance in manufacturing sector is observed to be lesser as compared with financial and other services sectors.

The results of CARs and BHARS of IPOs are found to be different from the results of Jensen's alpha. In the same line of international research for misspecification of model in the long run performance of IPOs, the results of misspecification of model are also validated in KSE. Even the results are found to be different when analyses are made on monthly, fortnightly and weekly basis.

4.3 SECTION C Pre and Post Efficiency of IPOs

The main objective of this section is to provide analysis and comparison of the efficiency of IPOs in pre and post IPO's event. The objectives also include to measure the efficiency of theses IPOs on sectoral basis.

In this section, the efficiency of IPOs is measured by applying Data Envelop Analysis (DEA) methodology. To measure the technical and scale efficiencies, DEA is applied in pre and post event of IPO. To observe the performance and efficiency change patterns (like change in productivity) over time, Malmquist Productivity Index (MPI) is applied for three years subsequent period after going public from year 2000 to 2010. In addition to sector wise analysis, the comparison of private and state owned enterprises (SOEs) is also discussed under DEA and MPI methodologies. As in the previous sections, first the descriptive statistics is discussed.

4.3.1 Descriptive Analysis

Table 4.3.1 represents descriptive statistics of different variables used in DEA and MPI mythologies for the period 2000 to 2010. The variables equity, assets and number of employees used as input variables, while market value, earning per share and return to investors used as output variables. The variables revenue and profit after taxes used both as input and output variables. The descriptive statistics include the average, median, variability and range of variables minimum to maximum. Part-A of the table represents pre IPOs descriptive statistics while Part-B is about the descriptive statistics of post IPOs.

In part-A, for input variables, the mean equity, the mean assets and the mean number of employees of these IPOs remain at Rs. 4413.395 million, Rs. 32353.944 million and 1296 respectively. The mean revenue and the mean profit after taxes remain at Rs. 4429.163 million and Rs. 986.152 million respectively. For out variables, the mean market value, EPS and return to investors remain at Rs. 11970.864 million, Rs. 4.084 and Rs. 432.302 million respectively. The variability in equity is observed to be 11528.952 million with lowest of 9.460 million and highest of 70671.493 million. The minimum numbers of employees are observed to be 9 while highest number of employees remains at 15000.

Table 4.3.1 Descriptive Statistics

S#	Variables	Mean	Median	S. Dev.	Minimum	Maximum
	Panel-A: Pre-IPO					
1	Equity	4413.395	1009.437	11528.952	9.460	70671.493
2	Total Assets	32353.944	1966.311	108987.218	5.000	655838.856
3	Employees	1295	244	3230.619	9	15000
4	Revenue	4429.163	272.698	11290.204	0.003	56314.037
5	Profit	986.152	34.461	3317.425	0.001	22414.461
6	Market Value	11970.864	1487.493	39012.992	106.000	223863.323
7	EPS	4.084	1.335	6.673	0.000	28.100
8	Return to Investors	432.302	0.000	1522.075	0.000	8965.784
	Panel-B: Post-IPO					
1	Equity	6947.322	1073.787	17044.094	8.837	100616.652
2	Total Assets	48011.160	2584.273	146850.079	23.897	887052.411
3	Employees	1538	304	3954	25	23456
4	Revenue	8436.926	737.273	18867.532	0.001	100261.191
5	Profit	1745.485	49.821	5972.604	0.002	45967.723
6	Market Value	18789.045	1282.337	71401.075	32.495	588151.959
7	EPS	5.782	0.740	19.652	0.000	213.167
8	Return to Investors	1293.415	0.000	5149.216	0.000	41370.951

These eight variables are used according to Zhoo (2009) methodolog. In first stage, the number of employees, total assets and equity of sample IPOs used as input variables while total revenue and profit after taxes used as output variables. In second stage, total revenue and profit after taxes of sample IPOs used as input variables while earning per share, return to investors and market value of IPO firms used as output variables. In third stage, the number of employees, total assets and equity used as input variables and earning per share, return to investors and market value used as output variables.

The part-B of table 4.3.1 represents the descriptive statistics of variables used in post IPO analysis for the period of three years. The tables show the increasing trend in all the measures of descriptive statistics as compared with the descriptive statistics in panel-A.

4.3.2 Pre IPO efficiency

The DEA is used in this analysis to measure the efficiency of IPOs before going to public in three ways. The input oriented DEA is measured as Constant Returns to Scale (CRS), Variable Returns to Scale (VRS) and Scale efficiencies.

As discussed in the methodology part (3.2.5), the efficiency of IPOs is measured in three stages. In first stage, the number of employees, total assets and equity of sample IPOs used as input variables while total revenue and profit after taxes used as output variables. In second stage, total revenue and profit after taxes of sample IPOs used as input variables while earning per share, return to investors and market value of IPO firms used as output variables. In third stage, the number of employees, total assets and equity used as input variables and earning per share, return to investors and market value used as output variables. The results of efficiency score are displayed as appendix tables (table A-4.3.2-a, table A-4.3.2-b table A-4.3.2-c).

The efficiency scores of stage 1 (profitability), displayed in table A-4.3.2-a portray that only 6.67% IPO firms are CRS efficient and located on efficient frontier. These IPO firms have produced output at optimal level .i.e. for given level of inputs; total assets, total equity and number of employees have produced maximum level of output i.e. total revenue and profit after taxes. It implies that these IPO firms were operating at 100% efficiency level before going public. Further, 5.00% IPO firms showed relatively good efficiency score less than one and greater than 0.8. On the other hand, 5.00% of IPO firms showed efficiency score between 0.6 and 0.8, 11.67% between 0.4 and 0.6, 15.00% between 0.2 and 0.4 while 56.67% below 0.2. On average the efficiency score of these IPO firms is observed to be 0.294. The reasons for such dismal efficiency score might be due to the newer firm going to public. As newer firms incur losses initially and then become profitable after some years of operation. The efficiency can be improved either by reducing the input level or improving the output level.

The variable returns to scale are measured according to one additional constraint introduced by Bankers et al (1984). The average efficiency score with regard to VRS is observed to be 0.475, higher than the average efficiency score by CRS. In VRS analysis, only 20.00% IPO firms are observed to be VRS efficient and located on efficient frontier. These IPO firms have produced output at optimal level. Further, 3.33% IPO firms also showed relatively good efficiency score between 0.8 and 1. However more than 66.67%

showed efficiency score less than 0.6. The overall results of efficiency scores of CRS and VRS are also displayed in the Figure 4.3.2-A.

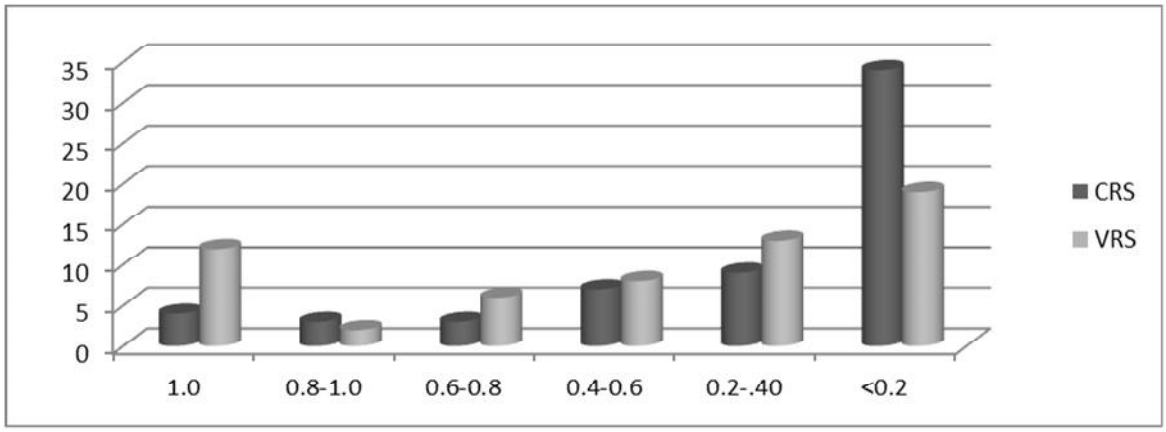


Figure 4.3.2-A: CRS and VRS of pre-IPOs (Stage-1, Profitability)

The analysis of scale efficiency which is the ratio of CRS to VRS also presented in appendix table A-4.3.2-a. The IPO firm is said to be scale efficient if the ratio is one. In case of less than one, the IPO firm is termed as scale inefficient. Just like CRS results, only 6.67% IPO firms are scale efficient. The 36.67% IPO firms also showed relatively good scale efficiency score between 0.8 and 1. However, more than 56.67% IPO firms are found to be scale inefficient.

Table 4.3.2-A: Scale Efficiency (Stage-1, Profitability)

SUMMARY			Alpha	0.05	
Count	*Mean*	*S. Dev.*	*S. Error*	*t*	*Df*
60	0.578667	0.381051	0.049194	-8.56482	59
t TEST			Hypothesized Mean	1	
	p-value	*t*	*Lower*	*Upper*	*Sig*
One Tail	0.000000	1.671093			Yes
Two Tail	0.000000	2.000995	0.480231	0.677103	Yes

To test the statistical significance of scale efficiencies, the t statistic is also employed; the results are presented in table 4.3.2-A. The scale efficiency is highly significant at 1%

level of significance implying the average score of all IPO sample firms to be less than 1. This indicates severe scale inefficiencies in IPO firms before going public.

The efficiency scores of stage 2 (marketability), displayed in table A-4.3.2-b portray that only 8.337% IPO firms are CRS efficient and located on efficient frontier. These IPO firms have produced output at optimal level .i.e. for given level of inputs; total revenue and profit after taxes have produced maximum level of output i.e. earnings per share, return to investors and total market value. It implies that these IPO firms were operating at 100% efficiency level before going public. On the other hand, 91.67% of IPO firms showed efficiency scores less than 0.6. On average the efficiency score of these IPO firms is observed to be 0.1940.

The average efficiency score with regard to VRS is observed to be 0.4118, higher than the average efficiency score by CRS as in case of stage-1. In VRS analysis, only 21.67% IPO firms are observed to be VRS efficient and located on efficient frontier. These IPO firms have produced output at optimal level. Further, 6.67% IPO firms also showed relatively good efficiency score between 0.8 and 1. However more than 71.67% showed efficiency score less than 0.6. The overall results of efficiency scores of CRS and VRS are also displayed in the Figure 4.3.2-B.

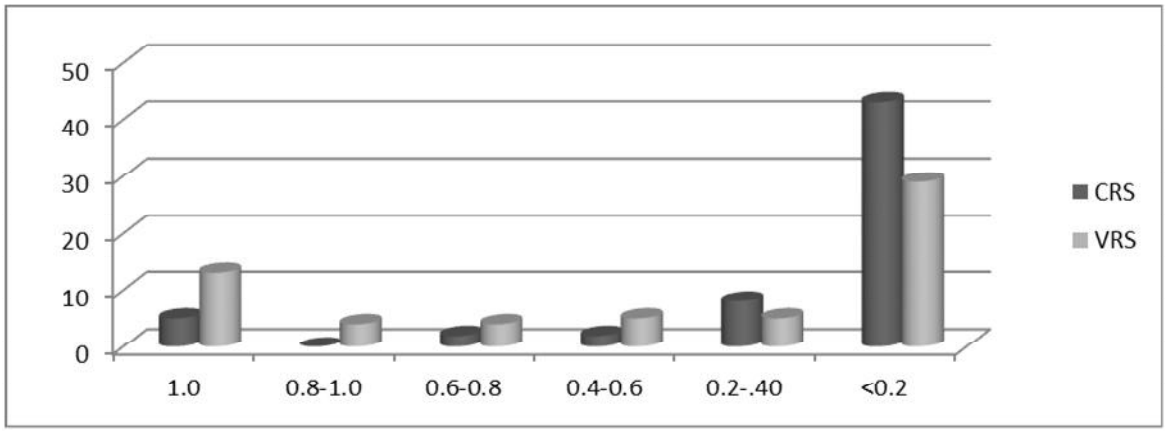


Figure 4.3.2-B: CRS and VRS of pre-IPOs (Stage-2, Marketability)

The analysis of scale efficiency of stage-2 presented in appendix table A-4.3.2-b, show that only 33.33% IPO firms are scale efficient. The 16.67% IPO firms also showed relatively good scale efficiency score between 0.8 and 1. However, more than 66.67% IPO firms are found to be scale inefficient.

Table 4.3.2-B: Scale efficiency (Stage-2, Marketability)

SUMMARY			Alpha	0.05	
Count	*Mean*	*S. Dev.*	*S. Error*	*t*	*Df*
60	0.6405	0.394632	0.050947	-7.05639	59
t TEST			Hypothesized Mean	1	
	p-value	*t*	*Lower*	*Upper*	*Sig*
One Tail	0.000000	1.671093			Yes
Two Tail	0.000000	2.000995	0.538556	0.742444	Yes

To test the statistical significance of scale efficiencies in stage-2, the t statistic is also employed; the results are presented in table 4.3.2-B. The scale efficiency is highly significant at 1% level of significance implying the average score of all IPO sample firms to be less than 1. This indicates severe scale inefficiencies in IPO firms in stage-2 also.

The efficiency scores of stage 3 (overall), displayed in table A3 reveal that 13.33% IPO firms are CRS efficient and located on efficient frontier. These IPO firms have produced output at optimal level using inputs as number of employees, assets and equity and produced maximum level of output i.e. earnings per share, return to investors and total market value. Conversely, 81.67% of IPO firms showed efficiency scores less than 0.8. On average the efficiency score of these IPO firms is observed to be 0.4301, which is higher than average score in stage 1 and 2.

The average VRS efficiency in stage 3 is observed to be 0.5163, higher than the average efficiency score by CRS as in case of stage-1 and 2. The VRS analysis shows that only 20.00% IPO firms are VRS efficient; while more than 73.33% showed efficiency score less than 0.6. These results of efficiency scores of CRS and VRS are also displayed in the Figure 4.3.2-C.

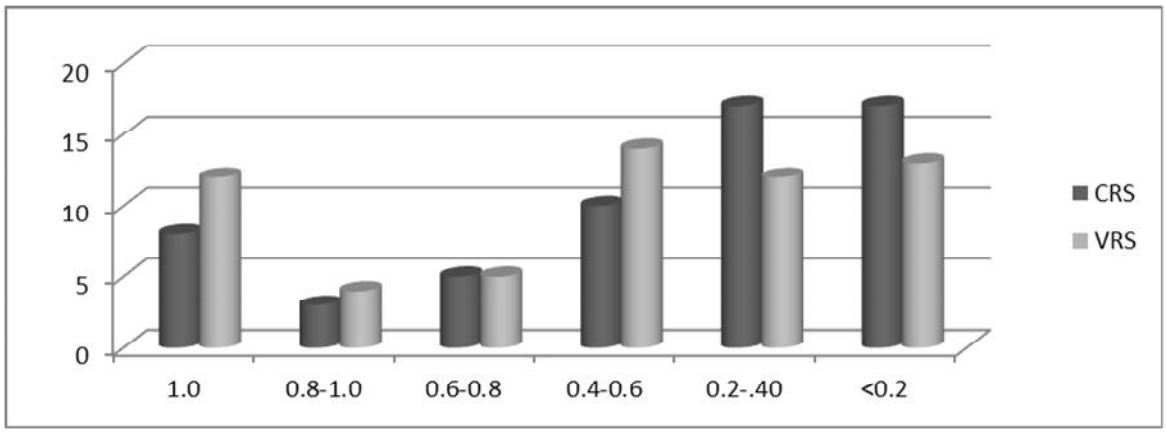


Figure 4.3.2-C: CRS and VRS of pre-IPOs (Stage-3, overall)

The analysis of scale efficiency of stage-3 presented in appendix table A-4.3.2-c, show that only 13.33% IPO firms are scale efficient, while 55.00% IPO firms also showed relatively good scale efficiency score between 0.8 and 1. However, only 31.67% IPO firms are found to be scale inefficient.

Table 4.3.2-C: Scale efficiency (Stage-3, overall)

SUMMARY			Alpha	0.05	
Count	*Mean*	*S. Dev.*	*S. Error*	*t*	*Df*
60	0.824	0.194939	0.025166	-7.00667	59
t TEST			Hypothesized Mean	1	
	p-value	*T*	*Lower*	*Upper*	*Sig*
One Tail	0.000000	1.671093			Yes
Two Tail	0.000000	2.000995	0.773309	0.874025	Yes

To test the statistical significance of scale efficiencies in stage-3, the t statistic results are presented in table 4.3.2-C. The scale efficiency in stage 3 is also highly significant at 1% level implying the average score of all IPO sample firms to be less than 1.

The results of pre IPO efficient firms are displayed in table 4.3.2-D. In stage 1 and 3, 12 IPO firms showed 100% efficiency in three different efficiency measures of CRS, VRS and Scales. These IPO firms increased to 28 in stage 2 for these efficiency measures of CRS, VRS and Scales. IPO firm 3 is efficient in stage 2 and stage 3 for CRS, VRS and Scales. The IPO firms 15, 62 are efficient in all stages for VRS; IPO firms 26, 28 and 39

are efficient in stage 1 and 3 for VRS only. The IPO firm 55 is efficient in all stages for CRS, VRS and Scales measures. The IPO firms 30 and 44 are efficient in stage 2 and 3 for VRS only. The IPO firms 35 and 36 are efficient in all stages for VRS, stage 1 and 3 for CRS and Scales. IPO 67 is efficient in stage 3 for all efficiency measure, stage 1 and 3 for VRS and stage 2 and 3 for scales measures.

Table 4.3.2-D: Pre-IPO Efficient Firms

IPO	Stage-1			Stage-2			Stage-3			IPO	Stage-1			Stage-2			Stage-3		
Firm	C	V	S	C	V	S	C	V	S	Firm	C	V	S	C	V	S	C	V	S
2						*				43						*			
3				*	*	*	*	*	*	44					*			*	
6		*								48		*							
7						*				53						*			
8					*					55	*	*	*	*	*	*	*	*	*
9						*				56						*			
11						*				58						*			
15		*			*			*		59		*							
18						*				62		*			*			*	
26		*						*		64					*				
28		*					*	*	*	65				*	*	*			
29						*				66						*			
30				*			*	*	*	67		*				*	*	*	*
35	*	*	*		*		*	*	*	69							*	*	*
36	*	*	*		*		*	*	*	70						*			
39	*	*	*			*				75					*				
41						*				76				*	*	*			

** show 100% efficient firms, C for CRS, V for VRS and S for Scale efficiencies.*

4.3.2.1 Sector-wise, Industry-wise and Private vs SOEs Analysis

To measure the pre IPO efficiency in detail, first, IPO firms are divided into three broader categories of manufacturing, financial and other sectors, the results of DEA model of three stages are presented in panel A of table 4.3.2.1. Second, detailed industry wise analysis are also discussed the results are presented in panel B. Further, comparative analysis of private and SOEs are also discussed and the results are displayed in panel C of table 4.3.2.1.

Table 4.3.2.1: Sector-wise and SOEs VS Private Analysis

Category	Stage-1			Stage-2			Stage-3		
	CRS	**VRS**	**Scale**	**CRS**	**VRS**	**Scale**	**CRS**	**VRS**	**Scale**
Panel-A: Sector-wise Analysis									
Financial Sector	0.2583	0.5764	0.4711	0.1982	0.4121	0.6218	0.4089	0.4979	0.7893
Manufacturing Sector	0.2886	0.2777	0.2739	0.1662	0.3177	0.3576	0.2120	0.2422	0.1552
Other Sectors	0.2581	0.3553	0.5107	0.1999	0.4703	0.5785	0.4979	0.5720	0.8456
Panel-B: Industry-wise Analysis									
Automobile And Parts	0.1670	0.2630	0.6330	0.0150	0.0150	0.9990	0.1120	0.1750	0.6390
Banks	0.2088	0.4647	0.5744	0.0827	0.4760	0.2503	0.2461	0.4233	0.6837
Chemicals	0.3306	0.4383	0.6006	0.4150	0.5694	0.6737	0.5404	0.5754	0.9051
Construction And Materials	0.2090	0.2273	0.9068	0.0803	0.0803	1.0000	0.2135	0.2365	0.9063
Electricity	0.3593	0.4430	0.5127	0.4833	1.0000	0.4833	0.7073	0.7370	0.9540
Equity Investment Instruments	0.2091	0.6556	0.3084	0.1606	0.1673	0.8650	0.4819	0.6867	0.6940
Financial Services	0.3460	0.6267	0.4943	0.2030	0.4384	0.6801	0.6311	0.7031	0.8440
Fixed Line Telecommunication	0.0280	0.0660	0.4240	0.0370	0.0400	0.9130	0.1310	0.1360	0.9670
General Industrials	0.1110	0.3010	0.3680	0.1860	0.1860	1.0000	0.4070	0.4580	0.8900
Industrial Metals And Mining	0.4860	0.5985	0.4870	0.0185	0.0660	0.4435	0.5270	0.5435	0.9690
Industrial Transportation	0.1150	0.1240	0.9340	0.0270	0.0270	0.9990	0.0750	0.2390	0.3130
Media	0.3713	0.4743	0.4867	0.1433	0.1537	0.6523	0.2763	0.3123	0.8627
Oil And Gas Producers	0.6630	0.7678	0.6630	0.3210	0.9970	0.3215	0.6488	0.7805	0.8600
Personal Goods	0.1550	0.1780	0.8690	0.1288	0.1288	0.9996	0.1186	0.1328	0.8554
Real Estate Invest. & Services	0.4340	0.4640	0.9360	0.2260	0.9320	0.2430	0.5200	0.5220	0.9970
Software & Computer Services	0.5960	0.7030	0.8470	0.1550	1.0000	0.1550	0.9770	1.0000	0.9770
Support Services	0.0010	0.2800	0.0020	0.2290	0.5770	0.3980	0.4880	0.5060	0.9640
Panel-C: Private V/S State owned Enterprise									
Private Enterprises	0.2896	0.4917	0.5498	0.1987	0.3790	0.6527	0.4235	0.5160	0.8108
Sate Owned Enterprises	0.3143	0.4007	0.7073	0.1733	0.5583	0.5862	0.4596	0.5175	0.8812

The DEA results of stage 1 suggest that CRS score of manufacturing sector is higher than the score of financial and other sectors. However, in VRS, manufacturing sector is not dominant as compared with financial and other sectors. In stage 2, both CRS and VRS analysis, financial and other sectors showed better efficiency than manufacturing sectors. In the same way the results of stage 3 are in accordance with the stage 2 results with the except that other sector exceeded the score of 0.50 under VRS. All these results suggest that neither of the sector is CRS efficient nor VRS efficient in all three stages. The results are also displayed graphically in Figure 4.3.2.1.

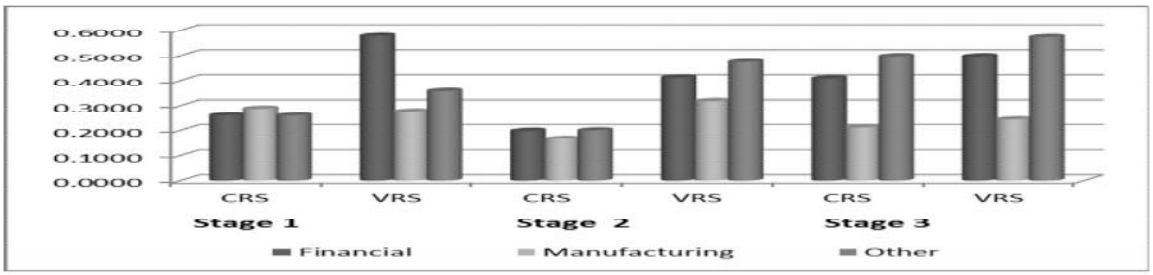


Figure 4.3.2.1: Manufacturing, Financial and Other Services

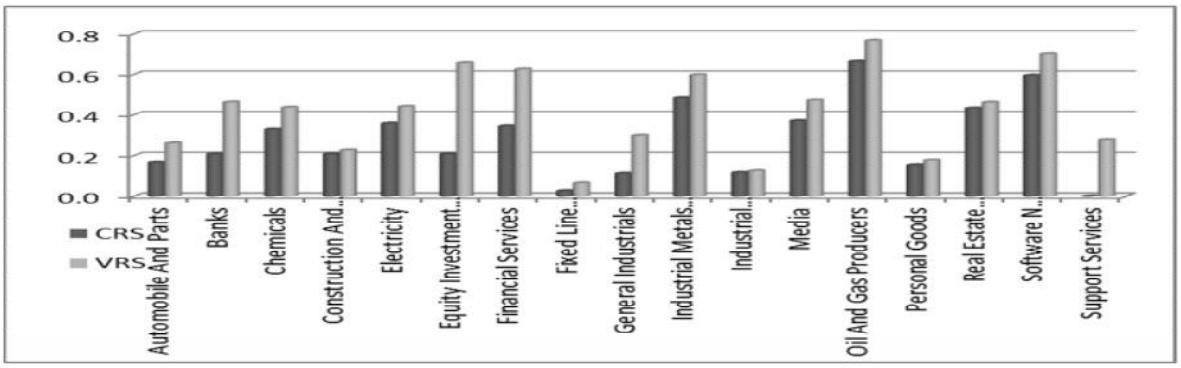


Figure 4.3.2.1-A: Sector-wise analysis of Stage-1

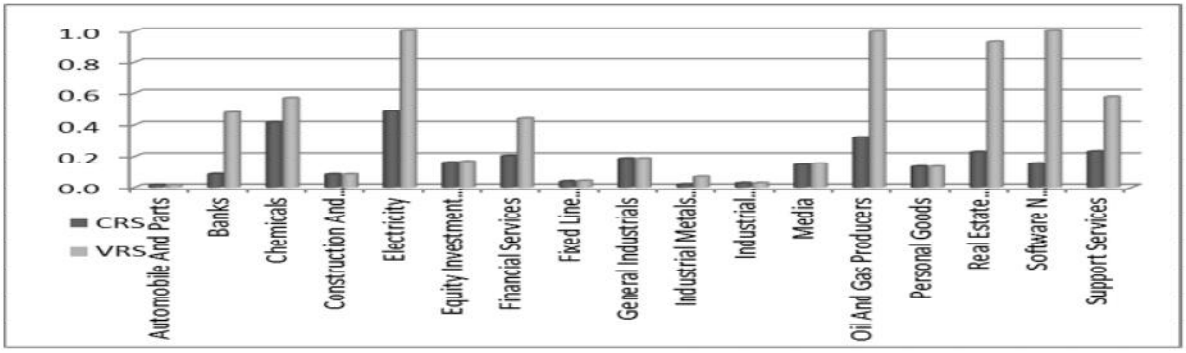


Figure 4.3.2.1-B: Sector-wise analysis of Stage-2

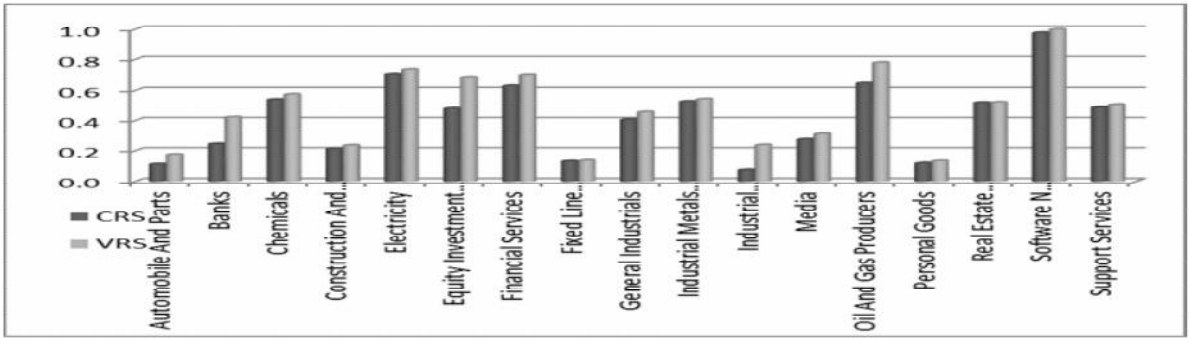


Figure 4.3.2.1-C: Sector-wise analysis of Stage-3

In sector-wise analysis, the oil and gas sector showed better performance than other sectors of KSE according to CRS efficiency score in stage 1. The sectors; Support Services, Fixed Line Telecommunication, General Industrials, Industrial Transportation, Personal Goods and Automobile & Parts showed very dismal efficiency score less than 0.2 under CRS. Banks, Construction & Materials, Equity Investment Instruments, Chemicals, Financial Services, Electricity and Media showed the efficiency score between the interval of 0.2 and 4.0. The Real Estate Investment & Services, Industrial Metals & Mining and Software & Computer Services sectors showed some good efficiency score between .4 and .06 compared with the other sectors of the KSE.

The VRS efficiency scores are observed to be higher than the efficiency scores of CRS in stage 1. Like CRS analysis, for VRS efficiency score in stage 1, the sector oil and gas showed some better performance than all other sectors in the KSE representing the score of 0.7678. The sector Software & Computer Services also showed good efficiency score of 0.703. On the Other hand sectors; Fixed Line Telecommunication, Industrial Transportation, Personal Goods, Construction & Materials, Automobile & Parts, Support Services and General Industrials showed efficiency score of less than 0.306 representing dismal efficiency. These results can be viewed in Figure 4.3.2.1-A.

In the marketability analysis of stage 2, none of the sector meet the efficacy score even 0.5 under CRS, however, two sectors; Electricity, Software & Computer Services showed their efficiency score at optimal level under VRS. Whereas, the sector Oil & Gas also found to be very close to efficient frontier. Similarly, the sector Real Estate Investment & Services also showed relatively good efficiency score of 0.932. All other sectors except Chemicals and Support Services showed efficiency score of less than 0.5 under VRS analysis of stage 2.

In the overall analysis of stage 3, the efficiency scores are found to be higher than the efficiency scores in stage 1 and 2. The only one sector in stage 3, i.e. Software & Computer Services sector showed its efficiency score near to optimal level under CRS. In

six sectors; Real Estate Investment & Services, Industrial Metals & Mining, Chemicals, Financial Services, Oil & Gas Producers and Electricity, the efficiency score remained between 0.5 and 0.7. For all other sectors, the efficiency score is observed to be less than 0.5. In VRS analysis, the sectors Oil & Gas Producers, Electricity and Financial Services also showed relative good efficiency scores. The efficiency score in stage 3 under VRS for Support Services, Real Estate, Investment & Services and Industrial Metals & Mining remained in the range of 0.5 and 0.7. Whereas, other sectors showed efficiency score less than 0.5.

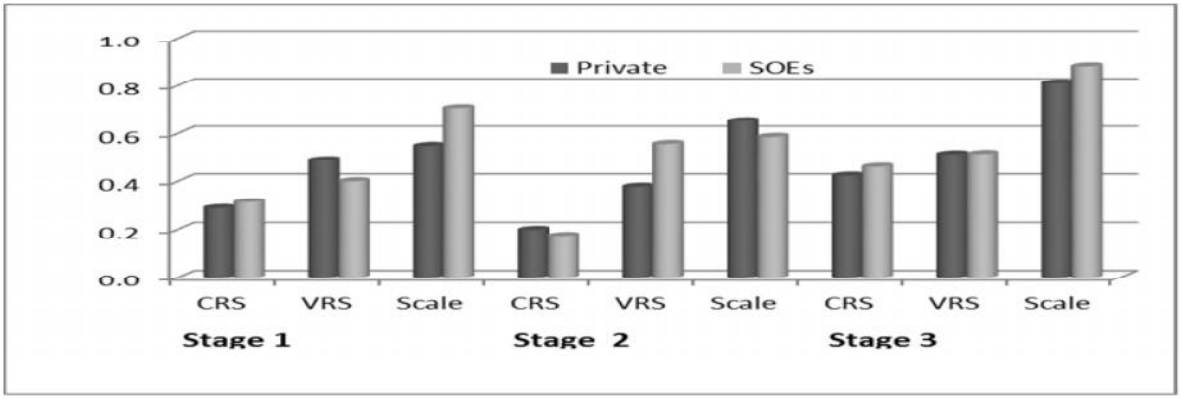


Figure 4.3.2.1-D: Private vs State Owned Enterprises (SOEs)

The efficiency scores of private and SOEs are displayed in panel C of table 4.3.2.1. In stage 1, both private and SOEs cannot meet the efficiency score of even 0.5 under CRS, however under VRS private firms approach efficiency score to 0.4917, showing some better efficiency than SOEs. In stage 2, the efficiency score approaches to less than 0.2 in CRS measure. However, in stage 2, under VRS, SOEs showed relative better efficiency than private, and efficiency score is observed to be 0.5583. In stage 3, although, SOEs showed marginally greater efficiency than private under CRS however is less than 0.5. On the other hand interestingly the efficiency scores are observed to be same both in CRS and VRS. The results of all the three stages under CRS, VRS and Scales are displayed in Figure 4.3.2.1-D.

One of the probable reason for non-performance of private firms in comparison to SOEs may be that most of the private firms are the newer than SOEs. The other reason might be

due to lesser number of IPO firms in SOEs category showing the better efficiency. Here in the sample of IPO firms 18% IPOs relate to SOEs while 82% of IPO firms relate to private.

To sum up, the overall efficiency scores of IPO firms remain dismal as the percentage of optimum level of IPO firms remains between 5% and 20% in all the three stages in pre IPO. In the analysis of broader categories of sectors; private, SOEs, manufacturing, financial, other services sectors, the results of DEA model of three stages suggest that neither of the sector is CRS efficient nor VRS efficient before going public. However, in detail sector-wise analysis the only oil and gas sector showed optimal level under VRS in stage 2

4.3.3 Post IPO efficiency, after one year

The post efficiency scores of stage 1, 2 and 3 after one year are displayed in appendix tables (table A-4.3.3-a, table A-4.3.3-b table A-4.3.3-c). The results suggest that in stage 1, only 6.67% IPO firms are CRS efficient while 6.67% IPO firms are VRS efficient. In stage 2 only 5% IPO firms are CRS efficient while 16.67% IPO firms are VRS efficient. In the 3rd stage the percentage score of efficient firms increased to 13.3% while the same percentage of efficient score under VRS is observed as in stage 1 and 2. These IPO firms have produced output at optimal level .i.e. these IPO firms were operating at 100% efficiency level after period of one year of going public. The results are also displayed graphically in Figure 4.3.3-A.

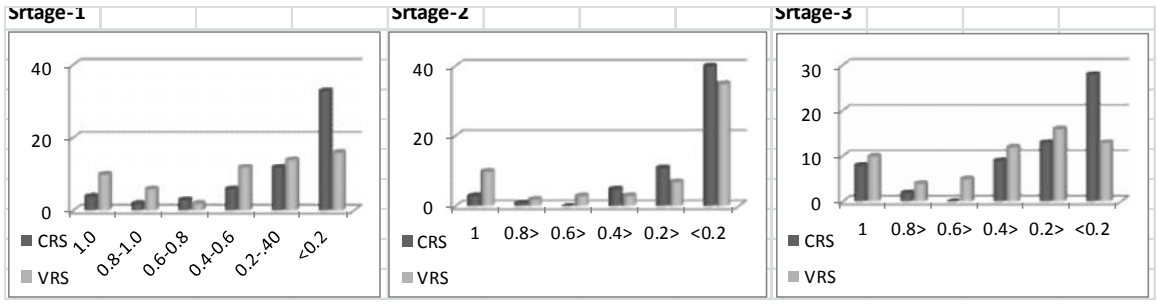


Figure 4.3.3-A: CRS and VRS after one year of post IPOs

The results further suggest that 85% of IPO firms in stage 1, 93.33% in stage 2 and 83.33% in stage 3, showed efficiency score less than 0.2 under CRS. In the same way 70% of IPO firms in stage 1, 75% in stage 2 and 68.33% in stage 3 also showed efficiency score less than 0.2 under VRS. The results indicate dismal performance of IPOs firms after one year of initial public offerings. After acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after one year of IPOs.

Tthe scores of CRS remain, on average, at 0.273 for stage 1, 0.2 for stage 2 and 0.355 for stage 3. The overall efficiency scores under CRS decrease to 7.14% in stage 1 and 17.44% in stage 3. However in stage 2, the efficiency score increase from 0.194 to 0.2 only. In variable returns to scale analysis, the average VRS scores remain at 0.476 for stage 1, 0.341 for stage 2 and 0.491for stage 3. Like CRS, on average, the decreasing pattern of efficiency scores is also observed in VRS in stage 1 and stage 3. The results of decreasing percentages are witnessed in Scale efficiencies for all the three stages as well.

To test the statistical significance of scale efficiencies, the t statistic is also employed. The scale efficiency is highly significant at 1% level of significance implying the average score of all IPO sample firms to be less than 1, after period of one year. This indicates severe scale inefficiencies in IPO firms after going public for all the three stages. The results are displayed in the following table.

Table 4.3.3-A: Scale efficiency (Stages1-3), after one year of IPOs

Stages	*Count*	*Mean*	*Std Dev*	*Std Err*	*t*	*df*	*p-value*	*lower*	*Upper*
1	60	0.552117	0.370196	0.047792	-9.37149	59	0.000000	0.456485	0.647748
2	60	0.637517	0.373019	0.048157	-7.52719	59	0.000000	0.541156	0.733878
3	60	0.755333	0.308638	0.039845	-6.14047	59	0.000000	0.675604	0.835063

The results of post IPO efficient firms are displayed in table 4.3.3-B. In Constant Returns to Scale analysis, 4 firms in stage 1, 3 firms in stage 2 and 9 firms in stage 3 are CRS efficient. In Variable Returns to Scale, 10 firms in each stage are VRS efficient. In Scale

Efficacies analysis, 4 firms in stage 1, 16 firms in stage 2 and 9 firms in stage 3 are scale efficient. The only IPO firm 3 showed 100% efficiency in all the three stages of CRS, VRS and Scale efficiency measure. The firm 7 is efficient in stage 1, firm 8 is efficient in stage 2 and firms 13, 15 & 16 are efficient in stage 3 for all efficiency measures. The firms 55 and 35 are efficient in stage 1 and 3, while firm 34 is efficient in stage 2 and 3 for all efficiency measures.

Table 4.3.3-B: Post-IPO Efficient Firms

IPO Firms	Stage-1			Stage-2			Stage-3			IPO Firms	Stage-1			Stage-2			Stage-3		
	C	V	S	C	V	S	C	V	S		C	V	S	C	V	S	C	V	S
2						*				43						*			
3	*	*	*	*	*	*	*	*	*	44						*			
7	*	*	*							48						*			*
8				*	*	*				52						*			
9						*				53						*			
13		*					*	*	*	55	*	*	*				*	*	*
15		*			*		*	*	*	59						*	*	*	*
26		*			*		*	*	*	60						*			
29						*				62		*							
30						*				63					*				
34				*	*	*	*	*	*	66						*			
35	*	*	*		*		*	*	*	67		*			*			*	
36		*						*		68					*				
37						*				73					*				

* show 100% efficient firms, C for CRS, V for VRS and S for Scale efficiencies.

4.3.3.1 Sector-wise, industry-wise and Private vs SOEs analysis

To measure the post IPO efficiency in detail, first, IPO firms are divided into three broader categories of manufacturing, financial and other sectors, the results of DEA model of three stages are presented in panel A of table 4.3.3.1. Second, detailed industry wise analysis are also discussed the results are presented in panel B. Further, comparative analysis of private and s are also discussed and the results are displayed in panel C of table 4.3.3.1.

Table 4.3.3.1: Sector-wise and SOEs VS Private Analysis

Category	Stage-1			Stage-2			Stage-3		
	CRS	VRS	Scale	CRS	VRS	Scale	CRS	VRS	Scale
Panel-A: Sector-wise Analysis									
Financial Sector	0.2020	0.5524	0.4028	0.1767	0.3132	0.6126	0.3099	0.5683	0.6045
Manufacturing Sector	0.4034	0.4620	0.7617	0.2333	0.3920	0.6885	0.3846	0.4294	0.8550
Other Sectors	0.2030	0.3600	0.5044	0.1909	0.3139	0.6055	0.3918	0.4439	0.8751
Panel-B: Industry-wise Analysis									
Automobile And Parts	0.2220	0.2930	0.7560	0.0100	0.0670	0.1430	0.0860	0.1870	0.4590
Banks	0.1627	0.3737	0.4433	0.1950	0.3710	0.4927	0.2244	0.3076	0.8093
Chemicals	0.3721	0.4760	0.6851	0.3273	0.4471	0.6560	0.4339	0.4939	0.8397
Construction And Materials	0.4593	0.4910	0.7533	0.0953	0.1485	0.7383	0.3155	0.3805	0.8420
Electricity	0.3077	0.6217	0.4020	0.1893	0.4210	0.2510	0.5877	0.6723	0.8900
Equity Investment Instruments	0.3394	0.7856	0.4561	0.1037	0.1596	0.8601	0.3550	0.7337	0.4506
Financial Services	0.1343	0.5497	0.3208	0.2152	0.3748	0.5400	0.3602	0.7003	0.5194
Fixed Line Telecommunication	0.2160	0.2570	0.8420	0.1000	0.1070	0.9380	0.1050	0.1070	0.9860
General Industrials	0.1000	0.3860	0.2580	0.1290	0.1290	0.9990	0.1630	0.3890	0.4180
Industrial Metals And Mining	0.2505	0.3595	0.4970	0.1350	0.5790	0.5560	0.1715	0.2470	0.6735
Industrial Transportation	0.0600	0.0720	0.8300	0.0780	0.0790	0.9990	0.3280	0.3410	0.9640
Media	0.1397	0.2673	0.4527	0.1527	0.4113	0.4903	0.4350	0.4610	0.9033
Oil And Gas Producers	0.7370	0.7683	0.7370	0.6668	1.0000	0.6668	0.8333	0.8335	0.9995
Personal Goods	0.0948	0.1076	0.8584	0.0894	0.0898	0.9982	0.1692	0.1758	0.9714
Real Estate Invest. & Services	0.6390	0.8110	0.7870	0.0230	0.2340	0.0970	0.2270	0.2310	0.9800
Software N Computer Services	0.3670	0.3800	0.9650	0.1410	0.1410	1.0000	0.5950	0.6030	0.9870
Support Services	0.0030	0.2510	0.0120	0.0090	0.0410	0.2210	0.1690	0.2890	0.5850
Panel-C: Private Vs SOEs									
Private Enterprises	0.2357	0.4284	0.5236	0.1863	0.2984	0.6536	0.3130	0.4675	0.7232
Sate Owned Enterprises	0.4376	0.6873	0.6793	0.2599	0.5303	0.5661	0.5427	0.5938	0.8985

The DEA results of stage 1 suggest that manufacturing sector CRS score is twice the score of financial and other sectors showing better efficiency. In VRS, the efficiency score of financial sector is greater than the score of manufacturing and other sectors. In stage 2, both CRS and VRS analysis, manufacturing sector showed better efficiency than financial and other sectors. In contrast to the results of stage 1 and 2, the efficiency score under CRS of other sector is observed to be greater than financial and manufacturing sectors. However, under VRS, financial sector showed better efficiency than

manufacturing and other sectors and exceeded the score of 0.50. All these results suggest that neither of the sector is CRS efficient nor VRS efficient in all three stages.

The efficiency scores showed decreasing trend under CRS in all the three stages while comparing pre IPO with post IPO analysis in financial and other sectors. However the results of manufacturing sector are in increasing trend under CRS and VRS.

In sector-wise analysis, for CRS efficiency scores in stage 1, the sector financial services and personal goods showed some better efficiency (greater than 0.5) than other sectors in the KSE. The sectors; Real Estate Investment & Services, Media, Electricity, Automobile & Parts, General Industrials, Banks and Support Services showed very dismal efficiency score less than 0.2 under CRS. The VRS efficiency scores are observed to be higher than the efficiency scores of CRS in stage 1. For VRS efficiency score in stage 1, the Real estate showed better performance than all other sectors representing the score of 0.811.

In the marketability analysis of stage 2, none of the sector can meet the efficacy score even 0.5 under CRS except oil and gas producer sector. However, in VRS sector oil and gas producer showed its efficiency score at optimal level. All other sectors except Industrial Metals & Mining showed efficiency score of less than 0.5 under VRS analysis of stage 2. In the overall analysis of stage 3, the efficiency scores are found to be higher than the efficiency scores in stage 1 and 2. The only one sector in stage 3, i.e. oil and gas producer sector showed relatively good efficiency score under CRS and VRS.

The efficiency scores of private and SOEs are displayed in panel C of table 4.3.2.1. In stage 1, both private and SOEs cannot meet the efficiency score of even 0.5 under CRS, however under VRS SOEs approach efficiency score to 0.6873, showing some better efficiency than private enterprises. In stage 2, the efficiency score approaches to less than 0.2 in CRS measure. However, in stage 2, under VRS, SOEs showed relative better efficiency than private. In stage 3 again SOEs showed relatively greater efficiency than private under CRS and VRS. The post IPO analysis showed that efficiency of SOEs is greater than the efficiency of private firms.

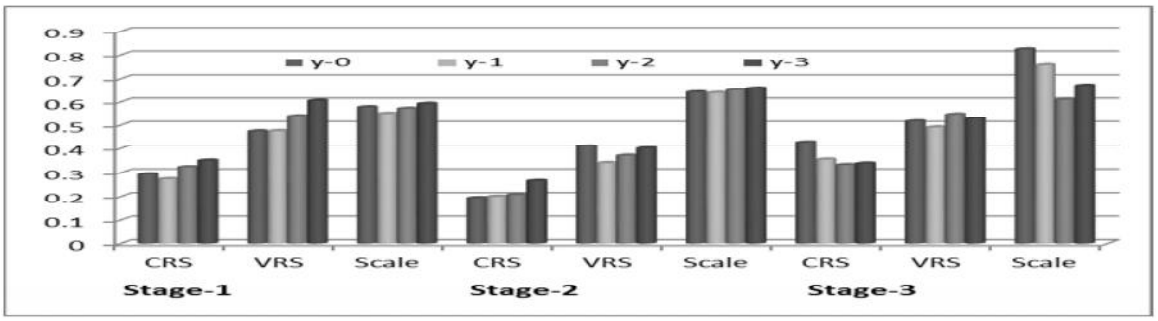


Figure 4.3.3-B: Pre and post IPOs efficiency

The results of post IPOs efficiency scores of three stages after two and three years are displayed as appendix tables (table A-4.3.3-a2, table A-4.3.3-b2 table A-4.3.3-c2) & (table A-4.3.3-a3, table A-4.3.3-b3 table A-4.3.3-c3) and graphically represented as Figure 4.3.3-B: Pre and post IPOs efficiency.

To sum up, the overall efficiency scores of IPO firms also remain dismal as the percentage of optimum level of IPO firms remains between 5% and 20% in all the three stages in post IPO. Even the efficiency scores are decreased in post IPO after one year. However, SOEs showed some better efficiency than private IPO firms. These efficiency scores in three different stages suggest that, after acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after one year of IPOs.

4.3.4 Post IPO efficiency, Malmquist Productivity index Analysis

To observe the efficiency of IPOs overtime, a time series analysis in DEA in the form of Malmquist Productivity Index (MPI) is used. It was initially developed by Caves et al. (1982) and popularized as an empirical index by Fare et al. (1994). It is the product of two terms; the "catching-up" and the "frontier shift". The first one is about the improving of efficiency overtime, while the latter on is about the change in the efficient frontier between the two periods of time.

As in CRS and VRS analysis of efficiency scores, MPI is presented in three stages suggesting changes as efficiency change (effch), technical change (techch), pure efficiency change (pech), scale efficiency change (sech) & total factor productivity change (tfch). The results are presented as appendix tables (table A-4.3.4-a, table A-4.3.4-b table A-4.3.4-c). In stage 1 overall declining trend is observed in all the four change measures of MPI except the third one and found to be 0.778, 0.974, 1.027, 0.831 and 0.860 respectively from year 1 to year 3 after IPO. Similarly in stage 2, five different measures give the averages of efficiency change, technical change, pure efficiency change, scale efficiency change & total factor productivity change; 0.686, 0.658, 0.825, 0.821 and 0.741 respectively. In stage 3, the averages of efficiency change, technical change, pure efficiency change, scale efficiency change & total factor productivity change; 0.898, 0.949, 0.880, 0.992 and 0.862 respectively.

These results are also consistent with the other performance measure models; CARs, BHARs and Jensen's alphas measure by asset pricing models in which underperformance is observed after the period of three years of IPOs.

A positive technical efficiency change is observed in 34 out of 60 for stage 1, 22 out of 60 for stage 2 and 25 out of 60 IPOs for stage 3 for the first year of IPOs to third year of IPOs. It indicates that there is increase in improving the performance of IPOs in profit after taxes and revenue by using input as assets, equity and number of employees for stage 1, improving the performance in EPS, MV using inputs as profit after taxes and revenue and returns to investors for stage 2 and improving the performance in EPS, MV and returns to investors by using input as assets, equity and number of employees for stage 3. The results of positive technical efficiency suggest the overall managerial efficiency of IPOs after going public for the period of three years.

A declining trend (on average) is observed in technological change in all the three stages of IPOs after going public from year 1 to year 3. However, a positive technological change is observed in 25 out of 60 for stage 1, 11 out of 60 for both stages 2 and 3 for the first year of IPOs to third year of IPOs. This positive technological change in any IPO

firm shift production frontier in the upward direction. Similarly, on average, a declining trend is also observed in pure technical efficiency in all the three stages of IPOs after going public from year 1 to year 3. However, a positive pure technical efficiency is observed in 34 out of 60 for stage 1, 24 out of 60 for both stages 2 and 3 for the first year of IPOs to third year of IPOs.

As a result of MPI analysis, on average, total productivity growth in all the three stages suggest a declining trend of IPOs after going public from 1 to year 3. Majority of IPO firms show positive change in productivity growth in stage 1 showing good achievement. A positive total productivity growth is observed in 43 out of 60 for stage 1, 24 out of 60 for stage 2 and 25 out of 60 IPOs for stage 3 for the first year of IPOs to third year of IPOs.

The overall results of declining trend in total productivity growth of IPOs after three years period in KSE are accordance with the Alanzai (2010) and Gao and Li (2013) but contrary to Chen (2012) studies. Alanzai (2010) reported declining trend in total productivity growth of IPOs after going public. Gao and Li (2013) also reported inefficiencies of SOEs by using Malmquist Productivity Index for Chinese IPOs. On the other hand Chen (2012) measured total factor productivity of banks and showed the technical efficiency of 21 banks improved to 106.22%, technological changes improved to 16.07%, and the total factor productivity improved to 70.03% for the period 2006 to 2011.

The Sector-wise analysis of MPI is presented in table 4.3.4. The panel A of table 4.3.4 is about three main sectors; Financial Service, Manufacturing and Other sectors. The total productivity growth of financial and other sectors in all the three stages from year 1 to three sowed declining trends. The Manufacturing sector showed increase of 8.2% growth in stage 1 by showing improvement in the performance of IPOs in profit after taxes and revenue by using input as assets, equity and number of employees after the period of three years. The results are consistent with the earlier study of Raheman et al (2008) in which total productivity growth is observed to be 9% from year 1998 to 2007. However,

his study was not about IPO firms. For stage 2 and 3, manufacturing sector also show negative growth in total productivity after the period of three years of IPOs.

The results of negative technical efficiency suggest the overall managerial efficiency of IPOs decreased in manufacturing, financial and other sectors in stage 1 after going public for the period of three years. However, an increase of 6.3% in financial and 1.2% in other sectors is observed in technological change in stage 1. Similarly, a positive technological change is observed in manufacturing, financial and other sectors in stage 1 to show shifting of production frontier in the upward direction. In stage 2, only manufacturing sector showed an increase of 3% in technological change.

In stage 1, panel B of table 4.3.4 envisage that the managerial efficiency increased after the period of three years in Industrial Transportation, Electricity, Chemicals, Automobile & Parts, Media, Support Services, Construction & Materials, Personal Goods, Financial Services and Fixed Line Telecommunication sectors while decreased in Equity Investment Instruments, Software & Computer Services, Banks, Oil & Gas Producers, Real Estate Investment & Services, Industrial Metals & Mining and General Industrials sectors. Amongst these sectors, Industrial Transportation sector showed highest increase in managerial efficiency of 22.8%, while General Industrial's sector showed lowest decrease in managerial efficiency.

Similarly in 8 sectors out of 17; Real Estate Investment & Services, Support Services, Industrial Metals & Mining, Banks, Equity Investment Instruments, Media, Personal Goods, Construction & Materials and Chemical, on average, an increasing trend is observed under technological change in stage 1 of IPOs after going public from year 1 to year 3. While, a negative technical change is observed in 9 out of 17 sectors for stage 1 with General Industrial sector at the bottom. In pure technical efficiency analysis, majority sectors showed positive trend while only 4 sectors; Construction & Materials, Media, Industrial Metals & Mining and Industrial Transportation showed decreasing trend in stage 1 after the period of three years.

Table 4.3.4: Sector-wise analysis (MPI)

	Stage 1					Stage 2					Stage 3				
	effch	techch	Pech	sech	tfpch	effch	techch	Pech	Sech	tfpch	effch	techch	pech	Sech	tfpch
Panel A: Financial, Manufacturing & Other Sectors															
Financial Sector	0.831	1.063	1.030	1.008	0.960	0.699	0.704	0.777	0.826	0.833	0.953	0.955	0.902	1.032	0.890
Manufacturing Sector	0.961	0.931	1.066	0.961	1.082	0.850	0.747	1.030	0.937	0.920	0.973	0.979	0.951	1.043	0.913
Other Sectors	0.956	1.012	1.071	0.903	0.972	0.846	0.670	0.925	0.882	0.890	0.882	0.920	0.902	0.947	0.938
Panel B: Sector wise analysis															
Automobile And Parts	1.051	0.753	0.732	1.513	1.169	0.750	0.749	1.037	0.974	1.006	0.722	0.827	1.232	1.181	0.855
Banks	1.073	0.887	1.079	0.934	0.892	0.690	0.805	0.842	0.908	0.761	0.936	0.990	0.757	1.071	1.003
Chemicals	1.002	1.009	1.112	1.052	1.171	0.965	0.651	1.004	0.948	0.897	0.968	0.972	0.945	0.985	0.808
Construction And Materials	0.764	0.891	1.092	1.062	1.095	1.033	0.721	1.052	0.786	0.904	1.105	0.999	0.804	1.080	0.937
Electricity	0.974	1.069	0.906	1.140	1.212	0.799	0.975	1.142	0.984	1.039	0.780	0.877	0.676	0.717	1.124
Equity Investment Instruments	0.666	1.336	1.028	0.926	0.949	0.652	0.673	0.747	0.810	0.890	1.049	0.947	1.030	1.074	0.701
Financial Services	0.718	1.026	0.983	1.146	1.036	0.746	0.626	0.734	0.757	0.861	0.894	0.925	0.946	0.960	0.924
Fixed Line Telecommunication	0.266	1.037	1.299	0.771	1.018	1.024	0.686	1.081	1.158	1.201	0.204	0.862	1.005	1.146	1.201
General Industrials	1.092	0.753	1.208	0.923	0.132	1.019	0.514	1.099	1.000	1.000	1.255	0.872	1.049	1.000	0.812
Industrial Metals And Mining	0.828	0.807	1.122	0.299	0.788	1.032	0.684	0.991	1.000	0.731	0.709	0.966	1.161	0.984	0.822
Industrial Transportation	0.974	1.070	1.000	0.005	1.228	0.800	0.750	0.978	1.028	1.000	0.643	0.850	1.201	1.014	0.380
Media	1.033	0.845	1.157	1.226	1.127	0.972	0.527	0.762	0.596	0.545	1.240	0.891	0.876	0.937	0.774
Oil And Gas Producers	1.035	1.123	1.105	0.983	0.863	0.484	0.963	0.854	1.076	1.101	1.053	0.991	0.947	1.067	1.063
Personal Goods	1.091	0.837	1.014	0.928	1.058	0.614	0.656	1.039	0.927	0.939	1.040	0.958	0.875	1.069	1.017
Real Estate Investment & Services	0.770	1.526	1.000	0.520	0.821	1.157	0.750	1.138	0.848	1.051	0.634	1.068	1.000	1.192	0.987
Software & Computer Services	1.046	1.214	0.877	0.141	0.948	0.646	0.828	1.101	1.020	1.161	0.287	1.203	1.130	1.000	0.727
Support Services	1.027	0.699	1.185	1.063	1.110	1.023	0.337	0.618	0.558	0.160	0.969	0.964	1.000	0.878	1.269
Panel B: SOEs vs Private															
SOEs	0.915	1.071	1.055	0.945	1.056	0.663	0.965	0.945	0.868	0.882	0.954	0.970	0.878	1.043	0.926
Private	0.904	0.990	1.052	0.972	0.994	0.814	0.654	0.890	0.881	0.876	0.941	0.951	0.928	1.010	0.905

In stage 1, as a result of MPI analysis, on average, total productivity growth in 10 sectors; Equity Investment Instruments, Media, Chemicals, Industrial Transportation, Software & Computer Services, General Industrials, Automobile & Parts, Oil & Gas Producers, Construction & Materials, Personal Goods increased with Equity Investment Instruments sector at top while 7 it decreased in 7 sectors; Support Services, Industrial Metals & Mining, Electricity, Banks, Real Estate Investment & Services, Fixed Line Telecommunication and Financial Services with the Financial Services sector at lowest.

In stage 2, panel B of table 4.3.4 envisage that the managerial efficiency increased after the period of three years in only six sectors; Real Estate Investment & Services, Construction & Materials, Industrial Metals & Mining, Fixed Line Telecommunication, Support Services and General Industrials while decreased in 11 sectors; Media, Chemicals, Industrial Transportation, Electricity, Automobile & Parts, Financial Services, Banks, Equity Investment Instruments, Software & Computer Services, Personal Goods, Oil & Gas Producers. Amongst these sectors, Real Estate Investment & Services sector showed highest increase in managerial efficiency of 15.7%.

On the contrary, in stage 2, none of the sector showed increase in technological change after going public from year 1 to year 3. In addition, as a result of MPI analysis, on average, total productivity growth increased in 6 out of 17 sectors; Fixed Line Telecommunication Software & Computer Services, Oil & Gas Producers, Real Estate Investment & Services, Electricity and Automobile & Parts increased with Fixed Line Telecommunication sector at top while it decreased in 9 sectors; Personal Goods, Construction & Materials, Chemicals, Equity Investment Instruments, Financial Services, Banks, Industrial Metals & Mining, Media and Support Services.

In stage 3, panel B of table 4.3.4 envisage that the managerial efficiency increased after the period of three years in only six sectors; General Industrials, Media, Construction & Materials, Oil & Gas Producers, Equity Investment Instruments and Personal Goods while decreased in 11 sectors; Support Services, Chemicals, Banks, Financial Services, Electricity, Automobile & Parts, Industrial Metals & Mining, Industrial Transportation, Real Estate Investment & Services, Software & Computer Services and Fixed Line Telecommunication. Amongst these sectors, General Industrial's sector showed highest increase in managerial efficiency of 20.3%.

On the other hand, in stage 3, only two sectors showed increase in technological change after going public from year 1 to year 3. In addition, as a result of MPI analysis, on average, total productivity growth in 6 out of 17 sectors; Support Services, Fixed Line

Telecommunication, Electricity, Oil & Gas Producers, Personal Goods and Banks increased with Support Services sector at top while it decreased in 11 sectors.

In general, sector-wise analysis regarding MPI showed mixed results of efficiency scores. Some sectors remained efficient in stage 1, while other remained in stage 2 and 3. However, efficiency of IPOs is decreased in majority of the sectors after the period of three years. In marketability analysis, only six sectors showed efficiency under MPI. The results are consistent with the other models like CARs, BHARs and Jensen's alphas, in which underperformance of IPOs are observed after the period of three years.

To sum up the section, the DEA is used in this analysis to measure the economic efficiency of IPOs before going to public in three ways. The input oriented DEA is measured as Constant Returns to Scale (CRS), Variable Returns to Scale (VRS) and Scale efficiencies. The same methodology is also applied after one year of public. On the other hand to measure the efficiency in longer run, Malmquist Productivity Index is applied.

The overall efficiency scores of IPO firms remain dismal as the percentage of optimum level of IPO firms remains between 5% and 20% in all the three stages in pre and post IPO. In the analysis of broader categories of sectors; private, SOEs, manufacturing, financial, other services sectors, the results of DEA model of three stages suggest that neither of the sector is CRS efficient nor VRS efficient in pre and Post IPO. Even the efficiency scores are decreased in post IPO after one year. However, SOEs showed some better efficiency than private IPO firms.

In pre IPO, under sector-wise analysis none of the sector shows efficiency score at optimum level however the only one sector in stage 3, i.e. Software & Computer Services sector showed its efficiency score near to optimal level under CRS. In VRS analysis, the sectors Oil & Gas Producers, Electricity and Financial Services also showed relative good efficiency scores. Further, the only oil and gas sector showed optimal level under VRS in stage 2 only. Therefore, pre IPO and after the period of one year of IPO, no

significant change is observed in the efficiency. These efficiency scores in three different stages suggest that, after acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after one year of IPOs.

The overall results of declining trend in total productivity growth of IPOs after three years period in KSE are observed and it was in accordance with the Alanzai (2010) and Gao and Li (2013) but contrary to Chen (2012) studies. However, the Manufacturing sector showed increase of 8.2% growth in stage 1, while detail sector-wise analysis showed mixed results of change in five different measures of MPI. These results of DEA and MPI are also consistent with the other performance measure models; CARs, BHARs and Jensen's alphas measure by asset pricing models in which underperformance is observed after the period of three years of IPOs.

CHAPTER 5

SUMMARY CONCLUSION AND RECOMMENDATIONS

In this chapter, after discussing the main objectives and methodology of this study, the summary of the overall results is discussed that starts with the findings of the analysis and determinants for underpricing, the long run performance and efficiency of pre and post IPOs. This is followed by the policy implication of the study. The chapter ends with the limitation of the study and recommendation for the future research.

The main objectives of this study include; to provide insights of the underpricing (on first trading day) of IPOs and to find out the determinants of underpricing in the light of asymmetric information and signaling theories, to provide insights of the long run performance, to provide analysis and comparison of the efficiency of IPOs and especially in the pre and post period of IPO on sectoral basis, to compare the results of efficiency analysis with long run performance analysis of IPOs and to compare the results of matured and less matured IPO firms in the long run.

To obtain these objectives different methodologies are used. For level of underpricing analysis, in addition to market adjusted model, matched firms adjusted returns are obtained by four models; market model, CAPM, 3-FF and 4-F. To find matched firms as true proxy for IPO firms, tracking error methodology is used. The long run performance of IPOs is measured by using CARs, BHARs, and Jensen's alpha (obtained through CAPM, 3-FF and 4-F) for different time horizons after the period of three years of going public. Considering the volatile nature of the KSE, performance is measured on weekly and fortnightly basis in addition to monthly basis. For long run analysis of IPOs with regard to maturity level GCT regression model is used.

The DEA is used to measure the efficiency of IPOs before going to public in three ways. The input oriented DEA is measured as Constant Returns to Scale (CRS), Variable

Returns to Scale (VRS) and Scale efficiencies. The same methodology is also applied after one year of public. On the other hand to measure the change in performance measures in long run, Malmquist Productivity Index is applied. The efficiency is measured in three stages according to Zhoo (2001) methodology.

5.1 Analysis of underpricing

In this study 83 IPO firms are analyzed for underpricing analysis covering the period of 13 years from year 2000 to 2012. The sample is reduced to 61 IPOs as the long run performance is conducted on those IPO firms that have covered the period of three years after the listing. The mean total size remains at Rs.713.10 million that were offered to general public. The Apna Microfinance Bank Limited issued lowest size while Habib Bank Limited issued highest offer size. The mean yearly offer size IPO firms remain at its highest level of Rs.1,468.00 million in year 2004, whilst, lowest in 2003. The shares offered ranges from 1.25 million to 215.05 million during the sample period.

The level of underpricing with regard to marked adjusted model is observed to be 28.28% for the full sample of 83 IPOs. This also prove that investors can make a market adjusted profit of 28.28% while investing in the new issues of the firms. The profit opportunity for the day traders is also observed; they can make profit if they manage to purchase the shares in the opening session and sell them at the close of first trading day. The year-wise analysis of level of underpricing shows that the overall amount of level of underpricing decreased over the years for the sample period of year 2000 to 2012, however, year 2007 has shown highest level of underpricing. Further, the level of underpricing is observed in all the sectors except Equity Investment Instruments, Technology hardware and equipment and personal goods. More than 100% return (without risk adjusted) is observed in the sectors of Oil & Gas Producers, Real Estate Investment & Services and General Industrials.

The matched firm technique is used for the first time to calculate the level of underpricing accounting for different risk factor; market, size, value and momentum factors. To find the level of underpricing by matched firms, the tracking error is

calculated and it is found to be 0.0196 which is less than 0.05 and depicts that matched firms are true proxy of IPO firms based on asset selection criterion. The results are further validated by applying t statistics with regard to no difference of asset's means of IPO and matched firm's assets means.

The level of underpricing is observed to be 39% or greater on the basis of the entire five models. The level of underpricing is observed to be 39.64% for market adjusted model, 42.63% for market model, 42.31% for CAPM, 42.84% for three Factor Fama French and 42.99% for four Factor model. All the five models on average give some consistent and significant results. The amount of level of underpricing increases accounting for taking more risk factors size, value and momentum. However, individually, level of underpricing is found to be different while comparing all the five models. The results of underpricing at KSE confirm the early studies across different countries in the globe like US, UK, Europe, other developed countries, Asian countries and south Asian countries as discussed in detail in the literature part of thesis.

5.2 Analysis of underpricing and its determinants

The determinants of level of underpricing are observed in the KSE in the light of asymmetric and signaling theories. The regression analysis is made to explain these determinants of level of underpricing with the help of Ex-Ante, Market Capitalization, Incidence of secondary market issues, Market Volatility, Offer Size, the proportion of shares offered to general public, Over / Under Subscription and Price Earnings ratio variables. These results validate the prior theories of asymmetric and signaling theories.

A positive relationship between the level of underpricing and Ex Ante variable is observed. It validates the asymmetric information theory and results are in accordance with Baron (1982), Ritter (1984) and Beatty and Ritter (1986) studies. These results suggest that the level of underpricing increases with the level of uncertainty about the new issue of IPO. In the same way, the positive relationship between market capitalization and level of underpricing is also observed. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) suggest that underpricing may itself be a

signal of the intrinsic value of the issuing firm or post-issue. In all these models, underpricing is used as a signal that the company is of high quality whereby an IPO firm that underpriced more is considered a well company. In KSE, the results also suggest strong support for the signaling theories.

A significant positive relationship between market volatility and the level of underpricing is observed. The market volatility is considered the degree of underpricing. When the market volatility is high, the regulators and underwriters deliberately lower the prices of an IPO firm in order to minimize the probability of unsuccessful offerings. as compared with low market volatility period. In prior studies, Miller and Reilly (1987) indicated that IPO issues following a rising market experience higher underpricing levels than IPOs following a falling market. The results on KSE are interesting as KSE experienced high volatility as compared with other markets of the world, during the study period from 2000 to 2012, KSE index remains at 1333 to 15470.

Finkle (1998) argued the larger firms, as compared to smaller firms, present less uncertainty for different stakeholders and particularly for the potential investors and three is less uncertainty in the IPO process. Confirming the same, a highly negative relationship is also observed in KSE. Further, highly positive significant relationship of proportion of shares offered to general public with the level of underpricing is observed. The results are contrary to the Perotti (1995) study, but in accordance with the IPO phenomena in KSE, where high offered rate exist. The highly significant positive relationship is observed between the level of underpricing and oversubscription variable confirming the winner curse theory of Rock's model. Conversely, insignificant relationship is found between SI variable and P/E ratio with the level of underpricing, that is contrary to the earlier studies.

5.3 Long run performance of IPOs

In long run performance, it is observed that IPOs do not sustain their initial level of underpricing and provide investors with negative abnormal returns over a long period of one to three years after listing. The average market-adjusted cumulative abnormal returns

are found to be negative and significant after listing of one year, one & half years, two years, two & half years and three years. The broader sector-wise analysis found that the IPOs of manufacturing sector underperform in the long run; however, the amount of level of underperformance is decreased as compared to full sample. The IPOs under financial services also underperform in the long run, however this underperformance increased as compared to manufacturing sector and full sample. The insignificant cumulative abnormal returns are to be observed under the other services sector.

The average market-adjusted buy and hold abnormal returns are found to be negative and significant after listing of one & half years, two years and three years period from year 2000 to 2010. The amount of level of underperformance is increased in BHARs as compared with the CARs. In broader sector-wise analysis with regards to BHARs, the manufacturing sector underperforms in the long run. Under financial services, the underperformance increased as compared to manufacturing sector and full sample. Like CARS, no significant buy and hold abnormal returns are observed under the other services sector.

The Jensen's alpha is obtained by using three models, CAPM, three factors Fama French Model and Four factors Carhart model. The analysis is made both on equally and value weighted average basis. Generally all the models represent the risk adjusted underperformance of these IPOs in longer run in context of asset pricing models.

In all these regression models the intercept term i.e. Jensen's alpha is observed to be negative but insignificant under monthly, fortnightly and weekly basis analysis. The sector-wise and size-wise analysis show that in all the regression models the intercept term i.e. Jensen's alpha is observed to be negative but insignificant after three years under manufacturing, financial services and other services sectors. However, no underperformance of these IPOs is observed after one year in manufacturing sector by all the models except CAPM. Similarly, no underperformance of these IPOs is also observed after 2 years in other services sector by 3-FF and 4-F models based on value weighted

basis. The under performance remains at deep downwards on monthly basis in financial services sector as compared with manufacturing and other services sectors.

In size analysis, small firms IPO portfolio show less underperformance as compared to medium and large firms IPO portfolios in different time horizons. Even, after two and half years, small firms IPO portfolio show no underperformance measured by all the models. The medium firms IPO portfolio also show no underperformance after one year by four factor model. The size effect, value effect in three factor Fama French model (equally and value weighted) and momentum effect in four factor Carhart's model is observed to be insignificant. The results indicate that there is no co movement of IPO portfolios with that of small and large firm's portfolio, value portfolio, growth's portfolio, winners and looser portfolios.

In the analysis of GCT regression model, the Jensen's alpha is found to negative and significant under the three level of maturity of firms showing the significant underperformance of IPOs in Carhart four factor model. The overall, the risk adjusted performance is worst after the period of three years irrespective of IPO maturity levels. In all the three cases of maturity levels, the risk adjusted performance marginally found to be higher from 1st to 2nd level and then 2nd to 3rd level of maturity after the period of three years.

The results of misspecification of model are also validated in KSE as previously discussed in the literature of IPOs with regard to choice of methods. Even the results are observed to be different when analyses are made on monthly, fortnightly and weekly basis. Underperformance is also observed irrespective of different maturity level of IPO firms after going public.

5.4 Efficiency of IPOs

The overall efficiency scores of IPO firms remain dismal as the percentage of optimum level of IPO firms remain between 5% and 20% in all the three stages in pre and post IPO. In the analysis of broader categories of sectors; private, SOEs, manufacturing,

financial, other services sectors, the results of DEA model of three stages suggest that neither of the sector is CRS efficient nor VRS efficient in pre and Post IPO. Even the efficiency scores are decreased in post IPO after one year. However, SOEs showed some better efficiency than private IPO firms.

In pre IPO under detail sector-wise analysis none of the sector show efficiency score at optimum level however the only one sector in stage 3, i.e. Software & Computer Services sector showed its efficiency score near to optimal level under CRS. In VRS analysis, the sectors Oil & Gas Producers, Electricity and Financial Services also showed relative good efficiency scores. Further, the only oil and gas sector showed optimal level under VRS in stage 2 only. Therefor pre IPO and after the period of one year of IPO, no significant change is observed in the efficiency. These efficiency scores in three different stages suggest that, after acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after one year of IPOs.

The overall results of declining trend in total productivity growth of IPOs after three years period in KSE are observed and it was accordance with the Alanzai (2010) and Gao and Li (2013) but contrary to Chen (2012) studies. However, the Manufacturing sector showed increase of 8.2% growth in stage 1, while detail sector-wise analysis showed mixed results of change in five different measures of MPI. These results of DEA and MPI are also consistent with the other performance measure models; CARs, BHARs and Jensen's alphas measure by asset pricing models in which underperformance is observed after the period of three years of IPOs. These efficiency scores in three different stages suggest that, after acquiring further resources of equity, assets and addition of employees, IPO firms did not improve their efficiency level after three years of IPOs.

5.5 Policy Implication of the study

To get the advantage of first trading day of IPOs, the investors are recommended to follow the myth that "IPOs have to be bought". It will also help the investors to know about the proper time to purchase shares to have maximum return on their investment and will guide them about the retaining shares in different time horizon. Even if, investors are

unable to purchase the shares from the primary market, they should purchase the shares of IPO firms in the opening session and mange to sell them at the closing session. As KSE reward the day traders of new IPO firms. Further, investors are recommended to purchase the shares of Oil & Gas Producers, Real Estate Investment & Services and General Industrials sectors as these sectors reward the investor 100% or greater returns on their first trading day. This study can be implemented in other emerging markets to observe whether day traders can get the advantage of underpricing by purchasing the new shares in the opening session and selling them in the closing session of first trading day.

In this study while determining the relationship of level of underpricing with ex ante variable, the KSE has witnessed highly significant positive relationship between these two variables and it strongly supports the asymmetric information theory. It also explains that where the more uncertainty exists about the new IPO firms the highly underpricing will be. As underpricing is ultimate the indirect cost to an IPO firm, so regulatory authorities should help in the new IPO firm to reduce the level of underpricing. As in book building process the amount of underpricing is less as compared to fixed method, so regulatory authorities should encourage the firms to issue shares by book building process to reduce the amount of underpricing.

Although the book building process has started in KSE since 2010 and up till only 5 IPOs are listed through this process. In addition, very depressing IPO activity is observed from 2000 to 2013. The number of IPOs listed in the last 14 years remains less than 100, which in not encouraging as compared the IPO market globally. Therefore, Securities and Exchange Commission of Pakistan (SECP) should encourage the book building process to reduce the amount of underpricing. It will lead to boost the IPO activity process and private firms can decide to go for IPOs. As a result, it will help to the development and further strengthening of capital market in Pakistan. The book building process will also helpful in south Asian countries; Bangladesh and Sri Lank. Especially this process may help in Bangladesh where underpricing is more than 400%.

In the long run performance of IPO, now it is obvious to answer the question that if investors purchased the shares from primary market and held it for longer period like one year, one and half years, two years, two and half years and three years. The investors earn market adjusted negative returns as well as risk adjusted negative returns accounting for market, size, value and momentum factors for these longer period. Therefore, it is recommended to investors that they should not retain the shares of IPO firms for longer period even the matured firm's IPOs. Conversely, the policy implication for firm level is recommended to improve the performance by getting the opportunity to raise the additional capital by secondary issue as in case of underperformance, IPO firms cannot get an opportunity for secondary issue. Further for emerging markets, the result may be different for matured and less matured IPO firms, ultimately it would be beneficial for different stakeholders of emerging markets to observe the long-run performance of matured and less matured firms.

To observe the efficiency of IPOs through DEA, KSE has also witnessed that the efficiency of SOEs is higher than private firms. It is recommended that Government should encourage the SOEs to issue IPOs to improve the efficiency level of the firms. Further, in the study period only 5 Secondary Issues were take place in KSE. The already existing firms can go for Secondary Issue to overcome the underpricing cost that arisen due to going public as literature review supports that in Secondary Issues the firms can earn the profits and can reduce the issuing cost that has been incurred previously.

This study will help firms, managers, researchers, investors, lenders and regulatory authorities to judge the determinants, performance and efficiency of IPOs.

5.6 Limitation of the study and recommendations for future research

In this study, substantial effort has been made to investigate the various issues of IPOs by taking the sample of IPO firms between the years 2000 to 2012. The most prominent issues are underpricing of IPOs, determinants of IPOs and performance & efficiency of IPOs in long run. It is indeed obvious that there is always room for improvement. Due to

the time constraints and availability of resources, further improvement in the form of future research is suggested.

First, investor's sentiment under the behavioral aspect should be incorporated while determining the factors of underpricing. These sentiments may be high or low in demand and influence the pricing of IPOs and ultimately affect the first trading day returns.

Second, underwriters ply an important role in the process of IPOs, it is suggested that this aspect should be incorporated in the future research, as underwriter involved in the pricing of IPOs and underpricing on first day is more concerned with the underwriters.

Third, use of environmental variable in DEA approach is encouraged to apply. In second phase of DEA, the efficiency scores should be taken as dependent variable to investigate the effect of different factors (like valuation, liquidity & leverage of IPO firms) to arrive at the reasons for underperformance and inefficiencies of IPOs on long run basis. Last, but not the least, IPO market at KSE is not yet explored extensively, so there are still many issues that can be investigated like corporate governance, institutional quality of an IPO firm, to find the reasons of failure of IPO firms, unlock up position of insiders, etc.

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APPENDICIES

Table A-4.1.1 Sector-wise Descriptive Statistics

Part-a: Paid-up Capital Of IPO Firms (Rs. In millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	734.03	734.03	734.03	734.03	0.00
2	Banks	9	3,058.67	2,000.00	100.00	6,900.00	2035.59
3	Chemicals	8	3,965.44	872.25	50.00	20,000.00	6310.85
4	Construction And Materials	5	1,042.55	797.75	200.00	1,934.70	633.67
5	Electricity	4	4,934.43	3,697.14	3,540.89	8,802.53	2234.23
6	Equity Investment Instruments	13	1,000.00	1,000.00	100.00	3,000.00	783.24
7	Financial Services	12	418.79	350.00	100.00	1,000.00	248.59
8	Fixed Line Telecommunication	5	2,429.46	1,500.00	502.53	6,174.75	2155.61
9	Food Producers	1	7,480.00	7,480.00	7,480.00	7,480.00	0.00
10	General Industrials	1	389.00	389.00	389.00	389.00	0.00
11	Industrial Metals And Mining	4	2,294.26	2,076.01	675.00	4,350.00	1632.06
12	Industrial Transportation	1	638.01	638.01	638.01	638.01	0.00
13	Media	3	780.46	500.00	500.00	1,341.38	396.63
14	None Life Insurance	1	460.00	460.00	460.00	460.00	0.00
15	Oil And Gas Producers	4	12,911.31	4,117.97	400.00	43,009.28	17550.54
16	Personal Goods	6	937.45	657.76	300.00	2,414.90	692.10
17	Real Estate Investment And Services	1	1,878.33	1,878.33	1,878.33	1,878.33	0.00
18	Software N Computer Services	1	355.00	355.00	355.00	355.00	0.00
19	Support Services	1	600.00	600.00	600.00	600.00	0.00
20	Technology hardware and equipment	1	2,172.49	2,172.49	2,172.49	2,172.49	0.00
21	Travel And Leisure	1	1,652.24	1,652.24	1,652.24	1,652.24	0.00
	Over all	**83**	**2,403.88**	**900.00**	**50.00**	**43,009.28**	**5261.15**

Part-b: Offer Price (Rupees)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	10.00	10.00	10.00	10.00	0.00
2	Banks	9	43.44	15.00	10.00	235.00	68.88
3	Chemicals	8	23.19	13.75	10.00	80.00	22.36
4	Construction And Materials	5	13.80	12.50	10.00	22.50	4.61
5	Electricity	4	17.25	14.50	10.00	30.00	8.23
6	Equity Investment Instruments	13	10.00	10.00	10.00	10.00	0.00
7	Financial Services	12	36.25	11.25	10.00	125.00	38.98
8	Fixed Line Telecommunication	5	10.00	10.00	10.00	10.00	0.00
9	Food Producers	1	25.00	25.00	25.00	25.00	0.00
10	General Industrials	1	15.00	15.00	15.00	15.00	0.00
11	Industrial Metals And Mining	4	17.27	12.03	10.00	35.00	10.37
12	Industrial Transportation	1	10.00	10.00	10.00	10.00	0.00
13	Media	3	10.00	10.00	10.00	10.00	0.00
14	None Life Insurance	1	10.00	10.00	10.00	10.00	0.00
15	Oil And Gas Producers	4	38.69	43.50	10.00	57.75	19.35
16	Personal Goods	6	12.25	11.25	10.00	18.00	2.85
17	Real Estate Investment And Services	1	14.00	14.00	14.00	14.00	0.00
18	Software N Computer Services	1	25.00	25.00	25.00	25.00	0.00
19	Support Services	1	10.00	10.00	10.00	10.00	0.00
20	Technology hardware and equipment	1	10.00	10.00	10.00	10.00	0.00
21	Travel And Leisure	1	20.00	20.00	20.00	20.00	0.00
	Over all	**83**	**21.76**	**10.00**	**10.00**	**235.00**	**31.04**

Part-c: Number of shares offered (In millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	18.50	18.50	18.50	18.50	0.00
2	Banks	9	35.38	40.00	4.00	59.75	16.91
3	Chemicals	8	42.71	20.83	1.25	200.00	61.25
4	Construction And Materials	5	12.00	10.00	10.00	20.00	4.00
5	Electricity	4	64.30	69.86	22.50	95.00	29.20
6	Equity Investment Instruments	13	32.81	25.00	5.00	100.00	26.50
7	Financial Services	12	12.96	11.00	2.50	25.00	7.32
8	Fixed Line Telecommunication	5	65.44	30.00	13.20	200.00	70.21
9	Food Producers	1	27.00	27.00	27.00	27.00	0.00
10	General Industrials	1	10.00	10.00	10.00	10.00	0.00
11	Industrial Metals And Mining	4	35.29	20.89	10.00	89.38	31.89
12	Industrial Transportation	1	16.00	16.00	16.00	16.00	0.00
13	Media	3	21.22	15.00	15.00	33.66	8.80
14	None Life Insurance	1	15.00	15.00	15.00	15.00	0.00
15	Oil And Gas Producers	4	88.79	65.06	10.00	215.05	80.83
16	Personal Goods	6	25.50	20.00	10.00	61.00	17.39
17	Real Estate Investment And Services	1	39.29	39.29	39.29	39.29	0.00
18	Software N Computer Services	1	10.00	10.00	10.00	10.00	0.00
19	Support Services	1	20.00	20.00	20.00	20.00	0.00
20	Technology hardware and equipment	1	30.00	30.00	30.00	30.00	0.00
21	Travel And Leisure	1	57.54	57.54	57.54	57.54	0.00
	Over all	**83**	**34.25**	**22.50**	**1.25**	**215.05**	**40.42**

Part-d: Total size Offered to G. Public, employees HNWIs, local and foreign institutions (Rs. In millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	185.00	185.00	185.00	185.00	0.00
2	Banks	9	1,631.31	616.50	40.00	8,107.50	2408.19
3	Chemicals	8	622.19	287.50	62.50	2,700.00	825.73
4	Construction And Materials	5	158.00	140.00	100.00	225.00	46.97
5	Electricity	4	1,199.47	966.07	225.00	2,640.75	885.49
6	Equity Investment Instruments	13	328.08	250.00	50.00	1,000.00	265.01
7	Financial Services	12	371.56	162.50	100.00	1,620.00	441.77
8	Fixed Line Telecommunication	5	654.40	300.00	132.00	2,000.00	702.11
9	Food Producers	1	675.00	675.00	675.00	675.00	0.00
10	General Industrials	1	150.00	150.00	150.00	150.00	0.00
11	Industrial Metals And Mining	4	532.85	387.35	100.00	1,256.70	441.28
12	Industrial Transportation	1	160.00	160.00	160.00	160.00	0.00
13	Media	3	212.20	150.00	150.00	336.60	87.96
14	None Life Insurance	1	150.00	150.00	150.00	150.00	0.00
15	Oil And Gas Producers	4	3,347.41	3,117.83	272.50	6,881.47	2956.21
16	Personal Goods	6	335.92	231.25	100.00	793.00	254.28
17	Real Estate Investment And Services	1	550.00	550.00	550.00	550.00	0.00
18	Software N Computer Services	1	250.00	250.00	250.00	250.00	0.00
19	Support Services	1	200.00	200.00	200.00	200.00	0.00
20	Technology hardware and equipment	1	300.00	300.00	300.00	300.00	0.00
21	Travel And Leisure	1	1,150.73	1,150.73	1,150.73	1,150.73	0.00
	Over all	**83**	**713.09**	**250.00**	**40.00**	**8,107.50**	**1334.12**

Part-e: Total size Offered to General Public (Rs. in millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	185.00	185.00	185.00	185.00	0.00
2	Banks	9	1,356.35	604.17	40.00	6,486.00	1911.47
3	Chemicals	8	352.31	279.38	56.00	900.00	285.72
4	Construction And Materials	5	158.00	140.00	100.00	225.00	46.97
5	Electricity	4	932.62	828.48	225.00	1,848.53	589.67
6	Equity Investment Instruments	13	313.08	250.00	50.00	1,000.00	246.47
7	Financial Services	12	349.63	162.50	25.00	1,539.00	423.16
8	Fixed Line Telecommunication	5	467.90	285.00	132.00	1,100.00	373.28
9	Food Producers	1	675.00	675.00	675.00	675.00	0.00
10	General Industrials	1	142.50	142.50	142.50	142.50	0.00
11	Industrial Metals And Mining	4	282.88	324.89	95.00	386.73	116.82
12	Industrial Transportation	1	152.00	152.00	152.00	152.00	0.00
13	Media	3	209.70	150.00	142.50	336.60	89.78
14	None Life Insurance	1	50.00	50.00	50.00	50.00	0.00
15	Oil And Gas Producers	4	3,340.19	3,103.39	272.50	6,881.48	2962.99
16	Personal Goods	6	240.80	193.95	100.00	540.00	150.19
17	Real Estate Investment And Services	1	536.00	536.00	536.00	536.00	0.00
18	Software N Computer Services	1	237.50	237.50	237.50	237.50	0.00
19	Support Services	1	197.50	197.50	197.50	197.50	0.00
20	Technology hardware and equipment	1	100.00	100.00	100.00	100.00	0.00
21	Travel And Leisure	1	1,150.73	1,150.73	1,150.73	1,150.73	0.00
	Over all	**83**	**604.14**	**250.00**	**25.00**	**6,881.48**	**1183.63**

Part-f: Total Size subscribed by the General Public (Rs in millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	225.97	225.97	225.97	225.97	0.00
2	Banks	9	4,909.04	3,102.89	46.96	15,577.37	5197.85
3	Chemicals	8	752.58	382.80	39.90	2,841.37	899.53
4	Construction And Materials	5	458.46	205.81	31.14	1,402.57	500.37
5	Electricity	4	5,522.34	490.66	266.98	20,841.08	8846.07
6	Equity Investment Instruments	13	173.05	121.13	6.08	660.13	176.24
7	Financial Services	12	660.84	378.10	4.79	2,190.39	683.32
8	Fixed Line Telecommunication	5	917.90	582.29	18.12	2,006.89	894.48
9	Food Producers	1	640.41	640.41	640.41	640.41	0.00
10	General Industrials	1	473.61	473.61	473.61	473.61	0.00
11	Industrial Metals And Mining	4	856.02	642.57	270.55	1,868.41	627.36
12	Industrial Transportation	1	1,332.68	1,332.68	1,332.68	1,332.68	0.00
13	Media	3	45.66	3.28	3.27	130.43	59.94
14	None Life Insurance	1	0.01	0.01	0.01	0.01	0.00
15	Oil And Gas Producers	4	15,272.42	16,464.53	42.23	28,118.38	10782.70
16	Personal Goods	6	120.48	127.71	10.66	238.90	79.43
17	Real Estate Investment And Services	1	1,069.61	1,069.61	1,069.61	1,069.61	0.00
18	Software N Computer Services	1	278.13	278.13	278.13	278.13	0.00
19	Support Services	1	1,119.42	1,119.42	1,119.42	1,119.42	0.00
20	Technology hardware and equipment	1	115.26	115.26	115.26	115.26	0.00
21	Travel And Leisure	1	1,329.33	1,329.33	1,329.33	1,329.33	0.00
	Over all	**83**	**1,943.50**	**270.55**	**0.01**	**28,118.38**	**4938.30**

Part-g: IPOs under / oversubscribed (in millions)

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	1.22	1.22	1.22	1.22	0.00
2	Banks	9	4.71	2.77	0.52	11.37	3.84
3	Chemicals	8	2.21	1.26	0.23	5.72	1.85
4	Construction And Materials	5	2.47	1.03	0.31	6.23	2.22
5	Electricity	4	3.40	0.98	0.38	11.27	4.55
6	Equity Investment Instruments	13	0.72	1.01	0.01	1.25	0.49
7	Financial Services	12	3.76	1.14	0.08	17.46	5.30
8	Fixed Line Telecommunication	5	2.60	1.82	0.03	6.88	2.60
9	Food Producers	1	0.95	0.95	0.95	0.95	0.00
10	General Industrials	1	3.32	3.32	3.32	3.32	0.00
11	Industrial Metals And Mining	4	3.26	2.60	1.04	6.79	2.15
12	Industrial Transportation	1	8.77	8.77	8.77	8.77	0.00
13	Media	3	0.32	0.02	0.01	0.92	0.42
14	None Life Insurance	1	0.00	0.00	0.00	0.00	0.00
15	Oil And Gas Producers	4	6.94	4.00	0.16	19.60	7.48
16	Personal Goods	6	0.60	0.67	0.09	1.03	0.42
17	Real Estate Investment And Services	1	2.00	2.00	2.00	2.00	0.00
18	Software N Computer Services	1	1.17	1.17	1.17	1.17	0.00
19	Support Services	1	5.67	5.67	5.67	5.67	0.00
20	Technology hardware and equipment	1	1.15	1.15	1.15	1.15	0.00
21	Travel And Leisure	1	1.16	1.16	1.16	1.16	0.00
	Over all	**83**	**2.70**	**1.16**	**0.00**	**19.60**	**3.76**

Part-h: Proportion of shares offered to General Public

S#	Sector	IPOs	Mean	Median	Min.	Max.	SD
1	Automobile And Parts	1	0.25	0.25	0.25	0.25	0.00
2	Banks	9	0.17	0.13	0.05	0.40	0.10
3	Chemicals	8	0.21	0.19	0.04	0.45	0.13
4	Construction And Materials	5	0.19	0.13	0.06	0.50	0.16
5	Electricity	4	0.14	0.12	0.06	0.26	0.07
6	Equity Investment Instruments	13	0.36	0.33	0.25	0.60	0.11
7	Financial Services	12	0.32	0.28	0.20	0.50	0.10
8	Fixed Line Telecommunication	5	0.25	0.25	0.20	0.32	0.05
9	Food Producers	1	0.04	0.04	0.04	0.04	0.00
10	General Industrials	1	0.26	0.26	0.26	0.26	0.00
11	Industrial Metals And Mining	4	0.21	0.20	0.03	0.41	0.13
12	Industrial Transportation	1	0.25	0.25	0.25	0.25	0.00
13	Media	3	0.28	0.30	0.25	0.30	0.02
14	None Life Insurance	1	0.33	0.33	0.33	0.33	0.00
15	Oil And Gas Producers	4	0.16	0.17	0.05	0.25	0.07
16	Personal Goods	6	0.28	0.28	0.20	0.35	0.05
17	Real Estate Investment And Services	1	0.21	0.21	0.21	0.21	0.00
18	Software N Computer Services	1	0.28	0.28	0.28	0.28	0.00
19	Support Services	1	0.33	0.33	0.33	0.33	0.00
20	Technology hardware and equipment	1	0.14	0.14	0.14	0.14	0.00
21	Travel And Leisure	1	0.35	0.35	0.35	0.35	0.00
	Over all	**83**	**0.25**	**0.25**	**0.03**	**0.60**	**0.12**

Table A- A-4.1.2.6.1: Modified Tracking Error

S#	IPO Firms Assets	Matched Firms Assets	$RW_{(matched\ firm)}$	$RW_{(IPO\ firm)}$	Δ_t	$(\Delta t-\Delta bar)^2$
1	3,476.846	3,225.552	0.00170337	0.00154900	0.00015437	0.00000002
2	4,924.761	5,628.198	0.00241272	0.00270281	-0.00029009	0.00000008
3	1,091.116	1,880.047	0.00053456	0.00090285	-0.00036829	0.00000014
4	432,802.853	235,138.567	0.21203745	0.11291996	0.09911749	0.00982428
5	1,428.506	1,630.514	0.00069985	0.00078302	-0.00008317	0.00000001
6	2,538.225	9,552.169	0.00124352	0.00458721	-0.00334369	0.00001118
7	1,579.864	1,535.194	0.00077400	0.00073724	0.00003676	0.00000000
8	673.607	2,111.537	0.00033001	0.00101402	-0.00068401	0.00000047
9	6,129.341	8,990.461	0.00300287	0.00431747	-0.00131460	0.00000173
10	558.529	5,090.598	0.00027363	0.00244464	-0.00217101	0.00000471
11	390.605	319.009	0.00019136	0.00015320	0.00003817	0.00000000
12	95,926.295	12,703.465	0.04699592	0.00610055	0.04089537	0.00167243
13	1,326.249	2,775.973	0.00064975	0.00133310	-0.00068335	0.00000047
14	651.828	3,258.294	0.00031934	0.00156472	-0.00124538	0.00000155
15	154,834.534	107,167.541	0.07585606	0.05146478	0.02439128	0.00059493
16	78,676.573	7,455.301	0.03854499	0.00358024	0.03496475	0.00122253
17	25,340.061	12,703.465	0.01241453	0.00610055	0.00631397	0.00003987
18	327.368	3,142.930	0.00016038	0.00150932	-0.00134894	0.00000182
19	3,142.930	7,951.822	0.00153977	0.00381868	-0.00227891	0.00000519
20	533.597	638.968	0.00026142	0.00030685	-0.00004543	0.00000000
21	108.316	9,618.413	0.00005307	0.00461902	-0.00456596	0.00002085
22	1,062.461	1,526.707	0.00052052	0.00073317	-0.00021265	0.00000005
23	2,447.915	20,323.095	0.00119927	0.00975971	-0.00856043	0.00007328
24	36,730.056	46,635.735	0.01799468	0.02239575	-0.00440108	0.00001937
25	643.554	6,060.544	0.00031529	0.00291044	-0.00259515	0.00000673
26	1,853.845	1,363.524	0.00090823	0.00065480	0.00025343	0.00000006
27	258.646	701.015	0.00012672	0.00033665	-0.00020993	0.00000004
28	347,048.951	298,776.797	0.17002516	0.14348078	0.02654438	0.00070460
29	2,564.632	2,580.087	0.00125646	0.00123903	0.00001743	0.00000000
30	10,056.662	10,541.227	0.00492693	0.00506219	-0.00013526	0.00000002
31	701.015	11,508.865	0.00034344	0.00552687	-0.00518343	0.00002687
32	5,971.618	701.015	0.00292560	0.00033665	0.00258895	0.00000670
33	794.390	1,521.472	0.00038918	0.00073065	-0.00034147	0.00000012
34	2,603.913	2,812.289	0.00127570	0.00135054	-0.00007484	0.00000001
35	1,087.091	898.766	0.00053258	0.00043161	0.00010097	0.00000001
36	27,211.260	164,855.137	0.01333126	0.07916794	-0.06583668	0.00433447
37	4,024.674	46,438.623	0.00197176	0.02230110	-0.02032934	0.00041328
38	1,206.422	1,011.968	0.00059105	0.00048597	0.00010507	0.00000001
39	706.764	4,193.952	0.00034626	0.00201405	-0.00166779	0.00000278

40	1,086.429	2,803.481	0.00053226	0.00134631	-0.00081405	0.00000066
41	2,447.104	2,608.549	0.00119888	0.00125270	-0.00005382	0.00000000
42	3,805.559	3,341.655	0.00186441	0.00160475	0.00025965	0.00000007
43	5,406.687	5,864.311	0.00264883	0.00281620	-0.00016737	0.00000003
44	964.066	1,086.429	0.00047231	0.00052173	-0.00004942	0.00000000
45	1,037.234	799.702	0.00050816	0.00038404	0.00012412	0.00000002
46	2,312.452	2,650.525	0.00113291	0.00127285	-0.00013995	0.00000002
47	655,838.856	762,193.593	0.32130657	0.36602619	-0.04471962	0.00199984
48	1,828.079	4,846.690	0.00089561	0.00232751	-0.00143191	0.00000205
49	24,802.817	21,627.802	0.01215132	0.01038626	0.00176506	0.00000312
50	2,344.604	2,334.379	0.00114866	0.00112103	0.00002763	0.00000000
51	1,346.352	1,368.815	0.00065960	0.00065734	0.00000226	0.00000000
52	850.282	2,334.379	0.00041657	0.00112103	-0.00070446	0.00000050
53	18,279.110	4,726.490	0.00895525	0.00226979	0.00668546	0.00004470
54	2,255.343	2,334.379	0.00110493	0.00112103	-0.00001610	0.00000000
55	1,729.253	2,334.379	0.00084719	0.00112103	-0.00027384	0.00000007
56	1,046.195	2,334.379	0.00051255	0.00112103	-0.00060848	0.00000037
57	1,718.896	3,138.324	0.00084212	0.00150711	-0.00066499	0.00000044
58	2,203.369	2,916.666	0.00107947	0.00140066	-0.00032120	0.00000010
59	22,436.598	90,185.671	0.01099207	0.04330962	-0.03231755	0.00104442
60	22,703.028	90,185.671	0.01112260	0.04330962	-0.03218703	0.00103600
61	1,284.111	5,362.046	0.00062911	0.00257500	-0.00194589	0.00000379
	2,041,162.300	2,082,347.151	1.00000000	1.00000000	0.00000000	0.02312688

Tracking Error = $\sigma \lhd$ = $\sqrt{\sum_{t=1}^{n} (\lhd - \lhd bar)\text{^}2 / (n-1)}$ =square root (0.02312688 / 60) = 0.0196

Table A-4.1.2.7.1: Expected returns of matched firm by Market Model

S#	Equity (IPO firm)	Debt (IPO firm)	D/E (IPO firm)	Equity (Matched firm)	Debt (Matched firm)	D/E (Matched firm)	Beta	Unlevered Beta	Adj. Levered Beta	Expected Return by Market Model	Up_matched_mkt
1	766.4380	1626.2448	2.1218	1635.8840	953.8008	0.5830	0.2326	0.1687	0.4013	-0.0781	0.0731
2	2003.4740	1752.7722	0.8749	228.6730	3239.7150	14.1675	0.6518	0.0639	0.1002	-0.0113	0.0113
3	494.6510	357.8790	0.7235	1076.2590	482.2728	0.4481	0.2145	0.1661	0.2442	-0.0177	0.0552
4	14279.3030	251114.1300	17.5859	6313.9570	137294.7660	21.7446	1.5035	0.0993	1.2349	0.2032	0.4718
5	1030.3440	238.8972	0.2319	916.4750	428.4234	0.4675	0.9775	0.7497	0.8627	-0.3806	0.5306
6	1377.5660	696.3954	0.5055	1123.3000	5057.3214	4.5022	0.6535	0.1664	0.2211	-0.0249	-0.1201
7	410.8700	701.3964	1.7071	531.9890	601.9230	1.1315	1.6025	0.9234	1.9480	0.7711	0.0039
8	658.6360	8.9826	0.0136	820.4920	774.6270	0.9441	1.0105	0.6262	0.6317	0.0139	0.8161
9	1846.7370	2569.5624	1.3914	1229.0770	4656.8304	3.7889	0.4796	0.1385	0.2637	-0.0240	0.1740
10	427.4740	78.6330	0.1839	1830.8530	1955.8470	1.0683	1.2620	0.7448	0.8339	0.7640	0.0160
11	250.3930	84.1272	0.3360	232.8980	51.6666	0.2218	0.5041	0.4406	0.5368	0.0033	0.1767
12	70671.4930	15152.8812	0.2144	7359.5410	3206.3544	0.4357	1.7319	1.3497	1.5378	0.1554	0.4712
13	519.1380	484.2666	0.9328	950.2360	1095.4422	1.1528	0.3201	0.1830	0.2939	0.0548	1.0952
14	503.0900	89.2428	0.1774	1444.8410	1088.0718	0.7531	1.1713	0.7864	0.8771	-0.0199	0.0199
15	5261.4840	89743.8300	17.0568	6016.0930	60690.8688	10.0881	1.4202	0.1879	2.2714	1.9240	-1.1640
16	13441.1920	39141.2286	2.9120	3357.5880	2458.6278	0.7323	-0.2220	-0.1504	-0.4350	0.0099	0.0751
17	14336.8860	6601.9050	0.4605	7359.5410	3206.3544	0.4357	0.7476	0.5826	0.7570	-0.0529	1.0519
18	293.7029	20.1992	0.0688	617.2970	1515.3798	2.4549	0.1473	0.0568	0.0593	0.0139	-0.0389
19	617.2970	1515.3798	2.4549	4357.4180	2156.6424	0.4949	1.1817	0.8941	2.3207	-0.8276	0.9776
20	526.5827	4.2088	0.0080	626.3390	7.5774	0.0121	1.4944	1.4828	1.4905	0.0240	-0.0490
21	81.8654	15.8704	0.1939	1632.2800	4791.6798	2.9356	1.3113	0.4509	0.5077	0.0082	0.0518
22	241.9328	492.3171	2.0349	1375.0809	90.9757	0.0662	0.4362	0.4182	0.9714	0.2271	0.2395
23	1013.1308	860.8703	0.8497	8303.0730	7212.0132	0.8686	0.6926	0.4427	0.6872	-0.0498	2.7571
24	22286.6280	8666.0568	0.3888	31671.8120	8978.3538	0.2835	0.4695	0.3965	0.4967	-0.2780	0.9614
25	618.1017	15.2716	0.0247	5882.7300	106.6884	0.0181	0.7760	0.7669	0.7792	-0.1118	0.1068
26	606.7745	748.2425	1.2331	356.2066	604.3906	1.6967	0.9577	0.4554	0.8205	-0.6093	0.6543
27	207.6828	30.5780	0.1472	620.0120	48.6018	0.0784	0.4936	0.4696	0.5146	0.1798	0.0102
28	21668.2700	195228.4086	9.0099	23307.7630	165281.4204	7.0913	1.1470	0.2045	1.4020	1.1980	-0.8240
29	650.6377	1148.3968	1.7650	560.2806	1211.8840	2.1630	-0.1303	-0.0542	-0.1163	0.0330	-0.0330
30	2367.7000	4613.3773	1.9485	3093.1026	4468.8745	1.4448	0.0613	0.0316	0.0717	-0.0204	-0.0491
31	620.0120	48.6018	0.0784	3689.1810	4691.8104	1.2718	0.8267	0.4526	0.4756	-0.1352	0.5652
32	2730.7823	1944.5015	0.7121	620.0120	48.6018	0.0784	0.4936	0.4696	0.6870	0.2400	-0.2400
33	324.1979	282.1151	0.8702	600.0000	552.8833	0.9215	-0.1027	-0.0642	-0.1006	0.0245	0.0255
34	1443.4017	696.3069	0.4824	1082.0640	1038.1350	0.9594	-0.0782	-0.0481	-0.0632	-0.0221	0.7764
35	1019.1210	40.7820	0.0400	888.7905	5.9853	0.0067	-0.3282	-0.3268	-0.3353	-0.0586	0.0986
36	3028.9560	14509.3824	4.7902	15201.5020	89792.1810	5.9068	-0.3026	-0.0625	-0.2572	0.2636	1.1030
37	2002.8870	1213.0722	0.6057	4763.3590	25005.1584	5.2495	0.6476	0.1468	0.2046	0.0083	0.9767
38	1136.5711	41.9105	0.0369	965.9470	27.6126	0.0286	0.1297	0.1273	0.1304	0.0392	-0.0592
39	357.9623	209.2812	0.5846	1635.1407	1535.2867	0.9389	0.2420	0.1503	0.2074	0.0851	0.0149
40	597.4593	293.3819	0.4910	967.1260	1101.8130	1.1393	0.0955	0.0549	0.0724	0.0297	0.1943
41	1068.0784	827.4156	0.7747	489.7535	1271.2773	2.5957	0.0383	0.0142	0.0214	0.0114	-0.2354
42	3177.4070	376.8912	0.1186	1252.6080	1253.4282	1.0007	0.0936	0.0567	0.0611	0.0324	1.0319
43	1975.1953	2058.8948	1.0424	2339.6561	2114.7927	0.9039	1.0895	0.6863	1.1513	0.1489	0.1939
44	727.3940	142.0030	0.1952	597.4593	293.3819	0.4910	1.3598	1.0308	1.1616	-0.0317	0.6967

45	1026.6730	6.3366	0.0062	774.9945	14.8247	0.0191	0.0907	0.0896	0.0899	-0.0025	0.0825
46	800.0050	907.4683	1.1343	1706.6550	566.3220	0.3318	0.3180	0.2616	0.4544	0.0820	3.1380
47	50741.5640	363058.3752	7.1550	69270.6310	415753.7772	6.0019	1.2102	0.2469	1.3953	0.2421	-0.0091
48	635.7658	715.3881	1.1252	2994.0040	1111.6116	0.3713	1.1302	0.9104	1.5763	-1.0704	2.4554
49	6132.7310	11202.0516	1.8266	5784.6280	9505.9044	1.6433	1.3693	0.6621	1.4482	-0.1111	0.4468
50	688.7870	993.4902	1.4424	571.0560	1057.9938	1.8527	0.4248	0.1927	0.3734	-0.0485	2.3285
51	570.7490	465.3618	0.8154	273.6150	657.1200	2.4016	0.6994	0.2731	0.4178	-0.0048	0.2915
52	396.9910	271.9748	0.6851	571.0560	1057.9938	1.8527	0.2281	0.1035	0.1496	-0.0017	1.2589
53	6565.8650	7027.9470	1.0704	1923.9920	1681.4988	0.8740	0.6187	0.3946	0.6691	0.0296	0.2654
54	1198.3560	634.1922	0.5292	571.0560	1057.9938	1.8527	0.6837	0.3102	0.4169	-0.4289	0.2930
55	807.9813	552.7633	0.6841	571.0560	1057.9938	1.8527	0.6837	0.3102	0.4481	-0.4610	0.3610
56	708.5772	202.5709	0.2859	571.0560	1057.9938	1.8527	0.6837	0.3102	0.3678	-0.3784	0.0208
57	1005.7424	427.8923	0.4254	2141.5440	598.0680	0.2793	0.1049	0.0888	0.1133	-0.0856	0.0596
58	1438.6898	458.8072	0.3189	2378.9180	322.6488	0.1356	1.2614	1.1592	1.3995	0.3857	-0.3507
59	3615.2620	11292.8015	3.1236	29532.3500	36391.9926	1.2323	0.7092	0.3938	1.1933	-0.4219	0.6979
60	3649.3297	11432.2189	3.1327	29532.3500	36391.9926	1.2323	0.7092	0.3938	1.1956	-0.4227	0.4367
61	645.5671	383.1262	0.5935	2658.4070	1622.1834	0.6102	0.0055	0.0039	0.0055	0.0007	0.5635
Avg.	**4595.0416**	**17319.9813**	**1.6842**	**5110.6731**	**17415.6993**	**2.1010**	**0.6301**	**0.3612**	**0.6183**	**0.0166**	**0.4263**

Table A-4.1.2.7.2: Expected returns of matched firm by CAPM

S#	Equity (IPO firm)	Debt (IPO firm)	D/E (IPO firm)	Equity (Matched firm)	Debt (Matched firm)	D/E (Matched firm)	Beta	Unlevered Beta	Adj. Levered Beta	Expected Return by CAPM	Up_matched_capm
1	766.4380	1626.2448	2.1218	1635.8840	953.8008	0.5830	0.2326	0.1687	0.4013	-0.0740	0.0690
2	2003.4740	1752.7722	0.8749	228.6730	3239.7150	14.1675	0.6516	0.0638	0.1001	-0.0013	0.0013
3	494.6510	357.8790	0.7235	1076.2590	482.2728	0.4481	0.2145	0.1661	0.2442	-0.0093	0.0468
4	14279.3030	251114.1300	17.5859	6313.9570	137294.7660	21.7446	1.5032	0.0993	1.2347	0.2018	0.4732
5	1030.3440	238.8972	0.2319	916.4750	428.4234	0.4675	0.9775	0.7497	0.8627	-0.3798	0.5298
6	1377.5660	696.3954	0.5055	1123.3000	5057.3214	4.5022	0.6535	0.1664	0.2211	-0.0204	-0.1246
7	410.8700	701.3964	1.7071	531.9890	601.9230	1.1315	1.6021	0.9232	1.9475	0.7690	0.0060
8	658.6360	8.9826	0.0136	820.4920	774.6270	0.9441	1.0104	0.6262	0.6317	0.0146	0.8154
9	1846.7370	2569.5624	1.3914	1229.0770	4656.8304	3.7889	0.4796	0.1385	0.2637	-0.0228	0.1728
10	427.4740	78.6330	0.1839	1830.8530	1955.8470	1.0683	1.2620	0.7448	0.8339	0.7643	0.0157
11	250.3930	84.1272	0.3360	232.8980	51.6666	0.2218	0.5041	0.4406	0.5368	0.0040	0.1760
12	70671.4930	15152.8812	0.2144	7359.5410	3206.3544	0.4357	1.7319	1.3497	1.5378	0.1546	0.4720
13	519.1380	484.2666	0.9328	950.2360	1095.4422	1.1528	0.3201	0.1830	0.2939	0.0559	1.0941
14	503.0900	89.2428	0.1774	1444.8410	1088.0718	0.7531	1.1712	0.7863	0.8769	-0.0197	0.0197
15	5261.4840	89743.8300	17.0568	6016.0930	60690.8688	10.0881	1.4202	0.1879	2.2715	1.9219	-1.1619
16	13441.1920	39141.2286	2.9120	3357.5880	2458.6278	0.7323	-0.2221	-0.1505	-0.4353	0.0123	0.0727
17	14336.8860	6601.9050	0.4605	7359.5410	3206.3544	0.4357	0.7476	0.5826	0.7570	-0.0523	1.0514
18	293.7029	20.1992	0.0688	617.2970	1515.3798	2.4549	0.1449	0.0558	0.0583	0.0175	-0.0425
19	617.2970	1515.3798	2.4549	4357.4180	2156.6424	0.4949	1.1813	0.8938	2.3199	-0.8312	0.9812
20	526.5827	4.2088	0.0080	626.3390	7.5774	0.0121	1.4933	1.4817	1.4894	0.0220	-0.0470
21	81.8654	15.8704	0.1939	1632.2800	4791.6798	2.9356	1.3131	0.4515	0.5084	0.0101	0.0499
22	241.9328	492.3171	2.0349	1375.0809	90.9757	0.0662	0.4375	0.4194	0.9742	0.2279	0.2388
23	1013.1308	860.8703	0.8497	8303.0730	7212.0132	0.8686	0.6929	0.4429	0.6875	-0.0483	2.7557
24	22286.6280	8666.0568	0.3888	31671.8120	8978.3538	0.2835	0.4696	0.3966	0.4968	-0.2756	0.9589
25	618.1017	15.2716	0.0247	5882.7300	106.6884	0.0181	0.7759	0.7669	0.7792	-0.1105	0.1055
26	606.7745	748.2425	1.2331	356.2066	604.3906	1.6967	0.9577	0.4554	0.8205	-0.6081	0.6531
27	207.6828	30.5780	0.1472	620.0120	48.6018	0.0784	0.4934	0.4695	0.5144	0.1835	0.0065
28	21668.2700	195228.4086	9.0099	23307.7630	165281.4204	7.0913	1.1472	0.2045	1.4023	1.1952	-0.8212
29	650.6377	1148.3968	1.7650	560.2806	1211.8840	2.1630	-0.1301	-0.0541	-0.1161	0.0416	-0.0416
30	2367.7000	4613.3773	1.9485	3093.1026	4468.8745	1.4448	0.0614	0.0317	0.0718	-0.0132	-0.0562
31	620.0120	48.6018	0.0784	3689.1810	4691.8104	1.2718	0.8264	0.4524	0.4755	-0.1311	0.5611
32	2730.7823	1944.5015	0.7121	620.0120	48.6018	0.0784	0.4934	0.4695	0.6868	0.2424	-0.2424
33	324.1979	282.1151	0.8702	600.0000	552.8833	0.9215	-0.1027	-0.0642	-0.1006	0.0334	0.0166
34	1443.4017	696.3069	0.4824	1082.0640	1038.1350	0.9594	-0.0782	-0.0482	-0.0633	-0.0135	0.7678
35	1019.1210	40.7820	0.0400	888.7905	5.9853	0.0067	-0.3282	-0.3268	-0.3353	-0.0478	0.0878
36	3028.9560	14509.3824	4.7902	15201.5020	89792.1810	5.9068	-0.3026	-0.0625	-0.2572	0.2738	1.0929
37	2002.8870	1213.0722	0.6057	4763.3590	25005.1584	5.2495	0.6476	0.1468	0.2046	0.0148	0.9702
38	1136.5711	41.9105	0.0369	965.9470	27.6126	0.0286	0.1297	0.1273	0.1304	0.0467	-0.0667
39	357.9623	209.2812	0.5846	1635.1407	1535.2867	0.9389	0.2420	0.1503	0.2074	0.0919	0.0081
40	597.4593	293.3819	0.4910	967.1260	1101.8130	1.1393	0.0955	0.0549	0.0724	0.0377	0.1863
41	1068.0784	827.4156	0.7747	489.7535	1271.2773	2.5957	0.0383	0.0142	0.0214	0.0198	-0.2438
42	3177.4070	376.8912	0.1186	1252.6080	1253.4282	1.0007	0.0936	0.0567	0.0611	0.0405	1.0237
43	1975.1953	2058.8948	1.0424	2339.6561	2114.7927	0.9039	1.0893	0.6862	1.1511	0.1476	0.1953
44	727.3940	142.0030	0.1952	597.4593	293.3819	0.4910	1.3600	1.0309	1.1617	-0.0331	0.6981

45	1026.6730	6.3366	0.0062	774.9945	14.8247	0.0191	0.0909	0.0898	0.0901	0.0054	0.0746
46	800.0050	907.4683	1.1343	1706.6550	566.3220	0.3318	0.3182	0.2617	0.4547	0.0871	3.1329
47	50741.5640	363058.3752	7.1550	69270.6310	415753.7772	6.0019	1.2102	0.2469	1.3952	0.2385	-0.0056
48	635.7658	715.3881	1.1252	2994.0040	1111.6116	0.3713	1.1301	0.9104	1.5762	-1.0757	2.4607
49	6132.7310	11202.0516	1.8266	5784.6280	9505.9044	1.6433	1.3693	0.6621	1.4482	-0.1152	0.4509
50	688.7870	993.4902	1.4424	571.0560	1057.9938	1.8527	0.4248	0.1927	0.3734	-0.0426	2.3226
51	570.7490	465.3618	0.8154	273.6150	657.1200	2.4016	0.6995	0.2731	0.4179	0.0008	0.2859
52	396.9910	271.9748	0.6851	571.0560	1057.9938	1.8527	0.2281	0.1035	0.1496	0.0064	1.2507
53	6565.8650	7027.9470	1.0704	1923.9920	1681.4988	0.8740	0.6188	0.3946	0.6692	0.0334	0.2616
54	1198.3560	634.1922	0.5292	571.0560	1057.9938	1.8527	0.6837	0.3102	0.4169	-0.4221	0.2863
55	807.9813	552.7633	0.6841	571.0560	1057.9938	1.8527	0.6837	0.3102	0.4481	-0.4546	0.3546
56	708.5772	202.5709	0.2859	571.0560	1057.9938	1.8527	0.6837	0.3102	0.3678	-0.3711	0.0135
57	1005.7424	427.8923	0.4254	2141.5440	598.0680	0.2793	0.1050	0.0888	0.1134	-0.0747	0.0487
58	1438.6898	458.8072	0.3189	2378.9180	322.6488	0.1356	1.2614	1.1592	1.3995	0.3802	-0.3452
59	3615.2620	11292.8015	3.1236	29532.3500	36391.9926	1.2323	0.7093	0.3939	1.1936	-0.4244	0.7004
60	3649.3297	11432.2189	3.1327	29532.3500	36391.9926	1.2323	0.7093	0.3939	1.1959	-0.4253	0.4393
61	645.5671	383.1262	0.5935	2658.4070	1622.1834	0.6102	0.0056	0.0040	0.0056	0.0127	0.5515
Avg.	**4595.0416**	**17319.9813**	**1.6842**	**5110.6731**	**17415.6993**	**2.1010**	**0.6301**	**0.3612**	**0.6183**	**0.0199**	**0.4231**

Table A-4.1.2.7.3: Expected returns of matched firm by 3-FF (Equally Weighted)

S#	B1	p	B2	p	B3	p	IPO Firm's Return	expected return by FF(EQ)	level of underpricing
1	0.2327	0.0649	0.2295	0.6884	0.1057	0.7779	(0.0050)	(0.1123)	0.1073
2	0.7111	0.2415	0.1660	0.8767	0.4921	0.4840	0.0000	(0.1268)	0.1268
3	0.2201	0.3173	(0.1644)	0.6585	(0.0210)	0.9314	0.0375	0.0449	(0.0074)
4	1.5083	0.0000	0.0350	0.9228	(0.0940)	0.7834	0.6750	0.2458	0.4292
5	0.9615	0.0000	(0.5197)	0.3333	0.0949	0.8490	0.1500	(0.5033)	0.6533
6	0.6177	0.0003	(0.7199)	0.2829	0.4012	0.5142	(0.1450)	(0.1631)	0.0181
7	1.5409	0.0004	0.9328	0.4330	1.1607	0.2325	0.7750	0.8706	(0.0956)
8	1.0518	0.0151	0.3401	0.5320	0.7524	0.0982	0.8300	0.2499	0.5801
9	0.4557	0.3630	(0.0953)	0.8778	0.6679	0.1933	0.1500	0.2464	(0.0964)
10	1.3796	0.0001	0.4549	0.5223	0.0189	0.9701	0.7800	1.1730	(0.3930)
11	0.5693	0.0562	(0.3698)	0.5871	0.6348	0.2761	0.1800	0.3370	(0.1570)
12	1.8017	0.0015	0.6693	0.6315	(0.9335)	0.3575	0.6266	(0.1001)	0.7267
13	0.2745	0.4189	0.8302	0.0906	0.2921	0.4038	1.1500	(0.3383)	1.4883
14	1.2009	0.0000	(1.2500)	0.0128	0.0240	0.9459	0.0000	0.5471	(0.5471)
15	1.4377	0.0000	(0.8733)	0.0867	(0.2216)	0.5413	0.7600	1.6255	(0.8655)
16	(0.2029)	0.6676	0.9283	0.2867	(0.4943)	0.4325	0.0850	(0.4063)	0.4913
17	0.7432	0.0000	0.0419	0.7682	(0.0663)	0.5206	0.9991	(0.0687)	1.0678
18	0.1418	0.7985	(0.0178)	0.9874	0.0715	0.9296	(0.0250)	0.0428	(0.0678)
19	1.0864	0.0223	(0.1235)	0.8723	1.3214	0.0201	0.1500	(0.3692)	0.5192
20	1.4446	0.0006	0.3323	0.5176	0.2354	0.5897	(0.0250)	0.0885	(0.1135)
21	1.2904	0.0075	0.0591	0.9220	0.4666	0.3650	0.0600	0.1016	(0.0416)
22	0.1243	0.8069	(1.3100)	0.1809	(1.7772)	0.0419	0.4667	(0.3714)	0.8380
23	0.6909	0.0060	0.2288	0.6541	0.0964	0.8275	2.7074	(0.0133)	2.7207
24	0.4647	0.0011	(0.0304)	0.9586	(0.7274)	0.1496	0.6833	(0.3801)	1.0634
25	0.7633	0.0000	0.5547	0.5317	0.2121	0.7791	(0.0050)	(0.0262)	0.0212
26	0.9711	0.0000	(0.2660)	0.6553	0.3568	0.4979	0.0450	(0.6847)	0.7297
27	0.5103	0.0308	0.4183	0.5360	0.1716	0.7724	0.1900	0.2458	(0.0558)
28	1.1500	0.0000	0.3952	0.3579	(0.3333)	0.3672	0.3740	0.9600	(0.5860)
29	(0.1849)	0.2901	(0.3208)	0.5998	(0.5880)	0.2566	0.0000	(0.0625)	0.0625
30	0.0487	0.8406	0.2789	0.7429	(0.6091)	0.3972	(0.0694)	(0.0834)	0.0139
31	0.7764	0.0000	(0.4634)	0.3982	(0.3081)	0.5050	0.4300	(0.3090)	0.7390
32	0.5103	0.0308	0.4183	0.5360	0.1716	0.7724	0.0000	0.2458	(0.2458)
33	(0.0569)	0.8822	(0.4272)	0.6568	0.7365	0.3801	0.0500	0.1077	(0.0577)
34	(0.0575)	0.8203	(0.4952)	0.3646	0.2823	0.5453	0.7543	(0.0069)	0.7612
35	(0.3760)	0.5252	0.8711	0.2988	0.4762	0.5196	0.0400	0.0924	(0.0524)
36	(0.2487)	0.3759	0.8024	0.1461	0.0296	0.9506	1.3667	0.2764	1.0903
37	0.6904	0.0016	0.5331	0.3830	0.8115	0.1375	0.9850	0.2784	0.7066
38	0.1220	0.4574	(0.3580)	0.3480	0.1225	0.7133	(0.0200)	0.0805	(0.1005)
39	0.2413	0.2757	0.5972	0.1459	0.5646	0.1030	0.1000	(0.0755)	0.1755
40	0.0924	0.6659	(0.4352)	0.2733	(0.0461)	0.8896	0.2240	0.1107	0.1133
41	0.0421	0.7797	(0.1303)	0.6120	(0.0928)	0.6672	(0.2240)	0.0645	(0.2885)
42	0.0790	0.6837	0.5211	0.1191	0.3064	0.2729	1.0643	(0.0739)	1.1382
43	1.0945	0.0055	(0.1444)	0.7865	(0.2948)	0.5092	0.3429	0.2136	0.1293
44	1.3781	0.0000	0.0180	0.9633	0.3062	0.3530	0.6650	(0.0994)	0.7644

45	0.1168	0.7380	(0.3592)	0.4517	0.1800	0.6536	0.0800	0.0180	0.0620
46	0.3311	0.3893	0.5194	0.2502	0.2280	0.5475	3.2200	(0.0433)	3.2633
47	1.2206	0.0000	0.2350	0.2818	0.1792	0.3297	0.2330	0.1464	0.0865
48	1.0645	0.0019	(1.0691)	0.0810	(0.6859)	0.1760	1.3850	(0.4590)	1.8440
49	1.4347	0.0000	(0.5037)	0.2796	(0.7624)	0.0365	0.3357	(0.0380)	0.3738
50	0.4394	0.0532	0.3131	0.4909	(0.2771)	0.4363	2.2800	(0.0277)	2.3077
51	0.7051	0.0004	0.1556	0.6484	(0.4236)	0.1169	0.2867	0.0339	0.2528
52	0.2303	0.3507	(0.2187)	0.6212	(0.1585)	0.6476	1.2571	0.0213	1.2358
53	0.5788	0.0000	0.2126	0.5565	(0.3295)	0.2520	0.2950	0.0602	0.2348
54	1.0380	0.0000	1.2413	0.0016	(0.5518)	0.0595	(0.1359)	(1.0248)	0.8889
55	1.0380	0.0000	1.2413	0.0016	(0.5518)	0.0595	(0.1000)	(1.0248)	0.9248
56	1.0380	0.0000	1.2413	0.0016	(0.5518)	0.0595	(0.3576)	(1.0248)	0.6672
57	0.0907	0.3655	(0.2087)	0.6058	(0.4266)	0.1811	(0.0260)	(0.0154)	(0.0106)
58	1.2412	0.0000	0.2195	0.6555	0.2488	0.4191	0.0350	0.2130	(0.1780)
59	0.6270	0.0043	(0.3359)	0.4089	(0.0160)	0.9451	0.2760	(0.1237)	0.3997
60	0.6270	0.0043	(0.3359)	0.4089	(0.0160)	0.9451	0.0140	(0.1237)	0.1377
61	(0.0146)	0.9231	0.1598	0.6361	0.1268	0.5568	0.5643	(0.0665)	0.6308
Avg.	0.6410	0.2178	0.0762	0.4840	0.0162	0.4762	0.4430	0.0065	0.4365

Table A-4.1.2.7.4: Expected returns of matched firm by 4-F (Equally Weighted)

S#	B1	p	B2	p	B3	p	B4	p	IPO Firm's Return	expected reurn by 4F(EQ)	level of underpricing
1	0.2245	0.0764	0.6207	0.4034	0.0045	0.9908	(0.3601)	0.4050	(0.0050)	(0.1440)	0.1390
2	0.7305	0.2328	(0.3161)	0.8194	0.6204	0.4052	0.4466	0.5801	0.0000	(0.0888)	0.0888
3	0.2120	0.3421	(0.0644)	0.8942	(0.0470)	0.8556	(0.0920)	0.7447	0.0375	0.0370	0.0005
4	1.5202	0.0000	0.0090	0.9803	(0.1091)	0.7520	0.1735	0.6042	0.6750	0.1989	0.4761
5	0.9690	0.0000	(0.5428)	0.3190	0.0854	0.8652	0.1893	0.6983	0.1500	(0.5586)	0.7086
6	0.6177	0.0004	(0.7544)	0.2681	0.3869	0.5330	0.2412	0.6848	(0.1450)	(0.2303)	0.0853
7	1.4344	0.0011	0.5126	0.6756	1.6870	0.1101	(1.2099)	0.2012	0.7750	0.5323	0.2427
8	1.0242	0.0191	0.2308	0.6880	0.8678	0.0802	(0.2687)	0.5382	0.8300	0.1864	0.6436
9	0.3905	0.4508	(0.1912)	0.7682	0.7900	0.1625	(0.2723)	0.5902	0.1500	0.1875	(0.0375)
10	1.3865	0.0002	0.4478	0.5347	0.0323	0.9513	(0.0422)	0.9238	0.7800	1.1654	(0.3854)
11	0.6674	0.0251	0.0565	0.9358	0.2431	0.6870	1.0167	0.0612	0.1800	0.5909	(0.4109)
12	1.7721	0.0020	0.7923	0.5800	(0.9316)	0.3620	(0.4095)	0.6463	0.6266	(0.0536)	0.6802
13	0.3661	0.2953	0.9270	0.0634	0.2832	0.4175	(0.3440)	0.2751	1.1500	(0.2766)	1.4266
14	1.2047	0.0000	(1.2971)	0.0119	0.0250	0.9440	0.1529	0.6217	0.0000	0.5290	(0.5290)
15	1.4308	0.0000	(0.8848)	0.0906	(0.2218)	0.5446	0.0414	0.9006	0.7600	1.6142	(0.8542)
16	(0.2120)	0.6555	1.0398	0.2443	(0.4967)	0.4326	(0.3624)	0.5099	0.0850	(0.3635)	0.4485
17	0.7421	0.0000	0.0578	0.6913	(0.0670)	0.5184	(0.0525)	0.5604	0.9991	(0.0623)	1.0614
18	0.0495	0.9267	0.4437	0.6878	0.0629	0.9359	(1.5216)	0.0299	(0.0250)	0.2035	(0.2285)
19	1.1418	0.0156	(0.3510)	0.6495	1.3245	0.0184	0.7572	0.1181	0.1500	(0.4806)	0.6306
20	1.4101	0.0007	0.4562	0.3788	0.1806	0.6777	(0.5210)	0.1724	(0.0250)	0.0042	(0.0292)
21	1.2748	0.0088	0.1150	0.8522	0.4419	0.3959	(0.2352)	0.6033	0.0600	0.0635	(0.0035)
22	0.1289	0.7992	(1.5063)	0.1286	(1.6822)	0.0538	0.8768	0.2302	0.4667	(0.2278)	0.6945
23	0.6755	0.0080	0.2732	0.6015	0.0725	0.8714	(0.1817)	0.6394	2.7074	(0.0420)	2.7494
24	0.4639	0.0013	(0.0525)	0.9302	(0.7171)	0.1606	0.0964	0.8270	0.6833	(0.3640)	1.0473
25	0.7540	0.0001	0.4962	0.5828	0.2401	0.7534	0.2924	0.6618	(0.0050)	0.0227	(0.0277)
26	1.0029	0.0000	(0.1098)	0.8549	0.3239	0.5350	(0.6344)	0.1633	0.0450	(0.8045)	0.8495
27	0.4865	0.0418	0.3333	0.6281	0.1996	0.7382	0.3803	0.4607	0.1900	0.2974	(0.1074)
28	1.1503	0.0000	0.3812	0.3858	(0.3267)	0.3830	0.0624	0.8475	0.3740	0.9704	(0.5964)
29	(0.1941)	0.2743	(0.3709)	0.5549	(0.5717)	0.2748	0.1883	0.6779	0.0000	(0.0305)	0.0305
30	0.0127	0.9582	0.0845	0.9220	(0.5458)	0.4475	0.7318	0.2434	(0.0694)	0.0409	(0.1103)
31	0.7996	0.0000	(0.3384)	0.5429	(0.3489)	0.4504	(0.4707)	0.2435	0.4300	(0.3889)	0.8189
32	0.4865	0.0418	0.3333	0.6281	0.1996	0.7382	0.3803	0.4607	0.0000	0.2974	(0.2974)
33	(0.0601)	0.8765	(0.3490)	0.7221	0.6983	0.4105	(0.3491)	0.6315	0.0500	0.0517	(0.0017)
34	(0.1299)	0.6076	(0.6347)	0.2441	0.3561	0.4405	0.6896	0.0938	0.7543	0.0816	0.6727
35	(0.3488)	0.5672	0.8932	0.2944	0.4913	0.5120	(0.0962)	0.8274	0.0400	0.1156	(0.0756)
36	(0.2802)	0.3213	0.8643	0.1198	0.0843	0.8605	(0.2960)	0.2912	1.3667	0.3686	0.9981
37	0.6514	0.0032	0.6127	0.3201	0.8622	0.1163	(0.3299)	0.3007	0.9850	0.3406	0.6444
38	0.1383	0.4135	(0.3338)	0.3889	0.1415	0.6758	(0.0942)	0.6386	(0.0200)	0.1047	(0.1247)
39	0.2406	0.2799	0.5125	0.2379	0.6726	0.0855	0.1945	0.5370	0.1000	(0.0958)	0.1958
40	0.0930	0.6658	(0.3625)	0.3889	(0.1387)	0.7116	(0.1667)	0.5859	0.2240	0.1280	0.0960
41	0.0314	0.8375	(0.0863)	0.7523	(0.1476)	0.5454	(0.0993)	0.6208	(0.2240)	0.0690	(0.2930)
42	0.0767	0.6978	0.5303	0.1368	0.2949	0.3507	(0.0209)	0.9358	1.0643	(0.0730)	1.1373
43	1.0964	0.0059	(0.1164)	0.8374	(0.3301)	0.5137	(0.0635)	0.8771	0.3429	0.2203	0.1226
44	1.3496	0.0000	0.1479	0.7200	0.1407	0.7037	(0.2949)	0.3302	0.6650	(0.0680)	0.7330
45	0.0750	0.8302	(0.1680)	0.7376	(0.0636)	0.8873	(0.4339)	0.2392	0.0800	0.0643	0.0157

46	0.2685	0.4868	0.3351	0.4789	0.4576	0.2803	0.4209	0.2280	3.2200	(0.0964)	3.3164
47	1.2504	0.0000	0.3725	0.1011	0.0092	0.9633	(0.3118)	0.0621	0.2330	0.1826	0.0504
48	1.0354	0.0025	(1.2807)	0.0491	(0.4252)	0.4526	0.4673	0.3131	1.3850	(0.4861)	1.8711
49	1.3843	0.0000	(0.7199)	0.1416	(0.6521)	0.0766	0.2813	0.1668	0.3357	0.0026	0.3332
50	0.4147	0.0719	0.1833	0.7082	(0.2257)	0.5353	0.1479	0.4698	2.2800	(0.0044)	2.2844
51	0.7084	0.0004	0.2915	0.4253	(0.4787)	0.0828	(0.1581)	0.2980	0.2867	0.0127	0.2740
52	0.2259	0.3595	(0.3967)	0.4028	(0.0864)	0.8066	0.2071	0.2932	1.2571	0.0491	1.2080
53	0.5913	0.0000	(0.1022)	0.7833	(0.1982)	0.4805	0.3636	0.0211	0.2950	0.1088	0.1862
54	0.8885	0.0000	1.3217	0.0007	(0.5265)	0.0663	(0.3234)	0.0661	(0.1359)	(0.9242)	0.7883
55	0.8885	0.0000	1.3217	0.0007	(0.5265)	0.0663	(0.3234)	0.0661	(0.1000)	(0.9242)	0.8242
56	0.8885	0.0000	1.3217	0.0007	(0.5265)	0.0663	(0.3234)	0.0661	(0.3576)	(0.9242)	0.5666
57	0.1191	0.2139	0.1756	0.6673	(0.5781)	0.0622	(0.4602)	0.0088	(0.0260)	(0.0995)	0.0735
58	1.1546	0.0000	0.1532	0.7527	0.2954	0.3331	0.5170	0.1062	0.0350	0.1393	(0.1043)
59	0.6366	0.0044	(0.3128)	0.4518	(0.0233)	0.9211	(0.0707)	0.7392	0.2760	(0.1236)	0.3996
60	0.6366	0.0044	(0.3128)	0.4518	(0.0233)	0.9211	(0.0707)	0.7392	0.0140	(0.1236)	0.1376
61	(0.0204)	0.8927	0.2023	0.5512	0.1191	0.5802	(0.2281)	0.2734	0.5643	(0.0517)	0.6160
Avg.	0.6251	0.2184	0.0802	0.4945	0.0275	0.5009	(0.0357)	0.4385	0.4430	0.0143	0.4287

Table A-4.1.2.7.3-a: Expected returns of matched firm by 3-FF (Value Weighted)

S#	B1	p	B2	p	B3	p	IPO Firm's Return	expected return by FF(VAL)	level of underpricing
1	0.2182	0.0831	0.3870	0.3169	0.1487	0.5986	(0.0050)	(0.2678)	0.2628
2	0.6791	0.2680	(0.2505)	0.7305	0.2528	0.6366	0.0000	0.0375	(0.0375)
3	0.2298	0.2988	0.0336	0.8933	0.1247	0.4993	0.0375	(0.0405)	0.0780
4	1.4984	0.0000	(0.1161)	0.6950	0.0281	0.9274	0.6750	0.2177	0.4573
5	0.9004	0.0000	(0.9826)	0.0269	(0.0323)	0.9416	0.1500	(0.5991)	0.7491
6	0.6094	0.0006	(0.5650)	0.3161	0.2677	0.6366	(0.1450)	(0.2000)	0.0550
7	1.5323	0.0005	0.5130	0.5748	0.9605	0.3623	0.7750	0.6836	0.0914
8	1.0351	0.0185	0.2687	0.5265	0.3613	0.4649	0.8300	0.0122	0.8178
9	0.5277	0.2875	(0.3510)	0.4571	0.6498	0.2374	0.1500	0.3739	(0.2239)
10	1.5312	0.0002	0.5939	0.3738	(0.1274)	0.8091	0.7800	1.0427	(0.2627)
11	0.5797	0.0488	(0.0270)	0.9586	0.7871	0.2052	0.1800	0.3042	(0.1242)
12	1.7427	0.0022	0.2107	0.8564	(0.4020)	0.6792	0.6266	0.0414	0.5851
13	0.2946	0.3895	0.5256	0.1937	0.2453	0.4682	1.1500	(0.2238)	1.3738
14	1.2502	0.0000	(1.1821)	0.0041	0.1410	0.6716	0.0000	0.6302	(0.6302)
15	1.4125	0.0000	(0.5376)	0.2008	(0.2519)	0.4744	0.7600	1.4820	(0.7220)
16	(0.2454)	0.6049	0.8692	0.2289	(0.5088)	0.3983	0.0850	(0.4942)	0.5792
17	0.7394	0.0000	0.0328	0.7782	(0.1047)	0.2888	0.9991	(0.0737)	1.0728
18	0.2188	0.6967	(0.6885)	0.4589	(0.1416)	0.8552	(0.0250)	0.4286	(0.4536)
19	1.0839	0.0248	(0.3271)	0.6118	1.0960	0.0462	0.1500	(0.1593)	0.3093
20	1.4903	0.0006	(0.0831)	0.8235	0.0640	0.8225	(0.0250)	0.0324	(0.0574)
21	1.2636	0.0107	(0.0646)	0.8826	0.2202	0.5115	0.0600	0.0500	0.0100
22	0.4392	0.3720	(1.4576)	0.0384	(1.0967)	0.0407	0.4667	(0.0094)	0.4761
23	0.6844	0.0058	0.0949	0.7948	(0.1029)	0.7114	2.7074	(0.0639)	2.7712
24	0.4605	0.0011	(0.5232)	0.2128	(0.3378)	0.2888	0.6833	(0.2887)	0.9721
25	0.7542	0.0000	0.6813	0.2830	0.1459	0.7605	(0.0050)	(0.1021)	0.0971
26	0.9583	0.0000	(0.2182)	0.6103	0.0152	0.9638	0.0450	(0.7047)	0.7497
27	0.4729	0.0453	0.1433	0.7687	(0.1277)	0.7348	0.1900	0.1492	0.0408
28	1.1375	0.0000	0.3004	0.3335	(0.1685)	0.4722	0.3740	0.9419	(0.5679)
29	(0.1618)	0.3496	0.1413	0.7437	(0.3817)	0.2537	0.0000	0.0010	(0.0010)
30	0.0131	0.9555	0.4452	0.4496	(0.7000)	0.1255	(0.0694)	(0.0991)	0.0296
31	0.7932	0.0000	(0.1657)	0.6694	(0.2387)	0.4253	0.4300	(0.2520)	0.6820
32	0.4729	0.0453	0.1433	0.7687	(0.1277)	0.7348	0.0000	0.1492	(0.1492)
33	(0.0927)	0.8112	(0.4632)	0.5051	(0.0584)	0.9132	0.0500	0.0337	0.0163
34	(0.0050)	0.9848	(0.2014)	0.6127	0.2515	0.4072	0.7543	0.0443	0.7100
35	(0.3027)	0.6091	0.4644	0.4942	0.2216	0.7742	0.0400	0.0084	0.0316
36	(0.3003)	0.2679	0.8143	0.0594	0.5836	0.2320	1.3667	0.4612	0.9054
37	0.6868	0.0016	0.3346	0.4959	0.8892	0.1193	0.9850	0.2687	0.7163
38	0.1124	0.4974	(0.2775)	0.3705	0.1694	0.6283	(0.0200)	0.0946	(0.1146)
39	0.2144	0.3348	0.5884	0.1353	0.5259	0.1250	0.1000	(0.0769)	0.1769
40	0.0754	0.7256	0.1177	0.7558	0.3544	0.2840	0.2240	(0.0567)	0.2807
41	0.0386	0.7979	0.0270	0.9128	0.0038	0.9856	(0.2240)	0.0259	(0.2499)
42	0.1000	0.6061	0.4014	0.2080	0.3937	0.1548	1.0643	(0.0648)	1.1291
43	1.0874	0.0055	(0.1738)	0.7325	(0.2605)	0.5539	0.3429	0.2164	0.1264
44	1.3532	0.0000	0.1354	0.7169	0.3249	0.3170	0.6650	(0.1296)	0.7946
45	0.0978	0.7772	(0.4371)	0.3354	0.2742	0.4846	0.0800	(0.0308)	0.1108

46	0.3121	0.4184	0.4755	0.2713	(0.0515)	0.8905	3.2200	0.0411	3.1789
47	1.1958	0.0000	0.3069	0.1352	0.3184	0.0747	0.2330	0.1054	0.1276
48	1.0691	0.0022	(0.8007)	0.1779	(0.3428)	0.4981	1.3850	(0.5847)	1.9697
49	1.4159	0.0000	(0.7596)	0.0529	(0.8517)	0.0240	0.3357	(0.1504)	0.4862
50	0.4576	0.0462	0.1417	0.7189	(0.4049)	0.2839	2.2800	(0.0057)	2.2857
51	0.6692	0.0007	0.4392	0.1333	(0.3434)	0.2192	0.2867	0.0790	0.2077
52	0.2444	0.3222	(0.2887)	0.4500	(0.0007)	0.9985	1.2571	(0.0338)	1.2909
53	0.5883	0.0000	(0.0712)	0.8189	(0.4994)	0.1012	0.2950	0.0580	0.2370
54	0.8900	0.0000	1.1284	0.0006	(0.1401)	0.6450	(0.1359)	(0.7545)	0.6187
55	0.8900	0.0000	1.1284	0.0006	(0.1401)	0.6450	(0.1000)	(0.7545)	0.6545
56	0.8900	0.0000	1.1284	0.0006	(0.1401)	0.6450	(0.3576)	(0.7545)	0.3969
57	0.0983	0.2971	0.9336	0.0062	0.4389	0.1710	(0.0260)	0.0281	(0.0541)
58	1.2239	0.0000	0.4276	0.2014	0.4083	0.1431	0.0350	0.1577	(0.1227)
59	0.5205	0.0276	(0.3972)	0.2227	0.0246	0.9053	0.2760	(0.1280)	0.4040
60	0.5205	0.0276	(0.3972)	0.2227	0.0246	0.9053	0.0140	(0.1280)	0.1420
61	(0.0128)	0.9311	0.2121	0.3606	0.2114	0.2785	0.5643	(0.0796)	0.6439
Avg.	0.6337	0.2131	0.0456	0.4375	0.0466	0.4992	0.4430	0.0146	0.4284

Table A-4.1.2.7.4-b: Expected returns of matched firm by 4-F (Value Weighted)

S#	B1	p	B2	p	B3	p	B4	p	IPO Firm's Return	expected return by 4F(VAL)	level of underpricing
1	0.1925	0.1272	0.8365	0.1065	(0.0959)	0.7754	(0.4232)	0.1903	(0.0050)	(0.3766)	0.3716
2	0.6773	0.2735	(0.1272)	0.8954	0.1821	0.7795	(0.1189)	0.8454	0.0000	0.0076	(0.0076)
3	0.2023	0.3676	0.2045	0.5410	0.0250	0.9116	(0.1652)	0.4383	0.0375	(0.0797)	0.1172
4	1.5100	0.0000	(0.1298)	0.6645	0.0112	0.9714	0.1776	0.5942	0.6750	0.1729	0.5021
5	0.9073	0.0000	(0.9922)	0.0269	(0.0451)	0.9193	0.1778	0.7046	0.1500	(0.6483)	0.7983
6	0.6093	0.0006	(0.5818)	0.3081	0.2510	0.6617	0.1899	0.7502	(0.1450)	(0.2504)	0.1054
7	1.3977	0.0017	0.2713	0.7700	1.5605	0.1770	(1.1940)	0.2068	0.7750	0.3869	0.3881
8	1.0273	0.0207	0.2421	0.5830	0.4125	0.4448	(0.1082)	0.8037	0.8300	(0.0087)	0.8387
9	0.4657	0.3618	(0.4145)	0.3962	0.7800	0.1943	(0.2776)	0.5731	0.1500	0.3235	(0.1735)
10	1.5616	0.0004	0.6106	0.3678	(0.0971)	0.8596	(0.0996)	0.8234	0.7800	1.0236	(0.2436)
11	0.6746	0.0212	0.2322	0.6572	0.3339	0.6040	1.0350	0.0510	0.1800	0.5140	(0.3340)
12	1.7216	0.0028	0.2562	0.8284	(0.3806)	0.6983	(0.2968)	0.7398	0.6266	0.0920	0.5346
13	0.3820	0.2796	0.5798	0.1557	0.2600	0.4423	(0.3228)	0.3060	1.1500	(0.1534)	1.3034
14	1.2544	0.0000	(1.2013)	0.0042	0.1327	0.6926	0.1113	0.7132	0.0000	0.6115	(0.6115)
15	1.4080	0.0000	(0.5413)	0.2048	(0.2546)	0.4760	0.0250	0.9399	0.7600	1.4736	(0.7136)
16	(0.2560)	0.5923	0.9180	0.2110	(0.4878)	0.4220	(0.2833)	0.6043	0.0850	(0.4466)	0.5316
17	0.7389	0.0000	0.0395	0.7383	(0.1020)	0.3058	(0.0405)	0.6495	0.9991	(0.0667)	1.0658
18	0.0930	0.8653	(0.4257)	0.6400	(0.0216)	0.9771	(1.4211)	0.0410	(0.0250)	0.6278	(0.6528)
19	1.1362	0.0185	(0.4293)	0.5059	1.0456	0.0558	0.6451	0.1876	0.1500	(0.2909)	0.4409
20	1.4642	0.0007	0.0503	0.8964	0.0011	0.9969	(0.4917)	0.2215	(0.0250)	(0.0597)	0.0347
21	1.2534	0.0120	(0.0127)	0.9780	0.1958	0.5685	(0.1914)	0.6870	0.0600	0.0142	0.0458
22	0.4642	0.3419	(1.7358)	0.0176	(0.9522)	0.0772	1.0511	0.1636	0.4667	0.1936	0.2730
23	0.6653	0.0080	0.1592	0.6775	(0.1372)	0.6314	(0.2413)	0.5518	2.7074	(0.1078)	2.8152
24	0.4586	0.0013	(0.5812)	0.1871	(0.3080)	0.3455	0.2197	0.6324	0.6833	(0.2465)	0.9298
25	0.7496	0.0001	0.6313	0.3407	0.1716	0.7266	0.1995	0.7735	(0.0050)	(0.0643)	0.0593
26	0.9845	0.0000	(0.0433)	0.9221	(0.0558)	0.8680	(0.6556)	0.1672	0.0450	(0.8449)	0.8899
27	0.4566	0.0552	0.0457	0.9284	(0.0811)	0.8329	0.3804	0.4797	0.1900	0.2142	(0.0242)
28	1.1373	0.0000	0.3035	0.3527	(0.1701)	0.4804	(0.0114)	0.9733	0.3740	0.9396	(0.5656)
29	(0.1628)	0.3534	0.1336	0.7692	(0.3784)	0.2689	0.0278	0.9533	0.0000	0.0064	(0.0064)
30	(0.0058)	0.9805	0.3036	0.6220	(0.6383)	0.1691	0.5119	0.4254	(0.0694)	0.0015	(0.0710)
31	0.8145	0.0000	(0.0064)	0.9873	(0.3082)	0.3072	(0.5763)	0.1718	0.4300	(0.3653)	0.7953
32	0.4566	0.0552	0.0457	0.9284	(0.0811)	0.8329	0.3804	0.4797	0.0000	0.2142	(0.2142)
33	(0.1050)	0.7887	(0.3689)	0.6126	(0.1096)	0.8423	(0.3549)	0.6431	0.0500	(0.0302)	0.0802
34	(0.0501)	0.8464	(0.3935)	0.3298	0.3476	0.2498	0.7844	0.0650	0.7543	0.1742	0.5801
35	(0.3031)	0.6201	0.4644	0.4982	0.2219	0.7776	0.0012	0.9978	0.0400	0.0083	0.0317
36	(0.3241)	0.2380	0.8017	0.0648	0.5424	0.2719	(0.1908)	0.4853	1.3667	0.5025	0.8642
37	0.6622	0.0030	0.3274	0.5079	0.8400	0.1479	(0.1779)	0.5777	0.9850	0.2803	0.7047
38	0.1286	0.4493	(0.2798)	0.3700	0.1481	0.6763	(0.0995)	0.6180	(0.0200)	0.1079	(0.1279)
39	0.2033	0.3617	0.5144	0.2006	0.7367	0.0771	0.2987	0.3634	0.1000	(0.1450)	0.2450
40	0.0794	0.7145	0.1440	0.7119	0.2796	0.4870	(0.1060)	0.7404	0.2240	(0.0325)	0.2565
41	0.0272	0.8590	0.0541	0.8307	(0.0740)	0.7762	(0.1108)	0.5973	(0.2240)	0.0435	(0.2675)
42	0.1173	0.5515	0.3600	0.2706	0.5122	0.1295	0.1687	0.5314	1.0643	(0.0916)	1.1559
43	1.0862	0.0060	(0.1538)	0.7689	(0.3169)	0.5545	(0.0805)	0.8509	0.3429	0.2333	0.1095
44	1.3406	0.0000	0.2119	0.5790	0.1110	0.7763	(0.3056)	0.3305	0.6650	(0.0646)	0.7296
45	0.0824	0.8118	(0.3442)	0.4572	0.0145	0.9755	(0.3710)	0.3293	0.0800	0.0482	0.0318

46	0.2748	0.4794	0.3941	0.3724	0.1713	0.7040	0.3232	0.3744	3.2200	(0.0328)	3.2528
47	1.2215	0.0000	0.3576	0.0875	0.1674	0.4334	(0.2136)	0.2161	0.2330	0.1553	0.0777
48	1.0337	0.0031	(0.9386)	0.1238	0.0208	0.9729	0.5149	0.2951	1.3850	(0.6693)	2.0543
49	1.3829	0.0000	(0.7058)	0.0799	(0.7341)	0.0815	0.1240	0.5310	0.3357	(0.1292)	0.4649
50	0.4305	0.0628	0.2027	0.6124	(0.2388)	0.5687	0.1787	0.3634	2.2800	0.0226	2.2574
51	0.6714	0.0007	0.4042	0.1758	(0.4297)	0.1683	(0.0934)	0.5177	0.2867	0.0656	0.2210
52	0.2401	0.3310	(0.2212)	0.5692	0.1658	0.6827	0.1801	0.3420	1.2571	(0.0081)	1.2652
53	0.5901	0.0000	0.0573	0.8505	(0.1788)	0.5773	0.3463	0.0225	0.2950	0.1071	0.1879
54	0.9066	0.0000	1.1534	0.0020	(0.1284)	0.6856	0.0299	0.8855	(0.1359)	(0.7645)	0.6287
55	0.9066	0.0000	1.1534	0.0020	(0.1284)	0.6856	0.0299	0.8855	(0.1000)	(0.7645)	0.6645
56	0.9066	0.0000	1.1534	0.0020	(0.1284)	0.6856	0.0299	0.8855	(0.3576)	(0.7645)	0.4069
57	0.1238	0.1890	0.8275	0.0147	0.1910	0.5802	(0.2769)	0.0930	(0.0260)	(0.0317)	0.0057
58	1.1413	0.0000	0.3413	0.3060	0.4604	0.0972	0.5048	0.1097	0.0350	0.0790	(0.0440)
59	0.5270	0.0319	(0.3858)	0.2623	0.0209	0.9214	(0.0245)	0.9107	0.2760	(0.1283)	0.4043
60	0.5270	0.0319	(0.3858)	0.2623	0.0209	0.9214	(0.0245)	0.9107	0.0140	(0.1283)	0.1423
61	(0.0170)	0.9081	0.2632	0.2638	0.1948	0.3169	(0.2462)	0.2362	0.5643	(0.0561)	0.6204
	0.6271	**0.2136**	**0.0598**	**0.4492**	**0.0569**	**0.5623**	**(0.0155)**	**0.5172**	**0.4430**	**0.0130**	**0.4299**

Table A-4.2.2-1: Analysis of Cumulative Abnormal Returns (Monthly)

s#	Variable	CARs	T	P values	s#	Variable	CARs	T	P values
1	mCAR_1	-0.0245	-.708	0.4815	19	mCAR_19	-0.2108***	-1.990	0.0512
2	mCAR_2	-0.0335	-.710	0.4807	20	mCAR_20	-0.2078***	-1.974	0.0530
3	mCAR_3	-0.0291	-.465	0.6438	21	mCAR_21	-0.2318**	-2.184	0.0329
4	mCAR_4	-0.0522	-.807	0.4228	22	mCAR_22	-0.2285**	-2.144	0.0361
5	mCAR_5	-0.0475	-.689	0.4938	23	mCAR_23	-0.2129***	-1.908	0.0612
6	mCAR_6	-0.0400	-.562	0.5761	24	mCAR_24	-0.2184**	-1.993	0.0508
7	mCAR_7	-0.0775	-1.037	0.3040	25	mCAR_25	-0.2619**	-2.449	0.0173
8	mCAR_8	-0.1103	-1.480	0.1441	26	mCAR_26	-0.2642**	-2.357	0.0217
9	mCAR_9	-0.1181	-1.467	0.1477	27	mCAR_27	-0.2737**	-2.444	0.0175
10	mCAR_10	-0.1229	-1.491	0.1413	28	mCAR_28	-0.2736**	-2.327	0.0234
11	mCAR_11	-0.1202	-1.395	0.1681	29	mCAR_29	-0.2742**	-2.271	0.0267
12	mCAR_12	-0.1240	-1.343	0.1844	30	mCAR_30	-0.2791**	-2.245	0.0284
13	mCAR_13	-0.1384	-1.465	0.1482	31	mCAR_31	-0.3364*	-2.735	0.0082
14	mCAR_14	-0.1493	-1.567	0.1223	32	mCAR_32	-0.3399*	-2.704	0.0089
15	mCAR_15	-0.1926***	-1.955	0.0552	33	mCAR_33	-0.3612*	-2.945	0.0046
16	mCAR_16	-0.2142**	-2.188	0.0325	34	mCAR_34	-0.3667*	-2.925	0.0049
17	mCAR_17	-0.1867***	-1.868	0.0667	35	mCAR_35	-0.3836*	-3.014	0.0038
18	mCAR_18	-0.1944***	-1.921	0.0595	36	mCAR_36	-0.4145*	-3.307	0.0016

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.2.2-2: Analysis of Cumulative Abnormal Returns (fortnightly)

s#	Variable	CARs	t	P values	s#	Variable	CARs	t	P values
1	fCAR_1	-0.0137	-.556	0.5800	37	fCAR_37	-0.2198**	-2.336	0.0228
2	fCAR_2	-0.0309	-.979	0.3316	38	fCAR_38	-0.2240**	-2.334	0.0230
3	fCAR_3	-0.0457	-1.290	0.2021	39	fCAR_39	-0.2126**	-2.217	0.0304
4	fCAR_4	-0.0422	-1.012	0.3156	40	fCAR_40	-0.2198**	-2.308	0.0244
5	fCAR_5	-0.0508	-1.201	0.2344	41	fCAR_41	-0.2263**	-2.390	0.0200
6	fCAR_6	-0.0544	-1.085	0.2821	42	fCAR_42	-0.2419**	-2.502	0.0151
7	fCAR_7	-0.0530	-1.021	0.3114	43	fCAR_43	-0.2361**	-2.486	0.0157
8	fCAR_8	-0.0758	-1.429	0.1581	44	fCAR_44	-0.2385**	-2.451	0.0172
9	fCAR_9	-0.0601	-1.047	0.2992	45	fCAR_45	-0.2397**	-2.368	0.0211
10	fCAR_10	-0.0720	-1.234	0.2222	46	fCAR_46	-0.2240**	-2.191	0.0324
11	fCAR_11	-0.0655	-1.076	0.2862	47	fCAR_47	-0.2299**	-2.256	0.0278
12	fCAR_12	-0.0685	-1.103	0.2743	48	fCAR_48	-0.2309**	-2.298	0.0250
13	fCAR_13	-0.0878	-1.434	0.1569	49	fCAR_49	-0.2597**	-2.598	0.0118
14	fCAR_14	-0.1068	-1.628	0.1087	50	fCAR_50	-0.2755*	-2.811	0.0067
15	fCAR_15	-0.1235***	-1.872	0.0661	51	fCAR_51	-0.2780*	-2.743	0.0080
16	fCAR_16	-0.1355	-2.053	0.0444	52	fCAR_52	-0.2789*	-2.706	0.0089
17	fCAR_17	-0.1283	-1.925	0.0590	53	fCAR_53	-0.2785*	-2.665	0.0099
18	fCAR_18	-0.1395	-1.953	0.0555	54	fCAR_54	-0.2872*	-2.784	0.0072
19	fCAR_19	-0.1363	-1.875	0.0656	55	fCAR_55	-0.3006*	-2.851	0.0060
20	fCAR_20	-0.1454**	-1.970	0.0535	56	fCAR_56	-0.2888**	-2.655	0.0101
21	fCAR_21	-0.1434***	-1.834	0.0716	57	fCAR_57	-0.2883**	-2.610	0.0114
22	fCAR_22	-0.1421***	-1.825	0.0729	58	fCAR_58	-0.2887**	-2.586	0.0122
23	fCAR_23	-0.1596**	-1.970	0.0535	59	fCAR_59	-0.2925**	-2.549	0.0134
24	fCAR_24	-0.1473***	-1.768	0.0821	60	fCAR_60	-0.2905**	-2.506	0.0149
25	fCAR_25	-0.1647**	-2.005	0.0495	61	fCAR_61	-0.3260*	-2.839	0.0062
26	fCAR_26	-0.1599***	-1.882	0.0646	62	fCAR_62	-0.3449*	-3.014	0.0038
27	fCAR_27	-0.1606***	-1.883	0.0646	63	fCAR_63	-0.3555*	-3.159	0.0025
28	fCAR_28	-0.1725**	-2.016	0.0483	64	fCAR_64	-0.3433*	-2.924	0.0049
29	fCAR_29	-0.1783**	-2.065	0.0432	65	fCAR_65	-0.3573*	-3.116	0.0028
30	fCAR_30	-0.2145**	-2.437	0.0178	66	fCAR_66	-0.3642*	-3.176	0.0024
31	fCAR_31	-0.2232**	-2.534	0.0139	67	fCAR_67	-0.3964*	-3.473	0.0010
32	fCAR_32	-0.2348*	-2.675	0.0096	68	fCAR_68	-0.3703*	-3.180	0.0023
33	fCAR_33	-0.2344**	-2.616	0.0112	69	fCAR_69	-0.3789*	-3.214	0.0021
34	fCAR_34	-0.2023**	-2.263	0.0273	70	fCAR_70	-0.3899*	-3.267	0.0018
35	fCAR_35	-0.2087**	-2.304	0.0247	71	fCAR_71	-0.4316*	-3.760	0.0004
36	fCAR_36	-0.2087**	-2.295	0.0253	72	fCAR_72	-0.4181*	-3.560	0.0007

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.2.2-3: Analysis of Cumulative Abnormal Returns (weekly)

S#	Variable	CARs	T	P values	S#	Variable	CARs	t	P values
1	wCAR_1	-0.0149	-.865	0.3903	73	wCAR_73	-0.2146**	-2.487	0.0157
2	wCAR_2	-0.0126	-.526	0.6010	74	wCAR_74	-0.2124**	-2.365	0.0213
3	wCAR_3	-0.0213	-.702	0.4854	75	wCAR_75	-0.2107**	-2.345	0.0224
4	wCAR_4	-0.0254	-.841	0.4036	76	wCAR_76	-0.2165**	-2.368	0.0211
5	wCAR_5	-0.0232	-.726	0.4708	77	wCAR_77	-0.2199**	-2.416	0.0187
6	wCAR_6	-0.0398	-1.177	0.2438	78	wCAR_78	-0.1956**	-2.128	0.0374
7	wCAR_7	-0.0515	-1.433	0.1572	79	wCAR_79	-0.2083**	-2.211	0.0308
8	wCAR_8	-0.0381	-.979	0.3316	80	wCAR_80	-0.2045**	-2.234	0.0292
9	wCAR_9	-0.0311	-.805	0.4240	81	wCAR_81	-0.2070**	-2.211	0.0309
10	wCAR_10	-0.0491	-1.257	0.2136	82	wCAR_82	-0.2088**	-2.279	0.0262
11	wCAR_11	-0.0627	-1.505	0.1377	83	wCAR_83	-0.2045**	-2.148	0.0357
12	wCAR_12	-0.0558	-1.232	0.2228	84	wCAR_84	-0.2197**	-2.329	0.0233
13	wCAR_13	-0.0604	-1.293	0.2009	85	wCAR_85	-0.2231**	-2.393	0.0199
14	wCAR_14	-0.0539	-1.130	0.2631	86	wCAR_86	-0.2106**	-2.278	0.0263
15	wCAR_15	-0.0654	-1.372	0.1752	87	wCAR_87	-0.2045**	-2.176	0.0335
16	wCAR_16	-0.0751	-1.544	0.1280	88	wCAR_88	-0.2138**	-2.266	0.0271
17	wCAR_17	-0.0513	-1.003	0.3200	89	wCAR_89	-0.2182**	-2.258	0.0276
18	wCAR_18	-0.0598	-1.126	0.2648	90	wCAR_90	-0.2169**	-2.222	0.0301
19	wCAR_19	-0.0732	-1.357	0.1800	91	wCAR_91	-0.2063**	-2.071	0.0427
20	wCAR_20	-0.0734	-1.367	0.1766	92	wCAR_92	-0.2016**	-2.019	0.0480
21	wCAR_21	-0.0790	-1.449	0.1525	93	wCAR_93	-0.2008**	-2.018	0.0481
22	wCAR_22	-0.0692	-1.214	0.2296	94	wCAR_94	-0.2056**	-2.074	0.0424
23	wCAR_23	-0.0797	-1.380	0.1726	95	wCAR_95	-0.2072**	-2.067	0.0430
24	wCAR_24	-0.0725	-1.253	0.2152	96	wCAR_96	-0.2081**	-2.139	0.0365
25	wCAR_25	-0.0831	-1.426	0.1591	97	wCAR_97	-0.2341**	-2.414	0.0188
26	wCAR_26	-0.0909	-1.578	0.1198	98	wCAR_98	-0.2362**	-2.432	0.0180
27	wCAR_27	-0.0912	-1.501	0.1387	99	wCAR_99	-0.2392**	-2.469	0.0164
28	wCAR_28	-0.1105***	-1.782	0.0798	100	wCAR_100	-0.2518*	-2.634	0.0107
29	wCAR_29	-0.1226***	-1.950	0.0558	101	wCAR_101	-0.2553*	-2.655	0.0101
30	wCAR_30	-0.1229***	-1.967	0.0538	102	wCAR_102	-0.2541*	-2.588	0.0121
31	wCAR_31	-0.1294**	-2.119	0.0382	103	wCAR_103	-0.2573*	-2.575	0.0125
32	wCAR_32	-0.1355**	-2.173	0.0338	104	wCAR_104	-0.2555*	-2.571	0.0126
33	wCAR_33	-0.1393**	-2.241	0.0287	105	wCAR_105	-0.2489**	-2.481	0.0159
34	wCAR_34	-0.1285**	-2.044	0.0454	106	wCAR_106	-0.2544*	-2.534	0.0139
35	wCAR_35	-0.1329**	-2.123	0.0379	107	wCAR_107	-0.2549*	-2.542	0.0136
36	wCAR_36	-0.1388**	-2.081	0.0418	108	wCAR_108	-0.2628*	-2.645	0.0104
37	wCAR_37	-0.1473**	-2.203	0.0315	109	wCAR_109	-0.2686*	-2.669	0.0098
38	wCAR_38	-0.1368**	-2.018	0.0480	110	wCAR_110	-0.2738*	-2.684	0.0094
39	wCAR_39	-0.1420**	-2.088	0.0411	111	wCAR_111	-0.2678*	-2.659	0.0100

40	wCAR_40	-0.1458**	-2.116	0.0385	112	wCAR_112	-0.2603**	-2.488	0.0156
41	wCAR_41	-0.1383***	-1.935	0.0577	113	wCAR_113	-0.2575**	-2.472	0.0163
42	wCAR_42	-0.1420***	-1.936	0.0576	114	wCAR_114	-0.2589**	-2.437	0.0178
43	wCAR_43	-0.1268***	-1.765	0.0827	115	wCAR_115	-0.2547**	-2.392	0.0199
44	wCAR_44	-0.1405***	-1.912	0.0606	116	wCAR_116	-0.2591**	-2.394	0.0198
45	wCAR_45	-0.1545**	-2.099	0.0400	117	wCAR_117	-0.2633**	-2.374	0.0208
46	wCAR_46	-0.1583**	-2.077	0.0421	118	wCAR_118	-0.2622**	-2.354	0.0219
47	wCAR_47	-0.1489***	-1.916	0.0601	119	wCAR_119	-0.2662**	-2.367	0.0212
48	wCAR_48	-0.1471***	-1.873	0.0659	120	wCAR_120	-0.2602**	-2.310	0.0243
49	wCAR_49	-0.1554**	-2.036	0.0461	121	wCAR_121	-0.2872*	-2.553	0.0132
50	wCAR_50	-0.1635**	-2.123	0.0379	122	wCAR_122	-0.2976*	-2.678	0.0095
51	wCAR_51	-0.1471***	-1.883	0.0645	123	wCAR_123	-0.3087*	-2.787	0.0071
52	wCAR_52	-0.1593**	-1.990	0.0511	124	wCAR_124	-0.3152*	-2.838	0.0062
53	wCAR_53	-0.1548***	-1.905	0.0615	125	wCAR_125	-0.3219*	-2.913	0.0050
54	wCAR_54	-0.1602***	-1.989	0.0512	126	wCAR_126	-0.3261*	-2.985	0.0041
55	wCAR_55	-0.1754**	-2.192	0.0323	127	wCAR_127	-0.3174*	-2.853	0.0059
56	wCAR_56	-0.1741**	-2.173	0.0337	128	wCAR_128	-0.3133*	-2.755	0.0078
57	wCAR_57	-0.1900**	-2.332	0.0231	129	wCAR_129	-0.3351*	-3.026	0.0036
58	wCAR_58	-0.1798**	-2.228	0.0296	130	wCAR_130	-0.3266*	-2.929	0.0048
59	wCAR_59	-0.1948**	-2.366	0.0212	131	wCAR_131	-0.3426*	-3.056	0.0033
60	wCAR_60	-0.2170*	-2.642	0.0105	132	wCAR_132	-0.3312*	-2.965	0.0043
61	wCAR_61	-0.2237*	-2.752	0.0078	133	wCAR_133	-0.3538*	-3.211	0.0021
62	wCAR_62	-0.2178*	-2.615	0.0113	134	wCAR_134	-0.3630*	-3.256	0.0019
63	wCAR_63	-0.2365*	-2.897	0.0052	135	wCAR_135	-0.3536*	-3.134	0.0027
64	wCAR_64	-0.2284*	-2.752	0.0078	136	wCAR_136	-0.3360*	-2.955	0.0045
65	wCAR_65	-0.2289*	-2.758	0.0077	137	wCAR_137	-0.3489*	-2.996	0.0040
66	wCAR_66	-0.2292*	-2.696	0.0091	138	wCAR_138	-0.3437*	-2.972	0.0043
67	wCAR_67	-0.2152*	-2.579	0.0124	139	wCAR_139	-0.3502*	-2.995	0.0040
68	wCAR_68	-0.1968**	-2.329	0.0232	140	wCAR_140	-0.3555*	-3.023	0.0037
69	wCAR_69	-0.2036**	-2.406	0.0192	141	wCAR_141	-0.3773*	-3.270	0.0018
70	wCAR_70	-0.2032**	-2.381	0.0204	142	wCAR_142	-0.3986*	-3.542	0.0008
71	wCAR_71	-0.1992**	-2.329	0.0232	143	wCAR_143	-0.3992*	-3.456	0.0010
72	wCAR_72	-0.2022**	-2.346	0.0223	144	wCAR_144	-0.3829*	-3.328	0.0015

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.2.3-1: Analysis of Buy & Hold Abnormal Returns (monthly)

s#	Variable	BHARs	t	P values	s#	Variable	BHARs	t	P values
1	mBHAR_1	-0.0245	-.708	0.4815	19	mBHAR_19	-0.1950***	-1.717	0.0911
2	mBHAR_2	-0.0124	-.180	0.8581	20	mBHAR_20	-0.2215***	-1.916	0.0601
3	mBHAR_3	-0.0095	-.129	0.8978	21	mBHAR_21	-0.2581**	-2.332	0.0231
4	mBHAR_4	-0.0234	-.305	0.7614	22	mBHAR_22	-0.2556**	-2.315	0.0240
5	mBHAR_5	-0.0237	-.313	0.7552	23	mBHAR_23	-0.2535**	-2.312	0.0242
6	mBHAR_6	-0.0154	-.204	0.8388	24	mBHAR_24	-0.2498**	-2.291	0.0255
7	mBHAR_7	-0.0613	-.715	0.4776	25	mBHAR_25	-0.3242*	-2.977	0.0042
8	mBHAR_8	-0.1010	-1.219	0.2275	26	mBHAR_26	-0.3096*	-2.558	0.0131
9	mBHAR_9	-0.1185	-1.386	0.1708	27	mBHAR_27	-0.3299**	-2.895	0.0053
10	mBHAR_10	-0.1114	-1.182	0.2418	28	mBHAR_28	-0.2643***	-1.850	0.0693
11	mBHAR_11	-0.0836	-.743	0.4606	29	mBHAR_29	-0.2706***	-1.672	0.0998
12	mBHAR_12	-0.0797	-.740	0.4621	30	mBHAR_30	-0.2028	-.977	0.3325
13	mBHAR_13	-0.0894	-.828	0.4109	31	mBHAR_31	-0.3360**	-2.139	0.0365
14	mBHAR_14	-0.1049	-.967	0.3373	32	mBHAR_32	-0.3187***	-1.795	0.0778
15	mBHAR_15	-0.1642	-1.472	0.1463	33	mBHAR_33	-0.4060**	-2.503	0.0151
16	mBHAR_16	-0.2005***	-1.815	0.0745	34	mBHAR_34	-0.3779**	-2.279	0.0263
17	mBHAR_17	-0.1860***	-1.689	0.0964	35	mBHAR_35	-0.4022**	-2.374	0.0208
18	mBHAR_18	-0.1863***	-1.698	0.0947	36	mBHAR_36	-0.4266*	-2.604	0.0116

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.2.3-2: Analysis of Buy & Hold Abnormal Returns (fortnightly)

s#	Variable	BHARs	t	P values	s#	Variable	BHARs	t	P values
1	fBHAR_1	-0.0137	-.556	0.5800	37	fBHAR_37	-0.2014***	-1.858	0.0681
2	fBHAR_2	-0.0245	-.708	0.4815	38	fBHAR_38	-0.1950***	-1.717	0.0911
3	fBHAR_3	-0.0352	-.814	0.4187	39	fBHAR_39	-0.1912	-1.644	0.1055
4	fBHAR_4	-0.0124	-.180	0.8581	40	fBHAR_40	-0.2215***	-1.916	0.0601
5	fBHAR_5	-0.0272	-.440	0.6618	41	fBHAR_41	-0.2426**	-2.182	0.0330
6	fBHAR_6	-0.0095	-.129	0.8978	42	fBHAR_42	-0.2581**	-2.332	0.0231
7	fBHAR_7	-0.0037	-.049	0.9612	43	fBHAR_43	-0.2651**	-2.440	0.0177
8	fBHAR_8	-0.0234	-.305	0.7614	44	fBHAR_44	-0.2556**	-2.315	0.0240
9	fBHAR_9	0.0045	.052	0.9583	45	fBHAR_45	-0.2647**	-2.427	0.0183
10	fBHAR_10	-0.0237	-.313	0.7552	46	fBHAR_46	-0.2535**	-2.312	0.0242
11	fBHAR_11	-0.0166	-.228	0.8208	47	fBHAR_47	-0.2289***	-1.954	0.0553
12	fBHAR_12	-0.0154	-.204	0.8388	48	fBHAR_48	-0.2498**	-2.291	0.0255
13	fBHAR_13	-0.0513	-.682	0.4976	49	fBHAR_49	-0.2867*	-2.596	0.0118
14	fBHAR_14	-0.0613	-.715	0.4776	50	fBHAR_50	-0.3242*	-2.977	0.0042
15	fBHAR_15	-0.0876	-1.051	0.2974	51	fBHAR_51	-0.3079*	-2.720	0.0085
16	fBHAR_16	-0.1010	-1.219	0.2275	52	fBHAR_52	-0.3096*	-2.558	0.0131
17	fBHAR_17	-0.1167	-1.435	0.1566	53	fBHAR_53	-0.3104*	-2.631	0.0108
18	fBHAR_18	-0.1185	-1.386	0.1708	54	fBHAR_54	-0.3299*	-2.895	0.0053
19	fBHAR_19	-0.1102	-1.181	0.2421	55	fBHAR_55	-0.3133*	-2.583	0.0122
20	fBHAR_20	-0.1114	-1.182	0.2418	56	fBHAR_56	-0.2643***	-1.850	0.0693
21	fBHAR_21	-0.0827	-.740	0.4619	57	fBHAR_57	-0.2643***	-1.700	0.0943
22	fBHAR_22	-0.0836	-.743	0.4606	58	fBHAR_58	-0.2706***	-1.672	0.0998
23	fBHAR_23	-0.1086	-1.087	0.2813	59	fBHAR_59	-0.2227	-1.161	0.2501
24	fBHAR_24	-0.0797	-.740	0.4621	60	fBHAR_60	-0.2028	-.977	0.3325
25	fBHAR_25	-0.0999	-.963	0.3394	61	fBHAR_61	-0.2931***	-1.823	0.0734
26	fBHAR_26	-0.0894	-.828	0.4109	62	fBHAR_62	-0.3360**	-2.139	0.0365
27	fBHAR_27	-0.1026	-.960	0.3411	63	fBHAR_63	-0.3706**	-2.421	0.0185
28	fBHAR_28	-0.1049	-.967	0.3373	64	fBHAR_64	-0.3187***	-1.795	0.0778
29	fBHAR_29	-0.1053	-.906	0.3688	65	fBHAR_65	-0.3957**	-2.460	0.0168
30	fBHAR_30	-0.1642	-1.472	0.1463	66	fBHAR_66	-0.4060**	-2.503	0.0151
31	fBHAR_31	-0.1818	-1.599	0.1150	67	fBHAR_67	-0.4317*	-2.769	0.0075
32	fBHAR_32	-0.2005***	-1.815	0.0745	68	fBHAR_68	-0.3779**	-2.279	0.0263
33	fBHAR_33	-0.2105***	-1.957	0.0550	69	fBHAR_69	-0.3965**	-2.425	0.0183
34	fBHAR_34	-0.1860***	-1.689	0.0964	70	fBHAR_70	-0.4022**	-2.374	0.0208
35	fBHAR_35	-0.1863***	-1.658	0.1026	71	fBHAR_71	-0.4581*	-2.854	0.0059
36	fBHAR_36	-0.1863***	-1.698	0.0947	72	fBHAR_72	-0.4266*	-2.604	0.0116

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.2.3-3: Analysis of Buy & Hold Abnormal Returns (weekly)

S#	Variable	BHARs	t	P values	S#	Variable	BHARs	t	P values
1	wBHAR_1	-0.0149	-.865	0.3903	73	wBHAR_73	-0.2007***	-1.843	0.0702
2	wBHAR_2	-0.0137	-.556	0.5800	74	wBHAR_74	-0.2014***	-1.858	0.0681
3	wBHAR_3	-0.0140	-.406	0.6862	75	wBHAR_75	-0.1949***	-1.742	0.0866
4	wBHAR_4	-0.0245	-.708	0.4815	76	wBHAR_76	-0.1950***	-1.717	0.0911
5	wBHAR_5	-0.0259	-.708	0.4815	77	wBHAR_77	-0.1971***	-1.699	0.0945
6	wBHAR_6	-0.0352	-.814	0.4187	78	wBHAR_78	-0.1912	-1.644	0.1055
7	wBHAR_7	-0.0370	-.684	0.4965	79	wBHAR_79	-0.2060***	-1.746	0.0859
8	wBHAR_8	-0.0124	-.180	0.8581	80	wBHAR_80	-0.2215***	-1.916	0.0601
9	wBHAR_9	-0.0098	-.154	0.8783	81	wBHAR_81	-0.2260**	-1.963	0.0542
10	wBHAR_10	-0.0272	-.440	0.6618	82	wBHAR_82	-0.2426**	-2.182	0.0330
11	wBHAR_11	-0.0325	-.504	0.6158	83	wBHAR_83	-0.2391**	-2.114	0.0387
12	wBHAR_12	-0.0095	-.129	0.8978	84	wBHAR_84	-0.2581**	-2.332	0.0231
13	wBHAR_13	-0.0131	-.179	0.8585	85	wBHAR_85	-0.2553**	-2.278	0.0263
14	wBHAR_14	-0.0037	-.049	0.9612	86	wBHAR_86	-0.2651**	-2.440	0.0177
15	wBHAR_15	-0.0187	-.258	0.7972	87	wBHAR_87	-0.2570**	-2.363	0.0214
16	wBHAR_16	-0.0234	-.305	0.7614	88	wBHAR_88	-0.2556**	-2.315	0.0240
17	wBHAR_17	0.0152	.174	0.8621	89	wBHAR_89	-0.2694**	-2.449	0.0172
18	wBHAR_18	0.0045	.052	0.9583	90	wBHAR_90	-0.2647**	-2.427	0.0183
19	wBHAR_19	-0.0163	-.208	0.8363	91	wBHAR_91	-0.2533**	-2.335	0.0229
20	wBHAR_20	-0.0237	-.313	0.7552	92	wBHAR_92	-0.2535**	-2.312	0.0242
21	wBHAR_21	-0.0323	-.453	0.6523	93	wBHAR_93	-0.2341**	-2.017	0.0482
22	wBHAR_22	-0.0166	-.228	0.8208	94	wBHAR_94	-0.2289***	-1.954	0.0553
23	wBHAR_23	-0.0243	-.335	0.7385	95	wBHAR_95	-0.2373**	-2.072	0.0426
24	wBHAR_24	-0.0154	-.204	0.8388	96	wBHAR_96	-0.2498**	-2.291	0.0255
25	wBHAR_25	-0.0331	-.426	0.6714	97	wBHAR_97	-0.2825*	-2.735	0.0082
26	wBHAR_26	-0.0513	-.682	0.4976	98	wBHAR_98	-0.2867*	-2.596	0.0118
27	wBHAR_27	-0.0521	-.633	0.5292	99	wBHAR_99	-0.2949*	-2.651	0.0103
28	wBHAR_28	-0.0613	-.715	0.4776	100	wBHAR_100	-0.3242*	-2.977	0.0042
29	wBHAR_29	-0.0774	-.935	0.3537	101	wBHAR_101	-0.3233*	-3.027	0.0036
30	wBHAR_30	-0.0876	-1.051	0.2974	102	wBHAR_102	-0.3079*	-2.720	0.0085
31	wBHAR_31	-0.1031	-1.302	0.1980	103	wBHAR_103	-0.3046*	-2.558	0.0131
32	wBHAR_32	-0.1010	-1.219	0.2275	104	wBHAR_104	-0.3096*	-2.558	0.0131
33	wBHAR_33	-0.1179	-1.477	0.1448	105	wBHAR_105	-0.2975**	-2.415	0.0188
34	wBHAR_34	-0.1167	-1.435	0.1566	106	wBHAR_106	-0.3104*	-2.631	0.0108
35	wBHAR_35	-0.1218	-1.465	0.1482	107	wBHAR_107	-0.3159*	-2.632	0.0108
36	wBHAR_36	-0.1185	-1.386	0.1708	108	wBHAR_108	-0.3299*	-2.895	0.0053
37	wBHAR_37	-0.1254	-1.458	0.1500	109	wBHAR_109	-0.3060**	-2.478	0.0160
38	wBHAR_38	-0.1102	-1.181	0.2421	110	wBHAR_110	-0.3133*	-2.583	0.0122
39	wBHAR_39	-0.1165	-1.259	0.2130	111	wBHAR_111	-0.3148*	-2.510	0.0148

40	wBHAR_40	-0.1114	-1.182	0.2418	112	wBHAR_112	-0.2643***	-1.850	0.0693
41	wBHAR_41	-0.0921	-.874	0.3857	113	wBHAR_113	-0.2750***	-1.865	0.0671
42	wBHAR_42	-0.0827	-.740	0.4619	114	wBHAR_114	-0.2643***	-1.700	0.0943
43	wBHAR_43	-0.0784	-.741	0.4613	115	wBHAR_115	-0.2662***	-1.688	0.0967
44	wBHAR_44	-0.0836	-.743	0.4606	116	wBHAR_116	-0.2706***	-1.672	0.0998
45	wBHAR_45	-0.1075	-1.062	0.2925	117	wBHAR_117	-0.2348	-1.265	0.2106
46	wBHAR_46	-0.1086	-1.087	0.2813	118	wBHAR_118	-0.2227	-1.161	0.2501
47	wBHAR_47	-0.0896	-.870	0.3877	119	wBHAR_119	-0.2009	-.917	0.3626
48	wBHAR_48	-0.0797	-.740	0.4621	120	wBHAR_120	-0.2028	-.977	0.3325
49	wBHAR_49	-0.1006	-1.011	0.3159	121	wBHAR_121	-0.2795***	-1.718	0.0910
50	wBHAR_50	-0.0999	-.963	0.3394	122	wBHAR_122	-0.2931***	-1.823	0.0734
51	wBHAR_51	-0.0822	-.788	0.4340	123	wBHAR_123	-0.3278**	-2.083	0.0416
52	wBHAR_52	-0.0894	-.828	0.4109	124	wBHAR_124	-0.3360**	-2.139	0.0365
53	wBHAR_53	-0.0846	-.764	0.4479	125	wBHAR_125	-0.3487**	-2.225	0.0298
54	wBHAR_54	-0.1026	-.960	0.3411	126	wBHAR_126	-0.3706**	-2.421	0.0185
55	wBHAR_55	-0.1169	-1.121	0.2667	127	wBHAR_127	-0.3418**	-2.095	0.0404
56	wBHAR_56	-0.1049	-.967	0.3373	128	wBHAR_128	-0.3187***	-1.795	0.0778
57	wBHAR_57	-0.1031	-.902	0.3706	129	wBHAR_129	-0.3957**	-2.474	0.0162
58	wBHAR_58	-0.1053	-.906	0.3688	130	wBHAR_130	-0.3957**	-2.460	0.0168
59	wBHAR_59	-0.1300	-1.136	0.2605	131	wBHAR_131	-0.3973**	-2.428	0.0182
60	wBHAR_60	-0.1642	-1.472	0.1463	132	wBHAR_132	-0.4060**	-2.503	0.0151
61	wBHAR_61	-0.1744	-1.548	0.1269	133	wBHAR_133	-0.4368*	-2.786	0.0071
62	wBHAR_62	-0.1818	-1.599	0.1150	134	wBHAR_134	-0.4317*	-2.769	0.0075
63	wBHAR_63	-0.2012***	-1.859	0.0679	135	wBHAR_135	-0.3929**	-2.407	0.0192
64	wBHAR_64	-0.2005***	-1.815	0.0745	136	wBHAR_136	-0.3779**	-2.279	0.0263
65	wBHAR_65	-0.2090***	-1.906	0.0615	137	wBHAR_137	-0.3826**	-2.289	0.0256
66	wBHAR_66	-0.2105***	-1.957	0.0550	138	wBHAR_138	-0.3965**	-2.425	0.0183
67	wBHAR_67	-0.1979***	-1.795	0.0776	139	wBHAR_139	-0.4090**	-2.497	0.0153
68	wBHAR_68	-0.1860***	-1.689	0.0964	140	wBHAR_140	-0.4022**	-2.374	0.0208
69	wBHAR_69	-0.1946***	-1.769	0.0820	141	wBHAR_141	-0.4302**	-2.567	0.0128
70	wBHAR_70	-0.1863***	-1.658	0.1026	142	wBHAR_142	-0.4581*	-2.854	0.0059
71	wBHAR_71	-0.1811	-1.633	0.1076	143	wBHAR_143	-0.4593*	-2.885	0.0054
72	wBHAR_72	-0.1863***	-1.698	0.0947	144	wBHAR_144	-0.4266*	-2.604	0.0116

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-1: Jensen's alpha for Financial (monthly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
m_CAPM										
Alpha	-0.016	-1.110	-0.013	-0.959	-0.016	-0.957	-0.013	-0.877	-0.014	-0.961
Beta	0.925	3.171	0.878	3.301	0.845	3.246	0.835***	3.766	0.882***	3.936
r^2	0.327		0.321		0.287		0.288		0.301	
Adj. r^2	0.260		0.279		0.254		0.262		0.280	
m_FF_Eq										
Alpha	-0.011	-1.026	-0.014	-0.878	-0.017	-1.035	-0.013	-0.897	-0.016	-0.954
Beta	0.834	3.098	0.829	3.248	0.835	2.949	0.842***	3.481	.890***	3.669
s	-0.119	-0.216	-0.106	-0.039	-0.106	-0.140	0.131	0.097	0.010	-0.092
h	-0.377	-0.280	-0.107	-0.140	-0.031	-0.085	-0.093	-0.147	-0.041	-0.121
R^2	0.459		0.390		0.349		0.337		0.335	
Adj. R^2	0.256		0.260		0.252		0.260		0.273	
m_FF_Val										
Alpha	-0.014	-1.164	-0.015	-0.976	-0.017	-1.051	-0.011	-0.889	-0.015	-0.958
Beta	0.858	3.118	0.828	3.150	0.815	2.969	0.806***	3.492	0.869***	3.655
s	-0.109	-0.597	-0.119	-0.063	-0.106	-0.232	0.103	-0.028	-0.008	-0.195
h	-0.050	-0.175	-0.035	-0.033	-0.004	-0.130	-0.027	-0.225	-0.004	-0.153
R^2	0.454		0.393		0.344		0.337		0.335	
Adj. R^2	0.250		0.263		0.246		0.260		0.272	
m_4F_Eq										
Alpha	-0.004	-0.268	-0.007	-0.306	-0.014	-0.643	-0.007	-0.470	-0.011	-0.632
Beta	0.987	2.769	0.889	3.051	0.871	2.817	0.879***	3.376	0.908***	3.652
s	-0.294	-0.169	-0.402	-0.056	-0.261	-0.032	0.275	0.229	0.127	-0.021
h	-0.481	-0.235	-0.263	-0.066	-0.152	-0.076	-0.135	-0.048	-0.063	-0.079
m	-0.154	-0.501	-0.193	-0.596	-0.094	-0.408	-0.198	-0.637	-0.182	-0.437
R^2	0.533		0.442		0.387		0.370		0.363	
Adj. R^2	0.266		0.270		0.259		0.269		0.281	
m_4F_val										
Alpha	-0.000	-0.245	-0.006	-0.327	-0.012	-0.570	-0.005	-0.418	-0.010	-0.656

Beta	1.038	2.639	0.904	2.964	0.852	2.873	0.846	3.455	0.890***	3.696
s	0.089	-0.677	0.229	-0.012	0.178	-0.140	0.161	-0.040	0.042	-0.193
h	-0.211	-0.070	-0.088	-0.042	-0.128	-0.155	-0.101	-0.228	-0.060	-0.185
m	-0.248	-0.646	-0.275	-0.819	-0.148	-0.578	-0.224	-0.700	-0.192	-0.484
R^2	0.526		0.450		0.390		0.372		0.365	
Adj. R^2	0.254		0.281		0.262		0.272		0.283	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-2: Jensen's alpha for Financial (fortnightly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
f_CAPM										
Alpha	-0.006	-0.556	-0.006	-0.602	-0.007	-0.681	-0.006	-0.580	-0.007	-0.690
Beta	0.695	2.696	0.723	3.152	0.741	3.433	0.755	3.841	0.784	3.791
r^2	0.237		0.238		0.218		0.221		0.215	
Adj. r^2	0.202		0.216		0.201		0.208		0.204	
f_FF_Eq										
Alpha	-0.005	-0.573	-0.006	-0.645	-0.007	-0.715	-0.006	-0.586	-0.007	-0.677
Beta	0.655	2.443	0.699	2.832	0.734	3.146	0.756	3.594	0.796	3.625
s	0.293	0.267	0.299	0.314	0.127	0.152	0.114	0.233	0.052	0.102
h	-0.179	-0.127	-0.051	-0.052	0.019	0.039	-0.041	-0.051	-0.034	0.012
R^2	0.291		0.271		0.251		0.244		0.233	
Adj. R^2	0.185		0.203		0.200		0.204		0.199	
f_FF_Val										
Alpha	-0.005	-0.573	-0.006	-0.626	-0.007	-0.709	-0.006	-0.561	-0.007	-0.673
Beta	0.650	2.445	0.693	2.842	0.722	3.132	0.742	3.614	0.785	3.634
s	0.269	0.161	0.214	0.193	0.110	0.069	0.113	0.176	0.064	0.041
h	-0.027	-0.025	0.005	-0.002	0.021	0.017	-0.014	-0.049	-0.013	0.003
R^2	0.289		0.280		0.255		0.247		0.235	
Adj. R^2	0.183		0.212		0.204		0.207		0.201	
f_4F_Eq										
Alpha	0.006	-0.035	0.000	-0.144	-0.004	-0.480	-0.003	-0.394	-0.005	-0.515
Beta	0.655	2.236	0.678	2.665	0.712	2.988	0.739	3.466	0.781	3.517
s	0.404	0.293	0.354	0.339	0.159	0.194	0.142	0.259	0.078	0.105
h	-0.139	-0.030	-0.036	-0.013	0.019	0.035	-0.031	-0.026	-0.024	0.055
m	-0.344	-0.518	-0.255	-0.482	-0.166	-0.361	-0.170	-0.393	-0.167	-0.372
R^2	0.332		0.310		0.276		0.263		0.248	
Adj. R^2	0.191		0.221		0.208		0.209		0.204	
f_4F_Val										
Alpha	0.006	-0.048	0.000	-0.143	-0.003	-0.432	-0.003	-0.338	-0.004	-0.488
Beta	0.663	2.261	0.680	2.668	0.705	2.967	0.730	3.482	0.774	3.525
s	0.280	0.123	0.228	0.161	0.125	0.067	0.127	0.173	0.078	0.054
h	-0.023	0.013	0.012	-0.004	0.031	0.016	-0.012	-0.066	-0.010	-0.016
m	-0.344	-0.532	-0.253	-0.527	-0.193	-0.431	-0.193	-0.445	-0.189	-0.436
R^2	0.334		0.319		0.280		0.266		0.251	
Adj. R^2	0.193		0.231		0.213		0.213		0.206	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-3: Jensen's alpha for Financial (weekly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
w_CAPM										
Alpha	-0.003	-0.550	-0.003	-0.482	-0.003	-0.550	-0.003	-0.482	-0.003	-0.597
Beta	0.758	3.451	0.768***	3.697	0.757***	3.866	0.754***	4.125	0.783***	4.422
r^2	0.195		0.186		0.176		0.177		0.173	
Adj. r^2	0.177		0.174		0.167		0.170		0.167	
w_FF_Eq										
Alpha	-0.004	-0.626	-0.003	-0.542	-0.004	-0.600	-0.003	-0.506	-0.003	-0.613
Beta	0.727	3.380	0.746	3.567	0.745***	3.759	0.748***	4.058	0.785***	4.332
s	0.181	0.360	0.184	0.476	0.096	0.325	0.102	0.481	0.081	0.445
h	-0.106	-0.056	-0.066	-0.138	-0.002	0.013	-0.016	-0.115	0.000	-0.093
R^2	0.224		0.205		0.193		0.193		0.191	
Adj. R^2	0.171		0.170		0.166		0.172		0.173	
w_FF_val										
Alpha	-0.004	-0.620	-0.003	-0.531	-0.003	-0.560	-0.003	-0.467	-0.003	-0.582
Beta	0.725	3.431	0.744	3.604	0.742***	3.812	0.742***	4.084	0.778***	4.351
s	0.133	0.199	0.172	0.443	0.119	0.373	0.125	0.498	0.131	0.492
h	-0.022	-0.003	-0.023	-0.090	0.031	0.041	0.023	0.020	0.026	0.044
R^2	0.220		0.204		0.194		0.192		0.188	
Adj. R^2	0.167		0.169		0.167		0.171		0.171	
w_4F_Eq										
Alpha	0.001	-0.093	-0.001	-0.192	-0.002	-0.383	-0.001	-0.325	-0.003	-0.486
Beta	0.729	3.323	0.743	3.579	.740***	3.785	0.742***	4.071	.780***	4.323
s	0.243	0.467	0.236	0.586	0.135	0.422	0.139	0.577	0.113	0.529
h	-0.082	-0.003	-0.060	-0.135	-0.008	-0.024	-0.019	-0.141	-0.009	-0.148
m	-0.306	-0.747	-0.214	-0.571	-0.184	-0.486	-0.174	-0.474	-0.115	-0.346
R^2	0.245		0.219		0.204		0.201		0.195	
Adj. R^2	0.174		0.172		0.169		0.173		0.172	
w_4F_val										
Alpha	0.001	-0.101	-0.001	-0.200	-0.002	-0.340	-0.001	-0.282	-0.002	-0.458
Beta	0.730	3.356	0.743	3.613	0.737***	3.836	0.737***	4.097	0.777***	4.350
s	0.161	0.295	0.200	0.530	0.145	0.455	0.150	0.588	0.152	0.564
h	-0.024	-0.006	-0.028	-0.115	0.025	0.010	0.016	-0.021	0.010	-0.036
m	-0.300	-0.707	-0.210	-0.565	-0.201	-0.513	-0.188	-0.494	-0.124	-0.372
R^2	0.239		0.218		0.205		0.200		0.193	
Adj. R^2	0.169		0.171		0.170		0.172		0.169	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-4: Jensen's alpha for Manufacturing (monthly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
m_CAPM										
Alpha	-0.001	-0.530	-0.010	-0.635	-0.008	-0.477	-0.012	-0.662	-0.010	-0.617
Beta	1.183***	3.733	1.028***	4.166	1.054***	4.312	1.045**	4.714	1.025**	4.834
r^2	0.391		0.382		0.372		0.359		0.353	
Adj. r^2	0.330		0.344		0.343		0.336		0.334	
m_FF_Eq										
Alpha	0.010	-0.038	-0.010	-0.540	-0.007	-0.404	-0.011	-0.641	-0.010	-0.671
Beta	1.230***	3.709	1.042***	4.502	1.088***	4.319	1.070**	4.635	1.051**	4.822
s	-0.735	-0.267	-0.021	-0.268	0.065	-0.141	0.109	0.051	0.140	0.092
h	0.184	-0.108	-0.214	-0.335	-0.168	-0.157	-0.074	-0.121	-0.071	-0.135
R^2	0.510		0.464		0.424		0.397		0.388	
Adj. R^2	0.326		0.350		0.337		0.327		0.331	
m_FF_Val										
Alpha	0.003	-0.274	-0.009	-0.574	-0.005	-0.384	-0.010	-0.647	-0.008	-0.618
Beta	1.252***	3.773	1.055***	4.582	1.091***	4.301	1.078**	4.660	1.054**	4.833
s	-0.331	-0.521	-0.084	-0.347	0.026	-0.164	0.029	0.004	0.076	0.065
h	0.000	-0.225	-0.172	-0.417	-0.107	-0.282	-0.105	-0.301	-0.106	-0.349
R^2	0.496		0.463		0.427		0.403		0.393	
Adj. R^2	0.308		0.347		0.341		0.334		0.336	
m_4F_Eq										
Alpha	0.010	0.012	-0.011	-0.492	-0.005	-0.333	-0.009	-0.613	-0.009	-0.654
Beta	1.271	3.541	1.049***	4.409	1.096***	4.269	1.075**	4.610	1.055**	4.814
s	-0.531	-0.288	-0.010	-0.291	0.030	-0.166	0.074	0.050	0.091	0.072
h	-0.251	-0.061	-0.325	-0.270	-0.091	0.018	0.024	0.033	0.056	0.073
m	-0.121	-0.085	0.125	0.239	0.107	0.152	0.070	0.157	0.050	0.106
R^2	0.559		0.481		0.445		0.414		0.401	
Adj. R^2	0.307		0.322		0.329		0.320		0.324	
m_4F_val										
Alpha	0.007	-0.078	-0.011	-0.659	-0.005	-0.338	-0.010	-0.616	-0.010	-0.674
Beta	1.236	2.995	1.041***	4.493	1.095***	4.117	1.079**	4.547	1.055**	4.783
s	-0.150	-0.384	-0.046	-0.019	0.034	-0.050	0.024	0.031	0.064	0.072
h	-0.325	-0.211	-0.265	-0.379	-0.088	-0.164	-0.079	-0.206	-0.053	-0.155
m	-0.178	-0.183	0.078	0.101	0.051	0.076	0.045	0.072	0.041	0.068
R^2	0.544		0.476		0.445		0.416		0.403	
Adj. R^2	0.283		0.314		0.328		0.323		0.326	

Table A-4.4.4.4-5: Jensen's alpha for Manufacturing (fortnightly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**
f_CAPM										
Alpha	-0.002	-0.416	-0.005	-0.571	-0.003	-0.387	-0.004	-0.406	-0.004	-0.443
Beta	1.051***	3.619	0.989***	4.171	1.037***	4.579	1.017**	4.687	0.987***	4.785
r^2	0.280		0.277		0.289		0.278		0.274	
Adj. r^2	0.248		0.256		0.274		0.265		0.264	
f_FF_Eq										
Alpha	-0.001	-0.339	-0.006	-0.654	-0.004	-0.453	-0.004	-0.448	-0.004	-0.467
Beta	1.059***	3.438	0.987***	4.007	1.041***	4.475	1.019***	4.546	0.986***	4.684
s	-0.423	-0.375	-0.093	-0.125	0.024	0.063	-0.055	-0.118	0.023	0.068
h	-0.117	0.015	-0.105	-0.064	-0.001	0.089	0.024	0.052	0.020	0.125
R^2	0.337		0.314		0.314		0.298		0.291	
Adj. R^2	0.237		0.249		0.267		0.260		0.260	
f_FF_Val										
Alpha	-0.002	-0.405	-0.005	-0.657	-0.003	-0.421	-0.004	-0.409	-0.004	-0.439
Beta	1.067***	3.396	0.999***	3.905	1.046***	4.397	1.023***	4.519	0.989***	4.698
s	-0.350	-0.442	-0.090	-0.170	-0.013	-0.016	-0.061	-0.142	-0.011	-0.014
h	-0.007	0.062	-0.028	-0.139	0.020	-0.021	0.033	-0.035	0.034	0.065
R^2	0.326		0.306		0.310		0.296		0.290	
Adj. R^2	0.225		0.241		0.263		0.258		0.258	
f_4F_Eq										
Alpha	-0.002	-0.273	-0.007	-0.646	-0.004	-0.473	-0.004	-0.534	-0.004	-0.571
Beta	1.055***	3.348	0.972***	3.928	1.033***	4.341	1.012***	4.457	0.982***	4.663
s	-0.402	-0.301	-0.092	-0.113	0.026	0.060	-0.059	-0.138	0.021	0.039
h	-0.107	0.036	-0.105	-0.023	0.011	0.119	0.039	0.062	0.035	0.132
m	-0.005	-0.031	0.020	0.062	-0.006	0.002	-0.012	-0.033	-0.026	-0.056
R^2	0.354		0.335		0.324		0.305		0.299	
Adj. R^2	0.218		0.249		0.261		0.254		0.257	
f_4F_Val										
Alpha	-0.003	-0.283	-0.006	-0.598	-0.004	-0.402	-0.004	-0.471	-0.003	-0.513
Beta	1.058***	3.308	0.986***	3.924	1.041***	4.315	1.018***	4.495	0.988***	4.717
s	-0.323	-0.391	-0.081	-0.166	-0.010	-0.025	-0.066	-0.172	-0.013	-0.046
h	-0.014	0.053	-0.012	-0.114	0.030	-0.026	0.030	-0.081	0.031	0.012
m	-0.030	-0.075	-0.009	-0.004	-0.012	-0.001	-0.011	-0.043	-0.030	-0.078
R^2	0.341		0.325		0.320		0.302		0.297	
Adj. R^2	0.203		0.238		0.257		0.252		0.255	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-6: Jensen's alpha for Manufacturing (weekly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**T**	**Coeff.**	**T**
w_CAPM										
Alpha	0.000	-0.155	-0.002	-0.311	-0.002	-0.208	-0.001	-0.230	-0.001	-0.267
Beta	0.965***	4.283	0.926**	4.523	0.939***	5.054	0.936**	5.429	0.917**	5.622
r^2	0.246		0.256		0.250		0.243		0.239	
Adj. r^2	0.230		0.246		0.242		0.236		0.233	
w_FF_Eq										
Alpha	0.001	-0.048	-0.003	-0.307	-0.002	-0.216	-0.001	-0.237	-0.001	-0.258
Beta	0.963***	4.219	0.93**	4.437	0.941***	4.978	0.942**	5.390	0.919**	5.562
s	-0.130	-0.184	-0.007	-0.091	0.010	0.011	-0.031	-0.117	-0.018	-0.080
h	-0.093	-0.146	-0.073	-0.139	-0.061	-0.124	-0.048	-0.127	-0.022	0.043
R^2	0.282		0.280		0.266		0.256		0.249	
Adj. R^2	0.233		0.248		0.242		0.237		0.233	
w_FF_val										
Alpha	0.000	-0.094	-0.002	-0.325	-0.001	-0.215	-0.001	-0.239	-0.001	-0.274
Beta	0.962***	4.266	0.929**	4.393	0.94***	4.983	0.938**	5.453	0.915**	5.645
s	-0.158	-0.347	-0.063	-0.246	-0.041	-0.130	-0.063	-0.230	-0.056	-0.209
h	-0.087	-0.185	-0.066	-0.277	-0.080	-0.324	-0.069	-0.332	-0.043	-0.170
R^2	0.280		0.274		0.263		0.254		0.248	
Adj. R^2	0.231		0.242		0.239		0.234		0.231	
w_4F_Eq										
Alpha	0.000	-0.157	-0.003	-0.320	-0.002	-0.283	-0.001	-0.296	-0.001	-0.331
Beta	0.987***	4.171	0.932**	4.409	0.944***	4.944	0.941**	5.356	0.918**	5.532
s	-0.173	-0.215	-0.024	-0.098	-0.005	-0.006	-0.045	-0.140	-0.024	-0.085
h	-0.100	-0.177	-0.073	-0.118	-0.057	-0.108	-0.045	-0.112	-0.019	0.038
m	0.002	0.022	0.007	-0.114	0.032	0.006	0.022	-0.005	-0.010	-0.051
R^2	0.294		0.289		0.271		0.260		0.253	
Adj. R^2	0.228		0.247		0.239		0.234		0.231	
w_4F_val										
Alpha	0.000	-0.158	-0.003	-0.361	-0.002	-0.252	-0.001	-0.269	-0.001	-0.311
Beta	0.986***	4.222	0.93**	4.346	0.943***	4.935	0.938**	5.384	0.915**	5.593
s	-0.183	-0.386	-0.073	-0.244	-0.054	-0.163	-0.077	-0.268	-0.065	-0.229
h	-0.099	-0.182	-0.065	-0.234	-0.078	-0.312	-0.071	-0.328	-0.050	-0.201
m	-0.016	0.029	-0.008	-0.148	0.019	-0.015	0.014	-0.020	-0.018	-0.063
R^2	0.292		0.284		0.267		0.258		0.251	
Adj. R^2	0.226		0.241		0.235		0.232		0.230	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-7: Jensen's alpha for Other Services (monthly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**T**	**Coeff.**	**t**
m_CAPM										
Alpha	-0.013	-0.739	-0.010	-0.474	-0.002	-0.117	-0.002	-0.319	-0.005	-0.446
Beta	1.097	3.003	1.081	2.766	1.025	2.531	1.036	2.999	1.001***	2.996
r^2	0.285		0.265		0.212		0.229		0.233	
Adj. r^2	0.214		0.219		0.176		0.202		0.211	
m_FF_Eq										
Alpha	-0.009	-0.674	-0.007	-0.345	-0.001	-0.067	-0.006	-0.406	-0.009	-0.542
Beta	1.123	3.150	1.090	3.023	0.982	2.690	1.016	3.072	0.986	3.192
s	0.679	-0.072	-0.360	-0.404	-0.093	-0.338	-0.057	-0.385	0.216	-0.060
h	-0.937	-1.029	-0.628	-0.733	-0.545	-0.606	-0.784	-0.969	-0.801	-0.992
R^2	0.422		0.354		0.295		0.300		0.291	
Adj. R^2	0.205		0.215		0.190		0.219		0.224	
m_FF_Val										
Alpha	-0.007	-0.719	-0.005	-0.449	0.002	0.006	-0.005	-0.321	-0.009	-0.513
Beta	1.087	2.609	1.075	3.034	0.986	2.707	1.002	3.080	0.969	3.074
s	0.236	-0.195	0.036	-0.309	0.024	-0.130	-0.001	-0.206	0.162	0.140
h	-0.496	-0.654	-0.349	-0.560	-0.224	-0.345	-0.518	-0.642	-0.583	-0.817
R^2	0.419		0.337		0.279		0.287		0.275	
Adj. R^2	0.201		0.195		0.170		0.205		0.207	
m_4F_Eq										
Alpha	-0.021	-0.193	-0.014	-0.371	-0.004	-0.022	-0.008	-0.277	-0.010	-0.353
Beta	1.003	2.163	1.042	2.722	0.981	2.770	1.012	3.154	0.976	3.196
s	1.325	-0.069	-0.523	-0.585	-0.169	-0.382	-0.048	-0.504	0.213	-0.137
h	-1.013	-0.814	-0.481	-0.542	-0.563	-0.450	-0.748	-0.803	-0.761	-0.861
m	0.388	-0.637	0.243	-0.117	0.156	-0.536	0.137	-0.507	0.079	-0.289
R^2	0.512		0.417		0.362		0.344		0.315	
Adj. R^2	0.233		0.238		0.228		0.239		0.227	
m_4F_val										
Alpha	-0.007	-0.101	-0.009	-0.342	0.000	0.160	-0.004	-0.134	-0.008	-0.299
Beta	0.930	1.581	1.052	2.609	0.991	2.686	1.006	3.074	0.970	3.062
s	0.415	-0.142	-0.032	-0.412	-0.031	-0.233	0.010	-0.257	0.173	0.049
h	-0.506	-0.594	-0.275	-0.422	-0.250	-0.295	-0.466	-0.574	-0.530	-0.764
m	0.118	-0.865	0.151	-0.310	0.095	-0.738	0.046	-0.743	0.007	-0.455
R^2	0.502		0.398		0.352		0.329		0.302	
Adj. R^2	0.217		0.213		0.216		0.222		0.212	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-8: Jensen's alpha for Other Services (fortnightly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**T**
f_CAPM										
Alpha	-0.005	-0.532	-0.004	-0.399	0.001	-0.046	0.000	-0.188	-0.003	-0.395
Beta	0.916	2.877	0.888***	3.162	0.790	2.918	0.788***	3.332	0.773**	3.439
r^2	0.189		0.191		0.153		0.157		0.166	
Adj. r^2	0.152		0.167		0.135		0.143		0.154	
f_FF_Eq										
Alpha	-0.005	-0.529	-0.003	-0.349	0.001	-0.004	0.000	-0.152	-0.003	-0.405
Beta	0.891	2.811	0.834***	3.109	0.771	2.921	0.789***	3.304	0.772**	3.581
s	-0.074	-0.181	-0.055	-0.139	0.005	-0.032	0.015	0.118	0.153	0.327
h	-0.229	-0.485	-0.156	-0.197	-0.196	-0.314	-0.291	-0.505	-0.283	-0.584
R^2	0.288		0.249		0.206		0.198		0.199	
Adj. R^2	0.181		0.178		0.152		0.155		0.164	
f_FF_Val										
Alpha	-0.004	-0.555	-0.003	-0.368	0.002	0.027	0.000	-0.151	-0.003	-0.440
Beta	0.875	2.754	0.858	3.128	0.780	2.919	0.788***	3.307	0.772**	3.515
s	0.126	0.003	0.103	0.032	0.013	0.008	0.020	0.101	0.101	0.316
h	-0.133	-0.140	-0.165	-0.080	-0.166	-0.218	-0.238	-0.379	-0.267	-0.541
R^2	0.270		0.243		0.197		0.194		0.192	
Adj. R^2	0.161		0.172		0.142		0.151		0.156	
f_4F_Eq										
Alpha	-0.005	-0.279	-0.004	-0.183	0.001	0.076	0.001	-0.004	-0.003	-0.249
Beta	0.870	2.472	0.835***	3.323	0.779	3.025	0.796***	3.392	0.767**	3.648
s	-0.164	-0.268	-0.137	-0.178	-0.075	-0.107	-0.033	0.054	0.127	0.276
h	-0.166	-0.268	-0.140	-0.017	-0.160	-0.122	-0.252	-0.347	-0.268	-0.493
m	-0.014	-0.405	0.001	-0.496	-0.015	-0.587	-0.038	-0.574	-0.014	-0.517
R^2	0.325		0.287		0.240		0.221		0.214	
Adj. R^2	0.183		0.195		0.170		0.164		0.168	
f_4F_Val										
Alpha	-0.003	-0.200	-0.003	-0.153	0.002	0.145	0.001	0.040	-0.003	-0.259
Beta	0.860	2.445	0.856	3.309	0.787	3.010	0.795***	3.410	0.765**	3.578
s	0.049	-0.147	0.028	-0.034	-0.059	-0.099	-0.020	0.017	0.080	0.246
h	-0.062	0.033	-0.122	0.018	-0.158	-0.145	-0.224	-0.288	-0.254	-0.492
m	-0.059	-0.495	-0.012	-0.559	-0.024	-0.634	-0.055	-0.638	-0.032	-0.564
R^2	0.314		0.287		0.236		0.221		0.210	
Adj. R^2	0.169		0.195		0.165		0.164		0.163	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-4.4.4.4-9: Jensen's alpha for Other Services (weekly analysis)

	1-year		1.5-years		2.0-years		2.5-years		3-years	
	Coeff.	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**t**	**Coeff.**	**T**
w_CAPM										
Alpha	-0.001	-0.345	-0.001	-0.256	0.001	0.063	0.000	-0.091	-0.002	-0.380
Beta	0.715	2.988	0.727	3.354	0.670	3.529	0.706***	4.056	0.708**	4.376
r^2	0.139		0.143		0.133		0.137		0.148	
Adj. r^2	0.120		0.131		0.124		0.130		0.142	
w_FF_Eq										
Alpha	-0.001	-0.347	-0.001	-0.281	0.001	0.052	0.000	-0.082	-0.002	-0.395
Beta	0.701	2.826	0.723	3.201	0.684	3.503	0.723***	4.050	0.714**	4.383
s	0.124	0.078	0.067	0.065	0.094	0.189	0.121	0.401	0.155	0.453
h	-0.089	-0.206	-0.044	-0.133	-0.093	-0.341	-0.141	-0.513	-0.116	-0.507
R^2	0.174		0.163		0.150		0.150		0.159	
Adj. R^2	0.118		0.126		0.122		0.128		0.141	
w_FF_val										
Alpha	-0.001	-0.351	-0.001	-0.249	0.001	0.066	0.000	-0.105	-0.002	-0.412
Beta	0.705	2.793	0.723	3.247	0.674	3.484	0.713***	4.022	0.711**	4.375
s	0.174	0.148	0.152	0.292	0.130	0.343	0.137	0.471	0.138	0.487
h	-0.133	-0.166	-0.099	-0.202	-0.120	-0.402	-0.167	-0.586	-0.127	-0.573
R^2	0.177		0.162		0.147		0.149		0.158	
Adj. R^2	0.121		0.125		0.119		0.127		0.140	
w_4F_Eq										
Alpha	0.000	-0.080	-0.001	-0.110	0.001	0.123	0.000	0.007	-0.002	-0.282
Beta	0.694	2.726	0.722	3.280	0.684	3.558	0.72***	4.089	0.71**	4.401
s	0.117	0.064	0.065	0.090	0.095	0.218	0.119	0.413	0.151	0.458
h	-0.030	-0.055	-0.019	-0.017	-0.050	-0.175	-0.108	-0.383	-0.085	-0.398
m	-0.088	-0.488	-0.043	-0.515	-0.026	-0.485	-0.011	-0.474	-0.040	-0.497
R^2	0.194		0.187		0.170		0.162		0.166	
Adj. R^2	0.118		0.138		0.134		0.133		0.142	
w_4F_val										
Alpha	0.000	-0.038	-0.001	-0.061	0.001	0.167	0.000	-0.002	-0.002	-0.286
Beta	0.694	2.720	0.723	3.309	0.675	3.529	0.709***	4.050	0.707**	4.393
s	0.162	0.124	0.143	0.275	0.119	0.301	0.132	0.440	0.133	0.459
h	-0.094	-0.105	-0.071	-0.135	-0.086	-0.313	-0.135	-0.494	-0.102	-0.496
m	-0.084	-0.491	-0.053	-0.569	-0.041	-0.552	-0.028	-0.542	-0.058	-0.594
R^2	0.196		0.187		0.168		0.162		0.165	
Adj. R^2	0.122		0.138		0.132		0.133		0.141	

*significant at 1% level, **significant at 5% level and ***significant at 10% level

Table A-3.1-a: List of IPO Firms

S#	Company Name (IPO)	Sector	Year of listing
1	Dewan Farooque Motors Ltd.	Automobile And Parts	2000
2	Bestway Cement	Construction And Materials	2001
3	Arif Habib Securities Ltd.	Financial Services	2001
4	Fayzan Manufacturing Modaraba	Equity Investment Instruments	2001
5	WorldCall Multimedia	Fixed Line Telecommunication	2002
6	National Bank Of Pakistan Limited	Banks	2002
7	Attock Cement Pakistan Limited	Construction And Materials	2002
8	Bosicor Pakistan Limited	Oil And Gas Producers	2002
9	Ittehad Chemicals Limited	Chemicals	2003
10	TRG Pakistan Limited	Support Services	2003
11	Mashreq Bank Pakistan Limited	Banks	2003
12	Pakistan International Container Terminal Ltd	Industrial Transportation	2003
13	First National Bank Modaraba	Equity Investment Instruments	2003
14	NDLC - IFIC Bank Limited	Banks	2003
15	Oil & Gas Development Company Limited	Oil And Gas Producers	2004
16	WorldCALL Broadband Limited	Fixed Line Telecommunication	2004
17	ABAMCO Stock Market Fund	Equity Investment Instruments	2004
18	MACPAC Films Limited	General Industrials	2004
19	ABAMCO Capital Fund	Equity Investment Instruments	2004
20	Callmate Telips Telecom Limited	Fixed Line Telecommunication	2004
21	Southern Networks Limited	Media	2004
22	Bank Alfalah Limited	Banks	2004
23	ABAMCO Composite Fund	Equity Investment Instruments	2004
24	Pakistan International Airline	Travel And Leisure	2004
25	PICIC Investment Fund	Equity Investment Instruments	2004
26	Pakistan Petroleum Limited	Oil And Gas Producers	2004
27	Pakistan Strategic Allocation Fund	Equity Investment Instruments	2004
28	AMZ Ventures Limited	Financial Services	2004
29	First National Equities Limited	Financial Services	2004
30	Atlas Fund of Funds	Equity Investment Instruments	2005
31	Network Microfinance Bank Limited	Banks	2005
32	Meezan Balanced Fund	Equity Investment Instruments	2005
33	International Housing Finance Limited	Financial Services	2005
34	Jahangir Siddiqui Capital Markets Limited	Financial Services	2005
35	Attock Petroleum Limited	Oil And Gas Producers	2005
36	Kot Addu Power Company Limited	Electricity	2005
37	First Dawood Mutual Fund	Equity Investment Instruments	2005
38	Dewan Farooque Spinning Mills Limited	Personal Goods	2005

39	Eye Television Network Limited	Media	2005
40	United Bank Limited	Banks	2005
41	Zephyr Textiles Limited	Personal Goods	2005
42	Allied Bank Limited	Banks	2005
43	Chenab Limited	Personal Goods	2005
44	NetSol Technologies Limited	Software N Computer Services	2005
45	WorldCALL Telecom Limited	Fixed Line Telecommunication	2005
46	D. S. Industries Limited	Personal Goods	2005
47	AKD Index Tracker Fund	Equity Investment Instruments	2005
48	Siddiqsons Tin Plate Limited	Industrial Metals And Mining	2005
49	PICIC Energy Fund	Equity Investment Instruments	2006
50	The Bank of Khyber	Banks	2006
51	BankIslami Pakistan Limited	Banks	2006
52	NAMCO Balanced Fund	Equity Investment Instruments	2006
53	Allied Rental Modaraba	Equity Investment Instruments	2007
54	BMA Principal Guaranted Fund I	Equity Investment Instruments	2007
55	Arif Habib Limited	Financial Services	2007
56	Hira Textile Mills Limited	Personal Goods	2007
57	PACE (Pakistan) Limited	Real Estate Investment And Services	2007
58	Flying Cement Company Limited	Construction And Materials	2007
59	Pervez Ahmed Securities Limited	Financial Services	2007
60	Pak Oman Advantage Fund	Equity Investment Instruments	2007
61	Sitara Peroxide Limited	Chemicals	2007
62	Habib Bank Limited	Banks	2007
63	Dost Steels Limited	Industrial Metals And Mining	2007
64	Arif Habib Bank Limited	Banks	2008
65	Invest and Finance Securities Limited	Financial Services	2008
66	Thatta Cement Company Limited	Construction And Materials	2008
67	Dawood Equities Limited	Financial Services	2008
68	Engro Polymer & Chemicals Limited	Chemicals	2008
69	KASB Securities Limited	Financial Services	2008
70	First Credit and Investment Bank Limited	Banks	2008
71	Arif Habib Investment Management Limited	Financial Services	2008
72	Descon Oxychem Limited	Chemicals	2008
73	Media Times Limited	Media	2009
74	IBL Healthcare Limited	Pharma And Bio Tech	2009
75	Nishat Power Limited	Electricity	2009
76	Nishat Chunian Power Limited	Electricity	2009
77	Ghani Gases Limited	Chemicals	2010
78	Fatima Fertilizer Company Limited	Chemicals	2010
79	Safe Mix Concrete Products Limited	Construction And Materials	2010

80	Agritech Limited	Chemicals	2010
81	Amtex Limited	Personal Goods	2010
82	Wateen Telecom Limited	Fixed Line Telecommunication	2010
83	International Steels Limited	Industrial metals and Mining	2011
84	Pakgen Power Limited	Electricity	2011
85	Engro Foods Limited	Food Producers	2011
86	TPL Direct Insurance Limited	None Life Insurance	2011
87	Next Capital Limited	Financial Services	2012
88	TPL Trakker Limited	Technology hardware and equipment	2012
89	Aisha Steel Mills Limited	Industrial Metals And Mining	2012

Table A-3.1-b: List of IPO Firms (sector-wise)

S#	Sector	No. of Firms
1	Automobile And Parts	1
2	Banks	12
3	Chemicals	7
4	Construction And Materials	5
5	Electricity	4
6	Equity Investment Instruments	16
7	Financial Services	12
8	Fixed Line Telecommunication	5
9	Food Producers	1
10	General Industrials	1
11	Industrial Metals And Mining	4
12	Industrial Transportation	1
13	Media	3
14	None Life Insurance	1
15	Oil And Gas Producers	4
16	Personal Goods	6
17	Pharma And Bio Tech	1
18	Real Estate Investment And Services	1
19	Software N Computer Services	1
20	Support Services	1
21	Technology hardware and equipment	1
22	Travel And Leisure	1
	Total	**89**

Table A-4.3.2-a: Pre-IPO Efficiency Score of Stage 1 (Profitability)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.167	0.263	0.633	Irs	**45**	0.028	0.066	0.424	Irs
2	0.173	0.175	0.986	Irs	**46**	0.137	0.213	0.643	Irs
3	0.485	0.5	0.97	Irs	**48**	0.972	1.000	0.972	Drs
6	0.308	1.000	0.308	Drs	**49**	0.06	0.411	0.146	Irs
7	0.277	0.286	0.972	Irs	**50**	0.134	0.136	0.985	Irs
8	0.000	0.071	0	Irs	**51**	0.009	0.06	0.147	Irs
9	0.329	0.349	0.943	Irs	**52**	0.382	0.566	0.675	Irs
10	0.000	0.28	0	irs	**53**	0.593	0.917	0.647	Irs
11	0.107	0.111	0.963	irs	**55**	1.000	1.000	1.000	-
12	0.115	0.124	0.934	irs	**56**	0.168	0.17	0.99	Irs
13	0.076	0.933	0.082	irs	**57**	0.434	0.464	0.936	Drs
15	0.772	1.000	0.772	drs	**58**	0.126	0.18	0.699	Irs
18	0.111	0.301	0.368	irs	**59**	0.822	1.000	0.822	Irs
21	0.007	0.17	0.038	irs	**60**	0.075	0.336	0.222	Irs
22	0.373	0.433	0.861	drs	**61**	0.000	0.429	0.000	Irs
26	0.88	1.000	0.88	drs	**62**	0.302	1.000	0.302	Drs
28	0.001	1.000	0.001	irs	**63**	0.000	0.197	0.002	Irs
29	0.608	0.616	0.987	irs	**64**	0.132	0.141	0.939	Irs
30	0.167	0.731	0.228	irs	**65**	0.092	0.388	0.239	Irs
31	0.024	0.509	0.047	irs	**66**	0.26	0.268	0.97	Irs
34	0.000	0.19	0.000	irs	**67**	0.54	1.000	0.54	Irs
35	1.000	1.000	1.000	-	**68**	0.448	0.454	0.989	Irs
36	1.000	1.000	1.000	-	**69**	0.231	0.367	0.631	irs
37	0.111	0.695	0.159	irs	**70**	0.077	0.335	0.23	irs
38	0.077	0.09	0.857	irs	**71**	0.743	0.744	0.999	drs
39	1.000	1.000	1.000	-	**72**	0.000	0.163	0.000	irs
40	0.49	0.792	0.618	drs	**73**	0.107	0.253	0.422	irs
41	0.14	0.162	0.861	irs	**75**	0.078	0.145	0.538	irs
43	0.253	0.255	0.994	irs	**76**	0.000	0.184	0.000	irs
44	0.596	0.703	0.847	drs	**77**	0.052	0.173	0.302	irs

The average efficiency scores for CRS, VRS and Scale are 0.294, 0.475 and 0.579 respectively

Table A-4.3.2-b: Pre-IPO Efficiency Score of Stage 2 (Marketability)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.015	0.015	0.999	-	**45**	0.037	0.040	0.913	irs
2	0.013	0.013	1.000	-	**46**	0.159	0.159	0.999	-
3	1.000	1.000	1.000	-	**48**	0.015	0.103	0.148	drs
6	0.050	0.240	0.210	drs	**49**	0.011	0.011	0.998	-
7	0.056	0.056	1.000	-	**50**	0.013	0.376	0.034	drs
8	0.632	1.000	0.632	Irs	**51**	0.043	0.434	0.098	drs
9	0.065	0.065	1.000	-	**52**	0.013	0.013	0.999	-
10	0.229	0.577	0.398	irs	**53**	0.036	0.036	1.000	-
11	0.007	0.007	1.000	-	**55**	1.000	1.000	1.000	-
12	0.027	0.027	0.999	-	**56**	0.318	0.318	1.000	-
13	0.003	0.050	0.066	irs	**57**	0.226	0.932	0.243	drs
15	0.299	1.000	0.299	drs	**58**	0.238	0.238	1.000	-
18	0.186	0.186	1.000	-	**59**	0.030	0.030	0.999	-
21	0.009	0.033	0.268	irs	**60**	0.038	0.038	0.998	-
22	0.097	0.468	0.207	drs	**61**	0.624	0.882	0.707	irs
26	0.166	0.988	0.168	drs	**62**	0.148	1.000	0.148	drs
28	0.079	0.789	0.099	irs	**63**	0.022	0.029	0.739	irs
29	0.022	0.022	1.000	-	**64**	0.151	1.000	0.151	drs
30	1.000	1.000	1.000	-	**65**	1.000	1.000	1.000	-
31	0.006	0.100	0.057	irs	**66**	0.014	0.014	1.000	-
34	0.328	0.625	0.525	irs	**67**	0.043	0.043	1.000	-
35	0.187	1.000	0.187	drs	**68**	0.002	0.270	0.008	drs
36	0.437	1.000	0.437	drs	**69**	0.012	0.913	0.013	drs
37	0.023	0.023	0.994	-	**70**	0.115	0.115	1.000	-
38	0.018	0.018	0.999	-	**71**	0.198	0.409	0.485	drs
39	0.406	0.406	1.000	-	**72**	0.200	0.750	0.267	irs
40	0.229	0.659	0.348	drs	**73**	0.015	0.022	0.689	irs
41	0.138	0.138	1.000	-	**75**	0.013	1.000	0.013	drs
43	0.011	0.011	1.000	-	**76**	1.000	1.000	1.000	-
44	0.155	1.000	0.155	drs	**77**	0.014	0.019	0.734	irs

The average efficiency scores for CRS, VRS and Scale are 0.194, 0.412 and 0.64 respectively

Table A-4.3.2-c: Pre-IPO Efficiency Score of Stage 3

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.112	0.175	0.639	irs	**45**	0.131	0.136	0.967	irs
2	0.093	0.104	0.892	drs	**46**	0.290	0.299	0.971	drs
3	1.000	1.000	1.000	-	**48**	0.548	0.551	0.995	irs
6	0.066	0.090	0.734	drs	**49**	0.339	0.504	0.673	irs
7	0.112	0.122	0.916	drs	**50**	0.304	0.306	0.994	irs
8	0.117	0.122	0.962	irs	**51**	0.268	0.271	0.990	drs
9	0.124	0.141	0.881	drs	**52**	0.313	0.477	0.655	irs
10	0.488	0.506	0.964	irs	**53**	0.358	0.764	0.469	irs
11	0.094	0.097	0.969	drs	**55**	1.000	1.000	1.000	-
12	0.075	0.239	0.313	drs	**56**	0.069	0.078	0.886	drs
13	0.360	0.862	0.418	irs	**57**	0.520	0.522	0.997	irs
15	0.635	1.000	0.635	drs	**58**	0.257	0.274	0.938	irs
18	0.407	0.458	0.890	irs	**59**	0.742	0.835	0.888	irs
21	0.155	0.184	0.841	irs	**60**	0.338	0.442	0.765	irs
22	0.227	0.368	0.616	drs	**61**	0.815	0.824	0.988	drs
26	0.843	1.000	0.843	drs	**62**	0.449	1.000	0.449	drs
28	1.000	1.000	1.000	-	**63**	0.506	0.536	0.943	drs
29	0.226	0.336	0.672	irs	**64**	0.423	0.617	0.686	drs
30	1.000	1.000	1.000	-	**65**	0.643	0.695	0.924	irs
31	0.130	0.508	0.256	irs	**66**	0.392	0.446	0.879	drs
34	0.245	0.293	0.835	irs	**67**	1.000	1.000	1.000	-
35	1.000	1.000	1.000	-	**68**	0.360	0.532	0.676	drs
36	1.000	1.000	1.000	-	**69**	1.000	1.000	1.000	-
37	0.665	0.758	0.878	irs	**70**	0.157	0.317	0.494	irs
38	0.049	0.084	0.578	drs	**71**	0.667	0.852	0.783	drs
39	0.457	0.482	0.947	drs	**72**	0.171	0.213	0.805	Irs
40	0.254	0.553	0.459	drs	**73**	0.217	0.271	0.800	Irs
41	0.109	0.125	0.865	drs	**75**	0.587	0.662	0.886	Drs
43	0.076	0.078	0.977	irs	**76**	0.535	0.549	0.976	Drs
44	0.977	1.000	0.977	drs	**77**	0.313	0.318	0.986	Irs

The average efficiency scores for CRS, VRS and Scale are 0.43, 0.516 and 0.824 respectively

Table A-4.3.3-a: Post-IPO Efficiency Score of Stage 1 (After one year)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.222	0.293	0.756	irs	**45**	0.216	0.257	0.842	drs
2	0.278	0.280	0.991	irs	**46**	0.115	0.143	0.803	irs
3	1.000	1.000	1.000	-	**48**	0.501	0.503	0.994	irs
6	0.224	0.336	0.666	drs	**49**	0.179	0.596	0.301	irs
7	1.000	1.000	1.000	-	**50**	0.063	0.086	0.733	irs
8	0.000	0.073	0.000	irs	**51**	0.012	0.065	0.183	irs
9	0.166	0.185	0.900	irs	**52**	0.395	0.619	0.638	irs
10	0.003	0.251	0.012	irs	**53**	0.326	0.945	0.345	irs
11	0.005	0.043	0.116	irs	**55**	1.000	1.000	1.000	-
12	0.060	0.072	0.830	irs	**56**	0.084	0.091	0.924	irs
13	0.014	1.000	0.014	irs	**57**	0.639	0.811	0.787	drs
15	0.989	1.000	0.989	drs	**58**	0.005	0.121	0.039	irs
18	0.100	0.386	0.258	irs	**59**	0.120	0.188	0.638	irs
21	0.061	0.206	0.298	irs	**60**	0.310	0.476	0.651	irs
22	0.335	0.381	0.880	drs	**61**	0.037	0.531	0.070	irs
26	0.959	1.000	0.959	drs	**62**	0.240	1.000	0.240	drs
28	0.002	0.965	0.002	irs	**63**	0.000	0.216	0.000	irs
29	0.497	0.670	0.742	irs	**64**	0.046	0.091	0.502	irs
30	0.550	0.986	0.558	irs	**65**	0.020	0.552	0.036	irs
31	0.031	0.528	0.060	irs	**66**	0.554	0.563	0.983	irs
34	0.447	0.488	0.917	irs	**67**	0.000	1.000	0.000	irs
35	1.000	1.000	1.000	-	**68**	0.179	0.218	0.819	irs
36	0.706	1.000	0.706	drs	**69**	0.037	0.480	0.078	irs
37	0.602	0.877	0.686	irs	**70**	0.027	0.463	0.058	irs
38	0.028	0.041	0.682	irs	**71**	0.059	0.141	0.416	irs
39	0.318	0.355	0.895	irs	**72**	0.011	0.174	0.063	irs
40	0.508	0.833	0.610	drs	**73**	0.040	0.241	0.165	irs
41	0.120	0.133	0.903	irs	**75**	0.109	0.435	0.250	irs
43	0.127	0.130	0.980	irs	**76**	0.108	0.430	0.250	irs
44	0.367	0.380	0.965	irs	**77**	0.212	0.224	0.944	irs

The average efficiency scores for CRS, VRS and Scale are 0.273, 0.476 and 0.552 respectively

Table A-4.3.3-b: Post-IPO Efficiency Score of Stage 2 (After one year)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.010	0.067	0.143	irs	**45**	0.100	0.107	0.938	drs
2	0.059	0.059	1.000	-	**46**	0.167	0.167	0.999	-
3	1.000	1.000	1.000	-	**48**	0.158	0.158	1.000	-
6	0.217	0.360	0.602	drs	**49**	0.073	0.073	0.999	-
7	0.233	0.401	0.582	drs	**50**	0.013	0.086	0.146	drs
8	1.000	1.000	1.000	-	**51**	0.129	0.239	0.541	drs
9	0.200	0.200	1.000	-	**52**	0.091	0.091	1.000	-
10	0.009	0.041	0.221	irs	**53**	0.167	0.167	1.000	-
11	0.017	0.023	0.740	irs	**55**	0.415	0.734	0.566	drs
12	0.078	0.079	0.999	-	**56**	0.070	0.070	0.999	-
13	0.009	0.400	0.022	irs	**57**	0.023	0.234	0.097	drs
15	0.500	1.000	0.500	drs	**58**	0.026	0.071	0.371	irs
18	0.129	0.129	0.999	-	**59**	0.317	0.317	1.000	-
21	0.018	0.134	0.132	irs	**60**	0.087	0.087	1.000	-
22	0.302	0.620	0.487	drs	**61**	0.014	0.046	0.302	irs
26	0.367	1.000	0.367	drs	**62**	0.500	0.938	0.533	drs
28	0.021	0.400	0.053	irs	**63**	0.112	1.000	0.112	irs
29	0.205	0.205	1.000	-	**64**	0.208	0.241	0.865	irs
30	0.144	0.144	1.000	-	**65**	0.015	0.133	0.112	irs
31	0.002	0.100	0.019	irs	**66**	0.063	0.063	1.000	-
34	1.000	1.000	1.000	-	**67**	0.245	1.000	0.245	irs
35	0.800	1.000	0.800	drs	**68**	0.581	1.000	0.581	drs
36	0.540	0.970	0.557	drs	**69**	0.039	0.139	0.280	irs
37	0.155	0.155	1.000	-	**70**	0.077	0.078	0.994	irs
38	0.083	0.084	0.994	irs	**71**	0.018	0.101	0.176	irs
39	0.100	0.100	0.999	-	**72**	0.012	0.081	0.144	irs
40	0.367	0.732	0.501	drs	**73**	0.340	1.000	0.340	drs
41	0.084	0.084	0.999	-	**75**	0.014	0.172	0.083	drs
43	0.043	0.044	1.000	-	**76**	0.014	0.121	0.113	drs
44	0.141	0.141	1.000	-	**77**	0.069	0.069	0.999	-

The average efficiency scores for CRS, VRS and Scale are 0.2, 0.341 and 0.637 respectively

Table A-4.3.3-c: Post-IPO Efficiency Score of Stage 3 (After one year)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.086	0.187	0.459	irs	**45**	0.105	0.107	0.986	irs
2	0.282	0.284	0.992	drs	**46**	0.497	0.521	0.954	drs
3	1.000	1.000	1.000	-	**48**	0.262	0.262	1.000	-
6	0.118	0.120	0.976	drs	**49**	0.170	0.590	0.288	irs
7	0.556	0.758	0.734	drs	**50**	0.167	0.176	0.952	irs
8	0.333	0.334	0.998	drs	**51**	0.238	0.241	0.986	irs
9	0.200	0.201	0.998	-	**52**	0.197	0.529	0.372	irs
10	0.169	0.289	0.585	irs	**53**	0.487	0.991	0.492	irs
11	0.163	0.165	0.989	irs	**55**	1.000	1.000	1.000	-
12	0.328	0.341	0.964	drs	**56**	0.063	0.063	0.997	-
13	1.000	1.000	1.000	-	**57**	0.227	0.231	0.980	irs
15	1.000	1.000	1.000	-	**58**	0.099	0.154	0.645	irs
18	0.163	0.389	0.418	irs	**59**	1.000	1.000	1.000	-
21	0.173	0.210	0.823	irs	**60**	0.199	0.437	0.456	irs
22	0.418	0.432	0.969	drs	**61**	0.324	0.624	0.520	irs
26	1.000	1.000	1.000	-	**62**	0.150	0.368	0.407	drs
28	0.114	0.984	0.116	irs	**63**	0.081	0.232	0.347	irs
29	0.535	0.591	0.905	irs	**64**	0.120	0.131	0.914	irs
30	0.221	0.847	0.261	irs	**65**	0.118	0.575	0.205	irs
31	0.121	0.525	0.230	irs	**66**	0.325	0.326	0.997	drs
34	1.000	1.000	1.000	-	**67**	0.057	1.000	0.057	irs
35	1.000	1.000	1.000	-	**68**	0.242	0.242	0.998	irs
36	0.822	1.000	0.822	drs	**69**	0.157	0.482	0.325	irs
37	0.211	0.742	0.285	irs	**70**	0.032	0.441	0.072	irs
38	0.088	0.092	0.950	drs	**71**	0.229	0.230	0.995	drs
39	0.169	0.185	0.913	irs	**72**	0.076	0.184	0.414	irs
40	0.525	0.610	0.861	drs	**73**	0.963	0.988	0.974	irs
41	0.109	0.111	0.984	drs	**75**	0.493	0.519	0.949	irs
43	0.089	0.092	0.972	irs	**76**	0.448	0.498	0.899	irs
44	0.595	0.603	0.987	irs	**77**	0.195	0.206	0.948	irs

The average efficiency scores for CRS, VRS and Scale are 0.355, 0.491 and 0.755 respectively

Table A-4.3.3-a2: Post-IPO Efficiency Score of Stage 1 (After two years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.428	0.489	0.874	irs	**45**	0.161	0.165	0.973	irs
2	0.101	0.123	0.818	irs	**46**	0.217	0.416	0.520	irs
3	1.000	1.000	1.000	-	**48**	0.435	0.519	0.839	irs
6	0.276	0.297	0.928	drs	**49**	0.266	0.623	0.426	irs
7	0.476	0.580	0.820	irs	**50**	0.048	0.081	0.595	irs
8	0.000	0.101	0.000	irs	**51**	0.025	0.054	0.466	irs
9	0.294	0.394	0.746	irs	**52**	0.003	0.626	0.005	irs
10	0.001	0.207	0.007	irs	**53**	0.734	1.000	0.734	irs
11	0.028	0.083	0.337	irs	**55**	0.388	0.544	0.714	irs
12	0.355	0.388	0.915	irs	**56**	0.186	0.233	0.798	irs
13	0.119	0.912	0.130	irs	**57**	0.229	0.243	0.943	irs
15	1.000	1.000	1.000	-	**58**	0.030	0.143	0.210	irs
18	0.106	0.574	0.185	irs	**59**	0.000	0.463	0.001	irs
21	0.051	0.574	0.089	irs	**60**	0.064	0.371	0.172	irs
22	0.338	0.346	0.975	drs	**61**	0.133	0.644	0.207	irs
26	0.993	1.000	0.993	drs	**62**	0.330	1.000	0.330	drs
28	0.005	0.856	0.006	irs	**63**	0.000	0.258	0.000	irs
29	0.937	1.000	0.937	irs	**64**	0.106	0.141	0.752	irs
30	0.430	0.896	0.479	irs	**65**	0.659	0.962	0.685	irs
31	0.025	1.000	0.025	irs	**66**	0.219	0.352	0.621	irs
34	0.579	0.629	0.922	irs	**67**	0.005	1.000	0.005	irs
35	1.000	1.000	1.000	-	**68**	0.211	0.242	0.869	irs
36	0.854	1.000	0.854	drs	**69**	0.190	0.475	0.401	irs
37	0.607	0.962	0.631	irs	**70**	0.026	0.469	0.055	irs
38	0.116	0.205	0.565	irs	**71**	0.257	0.480	0.536	irs
39	0.432	0.718	0.602	irs	**72**	0.100	0.303	0.330	irs
40	0.471	0.507	0.931	drs	**73**	0.039	0.220	0.176	irs
41	0.322	0.398	0.809	irs	**75**	1.000	1.000	1.000	-
43	0.232	0.247	0.937	irs	**76**	1.000	1.000	1.000	-
44	0.596	0.720	0.827	irs	**77**	0.205	0.305	0.672	irs

The average efficiency scores for CRS, VRS and Scale are 0.324, 0.542 and 0.573 respectively

Table A-4.3.3-b2: Post-IPO Efficiency Score of Stage 2 (After two years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.082	0.082	0.999	-	**45**	0.008	0.861	0.009	drs
2	0.052	0.629	0.082	drs	**46**	0.200	0.200	1.000	-
3	1.000	1.000	1.000	-	**48**	0.106	0.106	1.000	-
6	0.232	0.405	0.574	drs	**49**	0.060	0.060	0.999	-
7	0.092	0.215	0.426	drs	**50**	0.157	0.157	0.996	drs
8	1.000	1.000	1.000	-	**51**	0.084	0.930	0.091	drs
9	0.200	0.200	1.000	-	**52**	0.104	0.500	0.208	irs
10	0.051	0.816	0.062	drs	**53**	0.200	0.200	1.000	-
11	0.376	1.000	0.376	drs	**55**	0.283	0.283	1.000	-
12	0.079	0.697	0.114	drs	**56**	0.083	0.086	0.973	irs
13	0.240	0.240	0.999	-	**57**	0.025	0.025	1.000	-
15	0.600	1.000	0.600	drs	**58**	0.005	0.025	0.193	irs
18	0.067	0.247	0.271	irs	**59**	0.018	0.100	0.181	irs
21	0.018	0.166	0.108	irs	**60**	0.060	0.060	0.998	-
22	0.193	0.504	0.384	drs	**61**	0.011	0.050	0.217	irs
26	0.599	1.000	0.599	drs	**62**	0.460	0.708	0.650	drs
28	0.015	0.167	0.091	irs	**63**	0.019	0.250	0.077	irs
29	0.402	0.402	1.000	-	**64**	0.158	1.000	0.158	irs
30	0.119	0.119	1.000	-	**65**	0.100	0.100	1.000	-
31	0.005	0.125	0.037	irs	**66**	0.080	0.082	0.984	irs
34	1.000	1.000	1.000	-	**67**	0.001	0.050	0.022	irs
35	1.000	1.000	1.000	-	**68**	0.522	1.000	0.522	drs
36	0.394	0.678	0.580	drs	**69**	0.060	0.060	0.999	-
37	0.103	0.103	1.000	-	**70**	0.092	0.093	0.994	irs
38	0.100	0.100	0.997	-	**71**	0.200	0.200	1.000	-
39	0.120	0.158	0.758	drs	**72**	0.027	0.099	0.276	irs
40	0.362	1.000	0.362	drs	**73**	0.171	0.183	0.934	drs
41	0.100	0.102	0.984	irs	**75**	0.017	0.058	0.292	drs
43	0.056	0.060	0.935	irs	**76**	0.129	0.130	0.999	-
44	0.258	0.319	0.808	drs	**77**	0.083	0.083	1.000	-

The average efficiency scores for CRS, VRS and Scale are 0.207, 0.371 and 0.649 respectively

Table A-4.3.3-c2: Post-IPO Efficiency Score of Stage 3 (After two years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.398	0.457	0.871	irs	**45**	0.240	0.257	0.935	irs
2	0.348	0.366	0.950	irs	**46**	0.780	0.903	0.864	irs
3	1.000	1.000	1.000	-	**48**	0.167	0.262	0.638	irs
6	0.150	0.151	0.996	irs	**49**	0.228	0.723	0.315	irs
7	0.496	0.540	0.919	irs	**50**	0.073	0.106	0.689	irs
8	0.209	0.246	0.847	irs	**51**	0.119	0.129	0.921	irs
9	0.322	0.400	0.807	irs	**52**	0.143	0.673	0.212	irs
10	0.234	0.390	0.600	irs	**53**	0.275	1.000	0.275	irs
11	0.337	0.362	0.931	irs	**55**	0.398	0.724	0.550	irs
12	0.793	0.824	0.962	irs	**56**	0.034	0.085	0.398	irs
13	0.137	0.928	0.148	irs	**57**	0.056	0.115	0.484	irs
15	1.000	1.000	1.000	-	**58**	0.040	0.149	0.271	irs
18	0.279	0.684	0.408	irs	**59**	0.193	0.615	0.314	irs
21	0.163	0.619	0.262	irs	**60**	0.194	0.508	0.381	irs
22	0.332	0.336	0.989	irs	**61**	0.213	0.698	0.306	irs
26	1.000	1.000	1.000	-	**62**	0.256	0.256	0.999	-
28	0.121	0.915	0.132	irs	**63**	0.045	0.276	0.163	irs
29	0.426	0.692	0.615	irs	**64**	0.006	0.060	0.103	irs
30	0.204	0.761	0.269	irs	**65**	0.184	0.665	0.277	irs
31	0.249	1.000	0.249	irs	**66**	0.346	0.398	0.868	irs
34	1.000	1.000	1.000	-	**67**	0.040	1.000	0.040	irs
35	1.000	1.000	1.000	-	**68**	0.254	0.275	0.924	irs
36	0.665	0.931	0.714	drs	**69**	0.095	0.482	0.198	irs
37	0.205	0.685	0.300	irs	**70**	0.076	0.481	0.159	irs
38	0.141	0.206	0.684	irs	**71**	0.244	0.414	0.589	irs
39	0.825	1.000	0.825	irs	**72**	0.180	0.341	0.529	irs
40	0.664	0.665	0.999	irs	**73**	0.313	0.480	0.652	irs
41	0.072	0.134	0.536	irs	**75**	0.611	0.757	0.807	irs
43	0.044	0.082	0.541	irs	**76**	0.623	0.757	0.823	irs
44	0.591	0.684	0.864	irs	**77**	0.141	0.272	0.517	irs

The average efficiency scores for CRS, VRS and Scale are 0.333, 0.549 and 0.61 respectively

Table A-4.3.3-a3: Post-IPO Efficiency Score of Stage 1 (After three years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.578	0.633	0.913	irs	**45**	0.043	0.075	0.573	irs
2	0.446	0.450	0.991	drs	**46**	1.000	1.000	1.000	-
3	1.000	1.000	1.000	-	**48**	0.262	0.320	0.821	irs
6	0.303	0.371	0.817	drs	**49**	0.000	0.765	0.000	irs
7	0.717	0.717	1.000	-	**50**	0.078	0.087	0.892	irs
8	0.424	0.445	0.951	irs	**51**	0.056	0.066	0.844	irs
9	0.389	0.436	0.893	irs	**52**	0.000	0.779	0.000	irs
10	0.002	0.189	0.012	irs	**53**	0.547	1.000	0.547	irs
11	0.039	0.082	0.478	irs	**55**	0.319	0.741	0.431	irs
12	0.346	0.366	0.944	irs	**56**	0.366	0.410	0.891	irs
13	0.187	0.908	0.206	irs	**57**	0.177	0.216	0.817	irs
15	0.804	1.000	0.804	drs	**58**	0.005	0.105	0.050	irs
18	0.180	0.504	0.357	irs	**59**	0.004	0.589	0.007	irs
21	0.069	1.000	0.069	irs	**60**	0.178	0.448	0.399	irs
22	0.423	0.466	0.909	drs	**61**	0.344	0.574	0.600	irs
26	0.744	1.000	0.744	drs	**62**	0.343	1.000	0.343	drs
28	0.009	0.980	0.009	irs	**63**	0.000	0.206	0.001	irs
29	0.154	0.459	0.336	irs	**64**	0.194	0.201	0.963	irs
30	0.099	0.913	0.109	irs	**65**	0.139	0.721	0.192	irs
31	0.048	1.000	0.048	irs	**66**	0.275	0.385	0.715	irs
34	0.640	0.757	0.845	irs	**67**	0.009	1.000	0.009	irs
35	1.000	1.000	1.000	-	**68**	0.286	0.301	0.952	irs
36	0.788	1.000	0.788	drs	**69**	0.044	0.777	0.056	irs
37	1.000	1.000	1.000	-	**70**	0.026	0.758	0.035	irs
38	0.178	0.297	0.601	irs	**71**	0.131	0.261	0.501	irs
39	0.781	0.932	0.837	irs	**72**	0.605	0.729	0.830	irs
40	0.357	0.581	0.614	drs	**73**	0.056	0.260	0.215	irs
41	0.599	0.706	0.849	irs	**75**	1.000	1.000	1.000	-
43	0.342	0.358	0.954	irs	**76**	1.000	1.000	1.000	-
44	0.623	0.647	0.963	irs	**77**	0.304	0.353	0.861	irs

The average efficiency scores for CRS, VRS and Scale are 0.351, 0.605 and 0.593respectively

Table A-4.3.3-b3: Post-IPO Efficiency Score of Stage 2 (After three years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.109	0.109	1.000	-	**45**	0.812	0.822	0.988	irs
2	0.067	0.459	0.146	drs	**46**	0.367	0.367	1.000	-
3	1.000	1.000	1.000	-	**48**	0.102	0.102	1.000	-
6	0.150	0.445	0.337	drs	**49**	1.000	1.000	1.000	-
7	0.111	0.223	0.496	drs	**50**	1.000	1.000	1.000	-
8	0.033	0.261	0.126	drs	**51**	1.000	1.000	1.000	-
9	0.267	0.267	1.000	-	**52**	0.477	0.550	0.867	irs
10	0.767	1.000	0.767	drs	**53**	0.133	0.133	1.000	-
11	0.383	0.561	0.683	drs	**55**	0.213	0.213	1.000	-
12	0.106	0.365	0.290	drs	**56**	0.112	0.112	1.000	-
13	0.320	0.320	1.000	-	**57**	0.029	0.029	1.000	-
15	0.300	1.000	0.300	drs	**58**	0.512	1.000	0.512	irs
18	0.209	0.274	0.762	irs	**59**	0.042	0.100	0.420	irs
21	0.184	0.200	0.919	irs	**60**	0.080	0.131	0.613	drs
22	0.127	0.640	0.198	drs	**61**	0.088	0.098	0.895	irs
26	0.400	1.000	0.400	drs	**62**	0.250	0.690	0.362	drs
28	0.007	0.025	0.293	irs	**63**	0.046	0.150	0.307	irs
29	0.160	0.283	0.567	drs	**64**	0.016	0.097	0.163	irs
30	0.152	0.152	1.000	-	**65**	0.133	0.133	1.000	-
31	0.008	0.027	0.290	irs	**66**	0.534	0.583	0.917	irs
34	0.467	1.000	0.467	drs	**67**	0.004	0.060	0.072	irs
35	0.733	1.000	0.733	drs	**68**	0.304	1.000	0.304	drs
36	0.182	0.419	0.434	drs	**69**	0.056	0.136	0.412	irs
37	0.138	0.138	1.000	-	**70**	0.112	0.273	0.412	irs
38	0.025	0.033	0.737	irs	**71**	0.111	0.111	1.000	-
39	0.160	0.267	0.600	drs	**72**	0.125	0.250	0.502	irs
40	0.117	0.673	0.173	drs	**73**	1.000	1.000	1.000	-
41	0.020	0.100	0.197	irs	**75**	0.067	0.103	0.646	drs
43	0.064	0.112	0.574	irs	**76**	0.117	0.159	0.733	drs
44	0.167	0.167	1.000	-	**77**	0.110	0.110	1.000	-

The average efficiency scores for CRS, VRS and Scale are 0.265, 0.401 and 0.66 respectively

Table A-4.3.3-c3: Post-IPO Efficiency Score of Stage 3 (After three years)

IPO Firms	CRS	VRS	Scale	i/d	IPO Firms	CRS	VRS	Scale	i/d
1	0.288	0.288	0.999	-	**45**	0.049	0.066	0.746	irs
2	0.568	0.590	0.963	drs	**46**	0.385	0.476	0.808	irs
3	1.000	1.000	1.000	-	**48**	0.084	0.159	0.529	irs
6	0.176	0.183	0.963	drs	**49**	0.144	0.769	0.187	irs
7	0.480	0.483	0.995	irs	**50**	0.072	0.075	0.956	irs
8	0.266	0.269	0.988	drs	**51**	0.117	0.124	0.942	drs
9	0.285	0.292	0.974	drs	**52**	0.145	0.787	0.184	irs
10	0.227	0.298	0.761	irs	**53**	0.272	1.000	0.272	irs
11	0.270	0.292	0.927	drs	**55**	0.318	0.829	0.383	irs
12	0.510	0.524	0.973	drs	**56**	0.055	0.099	0.552	irs
13	0.158	0.913	0.173	irs	**57**	0.035	0.099	0.359	irs
15	1.000	1.000	1.000	-	**58**	0.041	0.108	0.383	irs
18	0.507	0.556	0.913	irs	**59**	0.144	0.646	0.222	irs
21	0.970	1.000	0.970	irs	**60**	0.234	0.468	0.500	irs
22	0.373	0.413	0.902	drs	**61**	0.556	0.563	0.988	irs
26	1.000	1.000	1.000	-	**62**	0.272	0.296	0.916	drs
28	0.099	0.982	0.101	irs	**63**	0.041	0.206	0.200	irs
29	0.570	0.607	0.939	irs	**64**	0.005	0.060	0.085	irs
30	0.221	0.940	0.235	irs	**65**	0.161	0.734	0.220	irs
31	0.259	1.000	0.259	irs	**66**	0.414	0.421	0.983	irs
34	1.000	1.000	1.000	-	**67**	0.044	1.000	0.044	irs
35	1.000	1.000	1.000	-	**68**	0.164	0.170	0.969	irs
36	0.433	0.529	0.819	drs	**69**	0.052	0.777	0.068	irs
37	1.000	1.000	1.000	-	**70**	0.070	0.758	0.092	irs
38	0.116	0.143	0.816	irs	**71**	0.202	0.320	0.630	irs
39	1.000	1.000	1.000	-	**72**	0.164	0.267	0.615	irs
40	0.282	0.321	0.877	drs	**73**	0.455	0.592	0.769	irs
41	0.051	0.146	0.348	irs	**75**	0.456	0.683	0.668	irs
43	0.034	0.047	0.735	irs	**76**	0.585	0.771	0.758	irs
44	0.170	0.221	0.767	irs	**77**	0.265	0.305	0.869	irs

The average efficiency scores for CRS, VRS and Scale are 0.339, 0.528 and0.672 respectively

Table A-4.3.4-a: Stage 1, Post-IPO Efficiency using MPI

IPO Firms	effch	techch	Pech	sech	tfpch	IPO Firms	effch	techch	pech	sech	tfpch
1	1.051	0.753	0.732	1.513	1.169	**45**	0.266	1.037	1.299	0.771	1.018
2	0.917	1.030	1.071	0.880	1.167	**46**	1.116	1.054	1.146	1.031	0.519
3	1.000	1.369	0.985	1.192	1.265	**48**	0.603	0.861	1.244	0.358	0.564
6	1.100	1.076	1.018	0.978	1.160	**49**	0.620	1.541	1.294	0.932	1.176
7	1.007	1.056	1.040	1.221	1.127	**50**	1.016	0.775	1.162	1.219	1.195
8	1.075	1.064	1.089	1.095	0.809	**51**	1.130	0.753	1.124	1.182	1.274
9	1.025	0.851	1.000	1.116	1.010	**52**	0.006	0.962	0.452	1.281	0.353
10	1.027	0.699	1.185	1.063	1.110	**53**	0.745	1.441	1.236	1.241	1.292
11	1.096	0.753	1.271	0.749	1.173	**55**	0.822	1.410	0.993	1.038	1.265
12	0.974	1.070	1.000	0.005	1.228	**56**	1.167	0.870	1.232	0.917	1.225
13	1.075	1.057	1.000	0.603	1.219	**57**	0.770	1.526	1.000	0.520	0.821
15	1.014	1.167	1.145	1.230	1.132	**58**	0.175	0.753	0.749	0.936	1.211
18	1.092	0.753	1.208	0.923	0.132	**59**	1.005	0.980	0.898	1.152	1.157
21	1.044	0.725	1.317	1.177	1.042	**60**	0.940	1.452	1.250	1.103	0.974
22	1.253	1.020	1.149	1.118	1.039	**61**	1.083	0.753	1.092	1.164	1.261
26	1.049	1.386	1.107	1.018	1.241	**62**	1.038	1.060	1.000	0.745	0.282
28	1.122	0.699	1.000	1.441	1.017	**63**	1.052	0.753	1.000	0.239	1.012
29	0.164	1.090	0.459	1.000	1.073	**64**	1.124	0.753	1.240	0.227	0.957
30	0.231	1.528	1.046	1.044	0.276	**65**	0.210	1.341	0.995	1.201	1.147
31	1.141	0.725	0.545	1.000	0.006	**66**	0.958	0.725	1.506	1.211	0.873
34	1.104	1.354	0.944	1.281	0.179	**67**	1.088	0.699	1.000	1.319	1.184
35	1.000	0.873	1.078	0.589	0.270	**68**	1.058	0.897	1.227	1.000	1.279
36	0.923	1.303	1.000	1.199	1.277	**69**	0.231	1.171	1.243	1.066	1.199
37	1.047	1.373	0.916	0.280	1.353	**70**	1.032	0.795	1.163	0.804	1.100
38	1.037	0.753	0.891	1.188	1.051	**71**	0.510	1.105	1.146	1.049	1.269
39	1.107	1.112	1.000	1.110	1.137	**72**	1.047	0.753	1.337	1.197	1.203
40	0.758	1.068	1.204	1.184	0.938	**73**	0.948	0.699	1.155	1.391	1.203
41	1.158	0.753	1.000	0.866	1.245	**75**	1.000	0.957	1.102	1.000	1.252
43	0.975	0.753	0.799	0.638	1.249	**76**	1.000	0.948	0.616	1.222	1.108
44	1.046	1.214	0.877	0.141	0.948	**77**	0.980	1.032	1.148	0.660	0.912

The averages of efficiency change (effch), technical change (techch), pure efficiency change (pech), scale efficiency change (sech) & total factor productivity change (tfch) are 0.778, 0.974, 1.027, 0.831 and 0.860 respectively.

Table A-4.3.4-b: Stage 2, Post-IPO Efficiency using MPI

IPO Firms	effch	techch	pech	sech	tfpch	IPO Firms	effch	techch	pech	sech	tfpch
1	0.750	0.749	1.037	0.974	1.006	**45**	1.024	0.686	1.081	1.158	1.201
2	0.750	0.969	1.200	0.614	1.051	**46**	0.832	0.639	1.075	0.966	1.137
3	1.000	0.595	0.934	1.000	0.980	**48**	0.965	1.037	1.000	1.000	0.867
6	0.646	1.191	0.923	1.135	1.091	**49**	1.049	0.498	0.522	0.567	1.000
7	1.208	0.827	1.033	1.181	1.121	**50**	1.173	0.539	0.600	0.500	0.909
8	0.033	0.368	0.150	1.034	1.000	**51**	1.044	0.527	0.667	1.000	0.519
9	1.333	0.750	0.989	1.222	1.094	**52**	0.179	0.321	0.097	0.126	0.012
10	1.023	0.337	0.618	0.558	0.160	**53**	0.667	0.787	1.022	1.030	0.965
11	1.018	0.497	1.000	1.000	0.506	**55**	0.754	0.892	1.032	1.066	0.795
12	0.800	0.750	0.978	1.028	1.000	**56**	0.642	0.750	1.000	1.000	1.000
13	0.634	0.750	0.524	0.747	1.111	**57**	1.157	0.750	1.138	0.848	1.051
15	0.500	1.198	0.955	1.000	1.000	**58**	1.020	0.428	0.975	0.733	1.071
18	1.019	0.514	1.099	1.000	1.000	**59**	1.026	0.245	0.261	0.739	1.101
21	1.006	0.353	1.000	0.734	0.525	**60**	0.750	0.838	0.967	1.001	1.000
22	0.655	1.144	1.135	1.134	1.266	**61**	1.158	0.414	1.000	0.413	0.128
26	0.668	1.197	1.135	1.277	1.223	**62**	0.543	1.175	1.076	0.414	0.136
28	0.481	0.333	0.673	0.583	1.073	**63**	1.099	0.331	0.982	1.000	0.595
29	0.398	0.812	1.121	1.094	1.191	**64**	0.100	0.664	0.561	1.204	1.181
30	0.750	0.765	1.011	1.112	1.008	**65**	0.534	0.750	1.170	1.004	1.000
31	0.707	0.333	0.703	0.997	0.569	**66**	1.153	0.661	1.000	0.614	0.373
34	0.467	1.199	1.079	1.158	1.171	**67**	1.098	0.331	0.333	0.478	0.642
35	0.733	1.088	1.176	0.991	1.180	**68**	0.583	0.640	1.169	0.932	1.141
36	0.461	1.170	1.175	0.951	1.000	**69**	0.937	0.555	1.000	1.043	0.569
37	0.534	0.750	1.085	1.089	1.131	**70**	1.216	0.560	0.754	0.515	0.933
38	0.246	0.553	1.000	1.000	0.794	**71**	0.556	0.852	0.218	0.200	0.066
39	0.750	0.750	0.730	0.588	0.474	**72**	1.179	0.515	0.945	1.000	1.151
40	0.322	1.172	0.912	0.791	0.672	**73**	1.161	0.477	0.556	0.467	0.635
41	0.196	0.651	0.965	0.668	1.081	**75**	1.033	0.610	1.110	1.001	1.118
43	1.155	0.687	1.157	1.000	0.681	**76**	0.902	1.146	1.140	1.001	0.999
44	0.646	0.828	1.101	1.020	1.161	**77**	0.750	0.750	0.956	1.000	0.993

The averages of efficiency change (effch), technical change (techch), pure efficiency change (pech), scale efficiency change (sech) & total factor productivity change (tfch) are 0.686, 0.658, 0.825, 0.821 and 0.741 respectively.

Table A-4.3.4-c: Stage 3, Post-IPO Efficiency using MPI

IPO Firms	effch	techch	pech	sech	tfpch	IPO Firms	effch	techch	pech	Sech	tfpch
1	0.722	0.827	1.232	1.181	0.855	**45**	0.204	0.862	1.005	1.146	1.201
2	1.246	0.864	0.745	0.917	0.879	**46**	1.093	0.823	1.019	1.000	0.873
3	1.000	1.137	0.806	0.742	0.789	**48**	0.502	0.934	1.089	0.759	0.589
6	1.174	0.924	0.255	1.251	0.845	**49**	0.630	0.866	1.158	1.000	0.427
7	0.968	1.027	1.213	0.995	0.949	**50**	0.980	1.112	0.895	0.868	0.807
8	1.210	0.933	0.570	1.070	1.182	**51**	0.982	0.933	0.324	0.922	0.628
9	0.883	0.935	1.000	0.888	1.022	**52**	1.015	1.201	1.093	1.000	0.628
10	0.969	0.964	1.000	0.878	1.269	**53**	0.991	1.027	1.272	1.146	1.185
11	0.802	0.855	1.000	0.935	1.209	**55**	0.798	0.847	1.059	0.967	0.895
12	0.643	0.850	1.201	1.014	0.380	**56**	1.237	1.039	0.813	1.211	0.769
13	1.154	0.940	0.691	1.132	0.741	**57**	0.634	1.068	1.000	1.192	0.987
15	1.000	1.103	0.984	0.829	1.188	**58**	1.022	1.185	0.731	1.227	1.245
18	1.255	0.872	1.049	1.000	0.812	**59**	0.742	0.883	0.723	0.832	0.691
21	1.291	0.907	0.707	0.793	0.551	**60**	1.192	0.855	1.056	1.038	0.726
22	1.123	0.987	1.074	1.241	1.102	**61**	1.273	1.291	0.630	1.049	0.404
26	1.000	0.974	1.235	1.166	1.281	**62**	1.062	0.908	1.064	0.875	0.966
28	0.815	0.860	1.105	0.912	0.635	**63**	0.915	0.997	1.232	1.208	1.055
29	1.219	0.959	1.000	0.650	1.196	**64**	0.836	1.122	0.636	1.105	1.281
30	1.081	0.839	0.773	1.191	1.004	**65**	0.876	1.163	0.764	1.271	1.257
31	1.038	0.952	0.569	1.162	0.988	**66**	1.183	0.919	0.527	1.180	0.673
34	1.000	0.975	0.877	0.991	1.152	**67**	1.105	0.825	0.902	1.023	0.723
35	1.000	0.954	1.000	1.201	0.600	**68**	0.648	0.819	1.122	1.291	0.656
36	0.652	0.870	0.806	1.231	0.917	**69**	0.552	0.885	1.161	1.172	1.123
37	1.282	0.900	1.169	1.012	0.196	**70**	0.911	0.829	0.784	0.707	0.732
38	1.084	0.990	1.000	1.212	1.293	**71**	0.827	0.948	1.202	1.082	0.803
39	1.201	0.871	0.920	1.221	0.867	**72**	0.911	0.889	1.144	1.261	1.037
40	0.424	1.115	1.000	1.281	1.197	**73**	1.228	0.894	1.000	0.798	0.905
41	0.707	0.934	0.483	0.828	1.041	**75**	0.747	0.910	0.605	0.578	1.221
43	1.077	1.005	1.061	1.092	1.109	**76**	0.940	0.851	0.617	0.342	1.233
44	0.287	1.203	1.130	1.000	0.727	**77**	1.264	0.884	0.855	0.697	0.851

The averages of efficiency change (effch), technical change (techch), pure efficiency change (pech), scale efficiency change (sech) & total factor productivity change (tfch) are 0.898, 0.949, 0.880, 0.992 and 0.862 respectively.