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IPO UNDERPRICING PHENOMENON ON THE KARACHI STOCK EXCHANGE

In this study the risk-adjusted performance of IPO firms listed on the KSE from 2000 to 2012 is analyzed. The objective is to provide insights of the underpricing (first trading day) of IPOs and to find out the determinants of underpricing in the light of asymmetric information and signaling theories. The results indicate that underpricing prevails on the KSE. The level of underpricing with regard to the marked adjusted model is found to be 28.28 percent for the full sample of 83 IPOs, which shows that investors can make a market adjusted profit of 28.28 percent by investing in new issues of IPO firms. The profit opportunity for the day traders is also observed. The year-wise analysis of the level of underpricing shows that the overall amount of level of underpricing decreased over the succeeding years. Furthermore, the level of underpricing is observed in all sectors except equity investment instruments, technology hardware and equipment and personal goods. The risk adjusted performance of IPO firms is also measured with the help of five models by using matched firm techniques. The level of underpricing is observed to be 39.64 percent for the market adjusted model, 42.63 percent for market model, 42.31 percent for CAPM, 42.84 percent for the Fama-French three-factor model and 42.99 percent for the four-factor model. The results indicate that the choice of model does not matter while measuring the risk adjusted returns of IPO firms on the first trading day.

Keywords: tracking error, matched firms, underpricing, IPOs, KSE

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1. INTRODUCTION

An initial public offering (IPO) means the issuing of securities for the first time to the general public. These securities include debt, common stocks or preference stocks. The firms issue securities to raise capital for the expansion of business operations and to promote the value of the firm. Underpricing of IPO seems to be a common characteristic of IPOs prevailing all over the world and it results in the initial excess return on the IPO

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investment. Investors of IPOs can earn huge returns if they manage to sell on the first day of trading of the IPOs. This high return of the IPOs on the first trading day is called underpricing. Underpricing means the pricing of an IPO at less than its market value on the closing of the first trading day. In other words, this is a huge return to investors that motivates them to subscribe for IPO firms.

The Karachi Stock Exchange (KSE) is the largest as well as the most liquid market of Pakistan. After going through different phases, the demutualization process of the KSE was completed in August 2012. After demutualization, it is now a public company limited by shares. The market capitalization of the KSE rose to US\$ 2.0701 on 30 June 2013. The KSE has now six indices, i.e. the KSE-100, KSE-30, KSE All Share Index, KMI-30, Oil & Gas sector Index and Banking sector Index. The KSE has been the most volatile market in the world. However, after the year 2000 it has shown tremendous performance. After a slump (2010-2011), the KSE-100 index crossed the barrier of 29,000 points on 20 April 2014 which is almost three times just in a period of less than four years (the KSE-100 index was 10,260 on 8 October 2010). In 2012-13, a 52% increase in the KSE index was observed. Due to this performance the KSE remained top in all the emerging Asian countries during 2012-13.

Pakistan witnessed stimulating expansion of the IPOs market in the 1990s. Table 1 provides the listing of new companies, both private as well as State Owned Enterprises (SOEs), from 1992 to 2012.

Table 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.

A firm can raise funds from different sources such as private equity placement, equity capital, bonds, debentures, preference equity and loans. Table 2 shows that raising funds through IPOs is the main source of funding in the world.

Table 2
IPOs and fund raising

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.

In the global context, the US and UK IPO markets have been the most widely researched, which over the past 50 years has 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.

The Pakistani IPOs market is not explored regarding research on different issues of IPOs. Only limited research regarding IPOs literature with reference to Pakistan is available (Sohail and Nasr, 2007; Rizwan and Khan, 2007; Sohail and Raheman, 2009, 2010; Kayaniand and Amjed, 2011). This provides strong motivation for the examination of the performance of IPOs. Significant underpricing 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 and Nasr (2007) for Pakistan. The study aims to analyze the performance of IPOs in Pakistan. The objective is to determine the under/overpricing of IPOs in Pakistan and to predict the under/overpricing of IPOs. Furthermore, both the sector-wise and year-wise performance of IPOs will also be examined. This study is important in several ways. First, it uses different models to capture the effect of risk-adjusted performance (level of underpricing). Second, the matched firms will be used to capture the risk-adjusted returns (level of underpricing) as in previous studies only market adjusted returns are used for underpricing. Third, the study will analyze the sector-wise and year-wise performance of IPOs. Fourth, the regression analysis will be used to analyze underpricing. This study will provide important policy implications to investors.

2. REVIEW OF LITERATURE

The phenomenon of underpricing has been extensively studied by different researchers in different time horizons. The underpricing issue in Pakistani IPOs market was first analyzed by Sohail and Nasr (2007) showing an underpricing of 35.66%. They have also found the effect of different variables that influenced the underpricing. Table 3 provides the comprehensive literature. The literature review reveals that different countries have different levels of underpricing in different time horizons.

From the results presented in Table 3, the highest level of underpricing has been reported by Datar and Mao (2006) in China. They reported 388 percent of underpricing by taking a sample of 226 firms during the period 1990 to 1996. Similarly, Hoque and Musa (2002) also reported the highest level of underpricing of 285 percent in Bangladesh by taking a sample of 113 firms in the period of 1984 to 2001. More than 100 percent 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 percent and 100 percent. The table illustrates that in some countries like Norway, Chile, Egypt, Denmark, Canada, Austria, Israel, Argentina, France and Russia, underpricing has been observed at the lowest level, at below 10 percent. The overall results presented in the table suggest that the level of underpricing varies from country to country.

Table 3
Level of underpricing across the globe

Country	Researchers	Sample size	Time period	Under-pricing
1	2	3	4	5
Argentina	Eijgenhuijsen and Valk (1997)	20	1991-1994	4.40%
Australia	Lee et al. (1996)	381	1976-1995	12.10%
Australia	Woo (2006)	1,103	1976-2006	19.80%
Austria	Aussenegg (2006)	96	1971-2006	6.50%
Bangladesh	Islam et al. (2010)	95	1994-1999	116.01%
Bangladesh	Hoque and Musa (2002)	113	1994- 2001	285.21%
Belgium	Rogiers et al. (1993)	28	1984-1990	10.10%
Brazil	Aggarwal et al. (1993)	62	1979-1990	78.50%
Brazil	Schiozer et al. (2010)	180	1979-2006	48.70%
Canada	Jog and Riding (1987)	258	1971-1992	5.40%
Canada	Kryzanowski et al. (2005)	696	1971-2010	6.70%
China	Datar and Mao (2006)	226	1990-1996	388.00%
China	Chen et al. (2007)	1,394	1990-2005	164.50%
Egypt	Omran (2005)	53	1990-2000	8.40%
Finland	Keloharju (1993)	85	1984-1992	9.60%
France	Husson and Jacquillat (1990)	686	1983-2006	10.70%
Germany	Ljungqvist (1997)	407	1978-1999	27.70%

1	2	3	4	5
Greece	Thomadakis et al. (2012)	373	1976-2011	50.80%
India	Krishnamurti and Kumar (1975)	98	1992-1993	35.30%
India	Singh and Mittal (2003)	500	1992-1996	96.56%
India	Marisetty and Subrahmanyam (2006)	2,964	1990-2011	88.50%
Indonesia	Suherman (2011)	410	1990-2012	25.70%
Iran	Bagherzadeh (2010)	279	1991-2004	22.40%
Israel	Kandel, Sarig and Wohl (1999)	28	1993-1994	4.50%
Israel	Amihud et al. (2001)	348	1990-2006	13.80%
Italy	Cherubini and Ratti (1991)	135	1985-1998	20.30%
Italy	Arosio et al. (2000)	233	1985-2006	18.20%
Japan	Fukuda and Toshio (1997)	975	1970-1996	24.00%
Japan	Kaneko and Pettway (2003)	3,136	1970-2011	40.20%
Mauritius	Bundoo (2007)	40	1989-2005	15.20%
Mexico	Aggarwal, Leal and Hernandez (1993)	37	1987-1990	33.00%
Mexico	Eijgenhuijsen and Valk (1997)	88	1987-1994	15.90%
New Zealand	Camp and Munro (2000)	201	1979-1999	23.00%
Nigeria	Ikoku (1998)	63	1989-1993	19.10%
Nigeria	Achua (2011)	114	1989-2006	12.70%
Norway	Emilsen et al. (1997)	68	1984-1996	12.50%
Norway	Liden (2004)	153	1984-2004	9.60%
Philippines	Sullivan and Angelo (2001)	104	1987-1997	22.70%
Poland	Aussenegg (2000)	149	1991-1998	35.60%
Poland	Jelic and Briston (2003)	224	1991-2006	22.90%
Saudi Arabia	Al-Anazi, Lio and Forster (2010)	76	2003-2010	264.50%
Singapore	Lee, Taylor, and Walter (1996)	128	1973-1992	31.40%
South Africa	Michael and Reyneke (2003)	285	1980-2002	18.00%
Spain	Rahnema and Fernandex (1993)	71	1985-1990	35.00%
Spain	Ansotegui and Fabregat (1999)	128	1986-2006	10.90%
Sri Lanka	Samarakoon (2010)	105	1987-2008	33.50%
Switzerland	Kunz and Aggarwal (1994)	42	1983-1989	35.80%
Switzerland	Drobetz, Kammermann and Walchli (2005)	147	1983-2005	29.30%
Taiwan	Li et al. (2007)	241	1986-1995	34.60%
Thailand	Wethyavivorn and Koo-Smith (1991)	32	1988-1989	58.10%
Turkey	Kiyamaz (2000)	138	1990-1996	13.60%
Turkey	Durukan (2002)	282	1990-2002	10.80%
UK	Chambers and Dimson (2009)	4,877	1989-2007	19.00%
USA	Liu and Ritter (2010).	12,340	2001-2008	12.00%
	Average			45.76%

Source: compiled and calculated by the authors.

In the case of IPO underpricing, only a few studies are available for Pakistan (Sohail and Nasr, 2007; Rizwan and Khan, 2008; Sohail and Raheman, 2009, 2010 and Kayani and Amjed, 2011). Sohail and Raheman (2010) have shown the level of underpricing in different states of the economy. Sohail and Nasr (2007) have shown underpricing of 35.66% by selecting 50 IPOs during 2000-2006. 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. In particular matched firms will be used by applying asset pricing models to capture the risk adjusted performance (underpricing) of IPOs.

3. METHODOLOGY

Data is collected for the period 2000 to 2012 for 83 IPO firms floated on the KSE. The data is taken from the SBP, the KSE and the business recorder. To study the long-term performance of IPOs, only those IPOs are taken which cover a period of more than three years. As a result, the number of IPO firms are reduced to 61 IPOs for the long-term analysis of IPOs. The initial return of each IPO and market return is calculated as:

$$R_{i,1} = \frac{(P_{i,1} - P_{i,0})}{P_{i,0}}, \quad (1)$$

$$R_{m,1} = \frac{(I_{m,1} - I_{m,0})}{I_{m,0}}, \quad (2)$$

where $R_{i,1}$ is the return on the first trading day, also known as the raw return $P_{i,1}$ represents the closing price of the IPO firm i at the end of the first trading day and $P_{i,0}$ is the offer price of that IPO firm. $R_{m,1}$ represents the market return on the first day, $I_{m,1}$ is the closing market value at the end of the first trading day, $I_{m,0}$ is the closing market index value on the offer day of the corresponding stock.

The level of underpricing is calculated using the matched firm's technique. The expected returns of the matched firms are calculated with the help of the following four models (3 to 6).

3.1. Market model

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

$$R_{it} = \beta_{0i} + \beta_{1i}R_{mt} + \varepsilon_{it} \quad (3)$$

3.2. Capital asset pricing model

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

$$R2_{it} = R_f + (R_{mt} - R_f) \beta_{li} + \varepsilon_{it} \quad (4)$$

Since the selected matched firm has a different capital structure, so the betas obtained in equations 3 and 4 are adjusted. The betas obtained in equations 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 the beta is adjusted according to the capital structure of an IPO firm. The first beta for the matched firm is calculated in the absence of debt with the help of the following equation.

$$\beta_{(matched, unlevered)} = \frac{\beta_{(matched, levered)}}{1 + \frac{debt_{matched\ firm}}{equity_{matched\ firm}} (1 - tc)}$$

where *tc* is corporate tax. Now the adjusted beta is calculated with a new capital structure of an IPO firm with the help of the following equation.

$$\beta_{(adjusted)} = \beta_{(matched, unlevered)} \left[1 + \frac{debt_{IPO\ firm}}{equity_{IPO\ firm}} (1 - tc) \right]$$

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

3.3. Fama-French three-factor model

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

$$R3_{it} = R_f + (R_{mt} - R_f) \beta_{li} + S_t SMB_t + H_t HML_t + \varepsilon_{it} \quad (5)$$

3.4. Carhart four-factor model

The fourth factor that is the momentum factor is incorporated by Carhart (1997) in addition to the three factors of the Fama French model.

$$R4_{it} = R_f + (R_{mt} - R_f) \beta_{li} + S_t SMB_t + H_t HML_t + M_t WML_t + \varepsilon_{it} \quad (6)$$

The expected returns $R1_{it}$ in equation (3), $R2_{it}$ in equation (4), $R3_{it}$ in equation (5) and $R4_{it}$ in equation (6) will be obtained by applying the 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_t (winner minus loser) is the risk factor for momentum. Fama and French (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 the problem of financial flexibility and less diversification in the business. Moreover, he argued that investors of value stock firms should also be compensated for taking another risk as value stocks are considered to be a weaker firm due to current distress and the future prospects being vague. In CAPM, the market factor is used for risk.

To calculate the size and value factors, all the firms of the KSE are sorted on the basis of the market capitalization (size) of the firms. The firms are divided in two parts by using the median, i.e. small firms (S) and big firms (B). Book-to-market (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, i.e. (Low, L) bottom 30%, (Middle, M) 40% and top 30% (High, H). 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 the historical data of IPO firms do not exist, therefore 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:

$$SMB = \left[(S/L + S/M + S/H) - (B/L + B/M + B/H) \right] / 3, \quad (7a)$$

$$HML = \left[(S/H + B/H) - (S/L + B/L) \right] / 2. \quad (7b)$$

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

$$WML = [(S/W + B/W) - (S/L + B/L)] / 2. \tag{7c}$$

For each IPO firm, to calculate expected return for matched firm, the daily excess returns of the matched firms are regressed against the respective risk factors. The level of underpricing is calculated with the help of the five models as presented in equations 8 to 12. The underpricing P^U of the IPO firms using the market adjusted model is calculated as:

$$P^U = 100 \left\{ \left[\frac{(1 + R_{i,1})}{(1 + R_{m,1})} \right] - 1 \right\}. \tag{8}$$

The above model was initially introduced by Aggarwalet al. (1993) and is used by many researchers to calculate underpricing (Chao et al., 2010; Boissin and Sentis, 2012). The above model has been criticized in earlier studies for not considering the risk factor assuming the unit beta. Thus the market model, CAPM, 3-FF (the three-factor Fama-French model) and 4-F (the four-factor Carhart model) are also used to measure the risk adjusted IPO performance on the first trading day (equations 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 the regression, a number of assumptions are also made. To control the problems of heteroscedasticity and autocorrelation, the HAV-Newey test is used in these regression models. In addition to model (8), the level of underpricing is calculated with the help of the following four models.

By market model

$$P^U = R_{it} - R1_{it} \tag{9}$$

By CAPM

$$P^U = R_{it} - R2_{it} \tag{10}$$

By Fama-French model

$$P^U = R_{it} - R3_{it} \tag{11}$$

By four-factor model

$$P^U = R_{it} - R4_{it} \tag{12}$$

The one sample t-statistic (equation 13b) is used to test the significance of hypotheses 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, $\overline{P_1^u}$, on IPO investment is divided equally among n IPO firms:

$$\overline{P_1^u} = \frac{1}{n} \sum_{i=1}^n P_{i,1}^u. \quad (13a)$$

The t statistic is computed as:

$$t = \overline{P_1^u} / \left[\frac{s}{\sqrt{n}} \right], \quad (13b)$$

where, s represents the cross-sectional standard deviation of $\overline{P_1^u}$ for the sample n IPO firms.

3.5. Regression model for determinants of underpricing

The regression model is based on previous theories like the agency theory, asymmetric information and signaling theory. The general form of the regression model is as follows:

$$\begin{aligned} P^U = & \alpha + \beta_1 ExAnte + \beta_2 LMC_i + \beta_3 PSO_i + \beta_4 MV_i + \dots \\ & + \beta_5 SI_i + \beta_6 PE_i + \beta_7 OS_i + \beta_8 LOS_i + \beta_9 Year_{ni} + \varepsilon_i, \end{aligned} \quad (14)$$

where P^U is the level of underpricing calculated by different models. *ExAnte* is measured by the standard deviation of daily returns of each IPO for a period of one month after the listing date, used to anticipate uncertainty. *SI* is secondary issues, a dummy variable. If *SI* is made within periods of twelve months after the IPO, its value is 1 and zero otherwise. *LMC* is the natural log of market capitalization, used to measure the intrinsic value of an IPO firm. It is obtained as the closing price at the 10th day of trading. *LOS* is the natural log of offer size variable. This variable is measured as the offering price multiplied by the number of shares offered. *MV* is the market volatility variable, obtained as the standard deviation of the closing value of the market index. To measure the standard deviation, a two-month period before the closing date of subscription of an IPO firm is used. *OS* is the over-subscription variable and is measured as funds received against public offer, i.e. times the share offerings in value. *PE* is the price earnings ratio, used to measure the quality of an IPO firm. It is calculated as the average offer price divided by the average earning per share (*EPS*) for

the last three years before going public. PSO represents the proportion of shares offered to general public. $Year_n$ represents the long run performance of IPO firms measured by different models.

4. RESULTS AND DISCUSSION

4.1. Descriptive analysis

Table 4 provides the descriptive statistics of the variables. The mean value of the underpricing is 0.33, which ranges between -0.36 and 3.22. The standard deviation of the underpricing is 0.61. Market volatility has the highest standard deviation (302.01) followed by the price earnings ratio (76.88). Market volatility also has the highest mean value (403.19) followed by the market capitalization (21.37). The same interpretation holds for other variables.

Table 4
Descriptive statistics of variables used in regression analysis

Variables	Mean	Minimum	Maximum	Standard Deviation
Underpricing	0.33	-0.36	3.22	0.61
ExAnte	1.90	0.00	29.25	3.59
Market capitalization	21.37	18.49	26.15	1.51
Secondary market issues	0.05	0.0	1.00	0.22
Market volatility	403.19	56.30	1,341.36	302.01
Size	19.61	17.50	22.82	1.11
Public shares	0.25	0.03	0.60	0.12
Over / Under subscription	2.70	0.00	19.60	3.78
Price/earnings ratio	1.95	(250.00)	500.00	76.88

Source: authors' calculation.

4.2. Level of underpricing

The underpricing is the difference between the offer price and the market price at the first trading day of an IPO firm. The level of underpricing means the adjusted returns of IPOs on their first trading day. Generally, market adjusted returns are used to represent the level of underpricing. In this study, the matched firm technique is used to calculate the adjusted returns on the first trading day in addition to the market adjusted returns. The matched firm technique is used on a reduced sample of 61 IPOs only as in determining the reasons for underpricing, one of the variables is long-term performance and in the long run performance sample is reduced to 61 IPOs.

4.2.1. First day market-adjusted returns

Table 5 provides the first day market-adjusted returns. The significance level of underpricing is observed on the KSE for the sample period of 2000 to 2012, which validates the underpricing phenomena. The average value of underpricing is 28.28 percent. This implies that investors can make a market adjusted profit of 28.28 percent by investing in the new issues of the firms. The median level of underpricing is 7.80 percent. The average value of raw return of IPOs is 32.76 percent and the average markets return is 3.48 percent. All these values are statistically significant. The average value of underpricing is low compared to earlier studies on the KSE market. For example, Sohail and Nasr (2007) reported the level of underpricing as 35.66 percent for the sample of 50 IPOs, while Sohail and Raheman (2010) reported the level of underpricing as 42.17 percent. This shows the efficiency of the issuing firms of IPOs as underpricing is the ultimate loss to the issuer. The results of underpricing on the KSE confirm the findings of the earlier studies in different countries like the US, the UK, Europe, etc. The results also show that 32.53 percent IPOs (27 from 83 IPO firms) offer the investors negative market adjusted returns of 11.34 percent on the first trading day, which shows the overpricing of IPOs. The remaining 67.47 percent IPOs (56 from 83 IPO firms) offer the investors a positive market adjusted return of 47.39 percent on the first trading day, which indicates the underpricing of IPOs. Nevertheless, taken together, all 83 IPOs offer the investors a positive market adjusted return.

Table 5
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*
<i>t</i> -statistic	4.849	2.714	4.621
Median	0.0600	0.0206	0.0780
Standard deviation	0.6154	0.1170	0.5576
Standard error of the mean	0.0676	0.128	0.0612
No. of positive returns (with mean)	58 (0.5035)	52 (0.0992)	56 (0.4739)
No. of negative 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

Note: * indicates that value is significant at 1% level of significance.

Source: authors' calculation.

Table 6 provides the results of level of underpricing in the opening, closing, highest and lowest share prices and market index.

Table 6

Level of underpricing (opening, closing, highest and lowest share prices and market index)

Variable	Mean	t-value	p-value
<i>Ri Closing</i>	.3276*	4.849	.000
<i>Rm Closing</i>	.0348*	2.714	.008
<i>Up Closing</i>	.2828*	4.622	.000
<i>Ri Opening</i>	.3007*	4.395	.000
<i>Rm Opening</i>	.0331*	2.653	.010
<i>Up Opening</i>	.2598*	4.116	.000
<i>Ri Highest</i>	.4116*	5.587	.000
<i>Rm Highest</i>	.0427*	3.350	.001
<i>Up Highest</i>	.3516*	5.344	.000
<i>Ri Lower</i>	.2798*	4.295	.000
<i>Rm Lower</i>	.0253**	1.987	.050
<i>Up Lower</i>	.2495*	4.115	.000

Note: * significant at 1% level, ** significant at 5% level.

Source: authors' calculation.

The results show that on average investors who have purchased the shares in the primary market can make a (market adjusted) profit of at least 24.95 percent, even if they sell the shares at the lowest prices at the first trading day of IPO firms. Likewise, investors can make an average market adjusted profit of 35.16 percent if they manage to sell the shares at the highest prices at the first trading day. If investors are anxious that share prices may fall from the opening prices, and if the investors sell the shares in the opening session on the first trading day, even then they can earn a market adjusted profit of 24.95 percent. These results further demonstrate 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 closing of first trading day. These results are contrary to the study of Chen et al. (2004). However, the amount of profit is not significant for the day traders if the transaction cost and other costs are considered. Even the day traders can lose money if they attempt to sell these shares during the trading hours of the first trading of these newly listed IPO firms. This implies that the day traders have no such vibrant opportunity to make a profit. Investors can make money only when they purchase the new issues at the offer price from the primary market and sell them on the first trading day.

The sector wise analysis of level of underpricing is presented in Table 7. The level of underpricing is observed in all the sectors except Equity Investment Instruments, Technology Hardware and Equipment, and Personal Goods. The General Industrials sector has shown the highest level of underpricing of 100.34 percent followed by the Industrial Transportation sector which has a 94.29 percent level of underpricing.

Table 7
Sector-wise level of underpricing

	Sector	<i>Ri_closing</i>	<i>Rm_closing</i>	<i>Up_closing</i>
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 and 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

Source: authors' calculation.

The year-wise analysis of level of underpricing is presented in Table 8, which shows that the overall amount of level of underpricing decreased over the years for the sample period of 2000 to 2102. All the years show underpricing, except for 2010 and 2011. The level of underpricing was highest in 2007.

Table 8
Year-wise level of underpricing

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

Source: authors' calculation.

4.2.2. First day market-adjusted returns – a reduced sample

Table 9 provides analysis of the reduced sample of 61 IPOs. This reduced sample covers the period of at least three years to meet the criterion to observe the long-term performance on a three-year basis.

Table 9
Level of underpricing by market-adjusted model

Returns	IPO firms	Market (Index)	Level of underpricing
Number of observations	61	61	61
Average	0.4430*	0.0303***	0.3964*
<i>t</i> -statistic	5.123	1.889	5.117
<i>p</i> -value	0.0000	0.0640	0.0000
Median	0.1900	0.0136	0.1944
Standard deviation	0.6754	0.1254	0.6050
Standard error mean	0.0865	0.0161	0.0775
No. of positive returns (with mean)	49 (0.5747)	36 (0.1066)	50 (0.5122)
No. of negative 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

Note: * (***) significant at 1% (10%) level.

Source: authors' calculation.

In addition, while finding the determinants of IPO underpricing, one of the variables is long-term performance, which is why an analysis on the reduced sample is also required. Like the full sample, all the average values in the reduced sample are also statistically significant. The level of underpricing is 39.64 percent, while the median level of underpricing is 19.44 percent. The average raw return of IPOs is 44.30 percent, while the average markets return is 3.03 percent. The amount of level of underpricing has increased compared to the full sample of 83 IPOs.

4.2.3. Matched firms

For the measurement of level of underpricing, generally the first day returns of IPO firms are adjusted by using the market-adjusted model. The main drawback of this model is that it assumes the betas of newly issued stocks as one. To tackle this problem, the matched firm adjusted returns are used to measure the level of underpricing. Since IPO firms have no past history of market prices, 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. Now the question is how true proxy firms are selected. Kim and Ritter (1999) have reported difficulties in selecting comparable firms for the valuation of IPO firms. They used the multiple of the P/E ratio as one of the methods to value the matched firms. In contrast to Kim and Ritter (1999), How et al. (2007) used an algorithm by selecting either on size and industry membership, industry and growth, or industry, growth and size basis. All these studies were related to the valuation of an IPO firm, and none has calculated the expected return using the matched firm technique. Before doing the analysis, the first algorithm is tested to check the similarity of an IPO firm with that of the matched firm.

First, we checked the tracking errors of IPOs and the matched firms. The tracking error (based on revised methodology) is 0.0196.¹ The tracking error of IPOs and matched firms is less than 0.05, which shows that the matched firms are a true proxy of IPO firms based on asset selection criterion. The bars in the line graph in Figure 1 also show that the matched firms resemble the IPO firms in fifty-four out of the sixty-one IPOs, the assets of the matched firms are the same as the assets of the IPO firms.

¹The results of tracking error are provided in Sohail (2016).

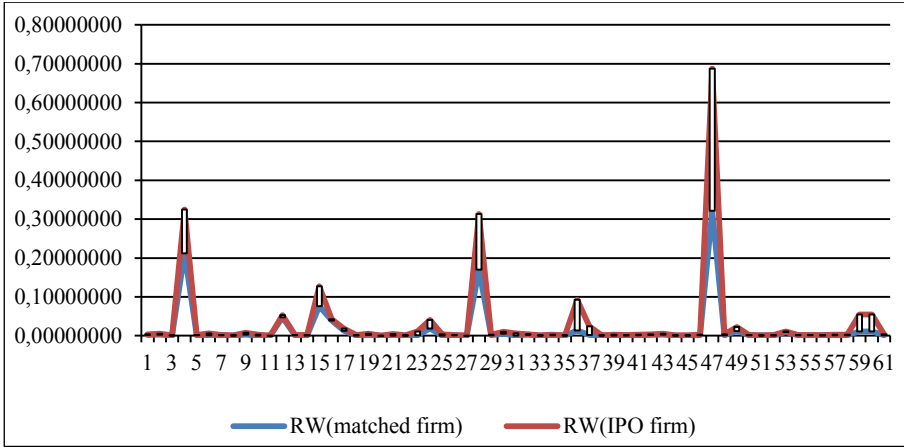


Figure 1. Tracking error of IPOs and matched firms

Source: authors’ own.

We also applied the *t*-test to test the mean difference of the IPOs and the matched firms. The results are displayed in Table 10. The value is statistically insignificant. Thus, the null hypothesis of no mean difference in

Table 10

t-statistics of difference of means of IPOs and matched firms

		IPO matched group		N	Mean	Standard deviation	Standard error mean		
IPO matched firms’ assets		1	61	33461.68	109088.65	13967.37			
		2	61	34136.84	109230.80	13985.57			
Independent sample test									
		Levene’s test for equality of variances		<i>t</i> -test for equality of means					
		F	Sig.	T	Df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
IPO matched firms’ assets	Equal variances assumed	0.004	0.950	-0.034	120	.973	-675.16	-39809.91	38459.58
	Equal variances not assumed			-0.034	120	.973	-675.16	-39809.91	38459.59

Source: authors’ calculation.

the assets of the IPO firms and the matched firms is supported. This further strengthens the selecting of matched firms as true proxies on assets criterion. The insignificant value of Leven's test indicates that the variances are equal.

4.2.4. First day matched firm adjusted returns of IPO firms

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

To calculate the expected returns, an event window is required. The estimation window consists of a six-month period using daily data. On the basis of this event period betas are calculated by market model and capital asset pricing model. As an IPO firm has a different capital structure than that of a matched firm, these levered betas are calculated in the absence of debt, called un-levered betas. Again, levered (adjusted) betas are calculated according to the capital structure of IPO firms. Now, with the help of these adjusted betas, the expected returns are calculated on the offer date of IPOs and adjusted for a 20-day period.

Table 11 provides the expected returns of matched firm, based on market models. These expected returns are calculated by regressing six-month daily returns against the market returns of the corresponding period before the offer date of an IPO firm. The average expected return of matched firms using the market model is 1.66 percent, which is less than the market return calculated on the reduced sample of sixty-one firms. The average expected return of matched firms is 1.99 percent in CAPM, 1.46 percent in the three-factor model and 1.30 percent in the four-factor model. All these returns are lower than the market return calculated on the reduced sample of sixty-one firms. The average expected return of matched firms in CAPM is slightly higher than the expected return calculated by the market model, the three-factor model and the four-factor model. The significant average value of returns in the Fama-French three-factor model supports the study of Nawazish (2008) for testing this model on the KSE. The level of underpricing is higher in the four-factor model (43 percent) compared to the market model, CAPM and the Fama-French three-factor model. This indicates that that investors can earn a significant risk-adjusted return of 43 percent or greater from the same type of matched firms by taking the four risk factors, i.e. market, size, value premium and winner minus loser (WML).

Table 11
Level of underpricing by market model

Level of underpricing by different models	IPO firms returns	Market model		CAPM		Fama-French three-factor model		Four-factor model	
		Matched firm's returns	Level of underpricing	Matched firm's returns	Level of underpricing	Matched firm's returns	Level of underpricing	Matched firm's returns	Level of underpricing
N	61	61	61	61	61	61	61	61	61
Average	0.443*	0.0166	0.4263*	0.0199	0.4231*	0.0146	0.4284*	0.013	0.430*
<i>t</i> -statistic	5.123	0.315	4.413	0.376	4.38	0.286	4.552	0.247	4.496
Median	0.19	0.0007	0.1939	0.0064	0.1863	0.001	0.237	-0.0081	0.2565
Standard deviation	0.6754	0.4127	0.7545	0.4123	0.7545	0.3987	0.735	0.4121	0.7468
Standard error mean	0.0865	0.0528	0.0966	0.0528	0.0966	0.0511	0.0941	0.0528	0.0956
No. of positive returns (with mean)	49 (0.5747)	31 (0.2325)	49 (0.5955)	34 (0.2150)	49 (0.5920)	30 (0.2437)	46 (0.6500)	30 (0.2882)	46 (0.6583)
No. of negative returns (with mean)	12 (-0.0948)	30 (-0.2064)	12 (-0.2644)	27 (-0.2258)	12 (-0.2666)	31 (-0.2645)	15 (-0.2514)	31 (-0.2533)	15 (-0.2705)
Maximum	3.22	1.924	3.138	1.9219	3.1329	1.482	3.1789	1.4736	3.2528
Minimum	-0.358	-1.072	-1.164	-1.076	-1.162	-0.755	-0.722	-0.845	-0.714

Source: authors' calculation.

The average debt-to-equity (D/E) ratio of IPO firms is 1.6842 while the average D/E ratio of the matched firms remains at 2.1010. As there is a difference in the capital structure of IPO firms with that of the matched firms, the betas of the matched firms are adjusted. The average beta of the matched firm remains at 0.6301 less volatile than the market, the unleveled beta remains at 0.3612 while the adjusted beta is 0.6183. In the market-adjusted model, the beta of the 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. It further explains that investors can earn a significant risk-adjusted return of 42.63 percent or greater from the same type of matched firms when investing in IPO firms.

4.2.5. The Wilcoxon signed-rank test

The level of underpricing is also confirmed by the Wilcoxon signed-ranked test, presented in Table 12. The Wilcoxon signed-rank test and standard *t*-statistics on median values against zero are used to confirm the level of underpricing by all the five models of reduced / full sample.

Table 12

Level of underpricing by Wilcoxon signed-rank test

Level of underpricing (models)	N	Sample median	Wilcoxon value (t)	Obs > 0.000000		Obs < 0.000000	
				Count	Mean rank	Count	Mean rank
Level_of_Up_ma (full sample)	83	0.0778*	4.238	56	47.80	27	29.96
Level_of_Up_mkt	61	0.2011*	5.129	45	36.89	16	14.44
Level_of_Up_capm	61	0.1863*	4.712	49	32.69	12	24.08
Level_of_Up_ma (reduced sample)	61	0.1944*	5.208	50	33.42	11	20.00
Up_matched_3FF	61	0.237*	4.425	46	33.96	15	21.93
Up_matched_4F	61	0.2565*	4.425	46	33.96	15	21.93

Note: * indicates that the value is statistically significant at 1% level of significance; Up=underpricing, ma=market adjusted, mkt=market, 3FF= three-factor Fama-French model, 4F= four-factor Carhart model.

Source: authors' calculation.

4.3. Comparisons of different models

The level of underpricing is observed to be more than 39 percent in all five models. The level of underpricing is 39.64 percent in the market-adjusted model, 42.63 percent in the market model, 42.31 percent in CAPM, 42.84 percent in the Fama-French three-factor model and 43 percent in the four-factor model.

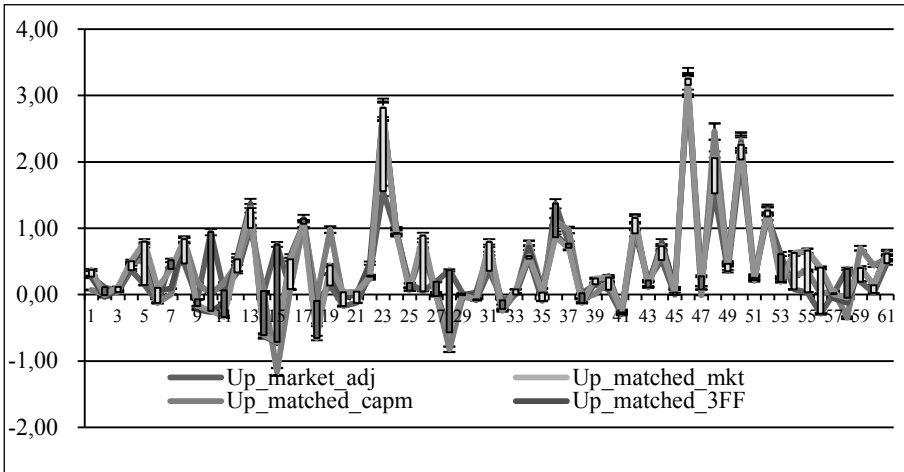


Figure 2. Comparison of different models

Source: authors' own.

The level of underpricing increases when more risk factors like size, value and momentum are taken into account. In general, all five models on average give consistent and significant results. However, at an individual level, underpricing is found to be different in all the five models as shown in Figure 2. These inconsistent results lead to debate about the choice of models for the long-term performance of IPOs. However, in the short run, the choice of model does not matter to measuring the risk-adjusted returns of IPO firms on the first trading day of their listing.

4.4. Results of regression analysis

The regression analysis is performed to examine the determinants of the level of underpricing. Table 13 (column 1) provides the estimated results of regression analysis of 83 IPOs in which market-adjusted returns is used as

Table 13
Estimated results of regression analysis (different models)

	Market-adjusted model (full sample)	Market-adjusted model (reduced sample)	Market model	CAPM	Fama-French three-factor model	Four-factor model
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-1.7085*** (-1.9075)	-2.0634*** (-1.7658)	-1.1406 (-1.0125)	0.2268 (0.1383)	-1.2154 (-0.7663)	-0.7802 (-0.4762)
ExAnte	0.0213*** (1.6512)	0.0200*** (1.6459)	0.0247 (1.5725)	0.0387*** (1.6943)	0.0406*** (1.8379)	0.0441*** (1.9320)
Market capitalization	0.4972* (4.8631)	0.5641* (4.3986)	0.5900* (4.7715)	0.6325* (3.5155)	0.5838* (3.3539)	0.5944* (3.3056)
Secondary market issues	-0.2775 (-1.3716)	-0.3692 (-1.5931)	-0.3132 (-1.4020)	-0.3868 (-1.1901)	-0.3563 (-1.1329)	-0.3438 (-1.0583)
Market volatility	0.0003** (2.1684)	0.0002 (1.5555)	0.0002 (0.9862)	0.0004*** (1.8760)	0.0004** (2.0395)	0.0005** (2.0977)
Size	-0.4877* (-4.4975)	-0.5462* (-3.7417)	-0.6212* (-4.4147)	-0.7464* (-3.6452)	-0.6212* (-3.1355)	-0.6549* (-3.2002)
Public shares	2.4402* (4.3282)	3.0431* (4.1936)	3.0137* (4.3078)	3.2849* (3.2270)	3.4227* (3.4751)	3.3722* (3.3144)
Over / Under subscription	0.0774* (5.6717)	0.0745* (4.6830)	0.0749* (4.8793)	0.0560** (2.5088)	0.0524* (2.4268)	0.0492** (2.2071)
Price-to-earnings ratio	-0.0002 (-0.4191)	-0.0002 (-0.0236)	-0.0003 (-0.3678)	-0.0008 (-0.6100)	0.0004 (0.3692)	0.0004 (0.3349)
Observations	83	61	61	61	61	61
R-square	0.6313	0.6330	0.7156	0.5356	0.5419	0.5266
Adjusted R-square	0.5914	0.5765	0.6718	0.4642	0.4715	0.4537
Standard error	0.3564	0.3936	0.3795	0.5522	0.5343	0.5519
F-statistic	15.8402	11.2123	16.3585	7.4995	7.6912	7.2305
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: *, ** and *** indicate that the value is statistically significant at 1%, 5% and 10% level of significance, respectively.

Source: authors' calculation.

the dependent variable for the level of underpricing, while *ExAnte*, 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 are used as independent variables. The results reveal that *ExAnte* has a statistically significant positive effect on the

level of underpricing, which validates the results of Baron (1982), Ritter (1984) and Beatty and Ritter (1986) that the level of underpricing increases with the level of uncertainty about the new issue of IPO. The results also corroborate the findings of Sohail and Nasr (2007) and Sohail and Raheman (2009) on the KSE. As an IPO is a new firm, information about the potential market demand and true value of the firm is unevenly distributed amongst different stakeholders, i.e. the IPO firm, underwriters and the investors, so underpricing is done under the underwriter's umbrella to safeguard a full subscription of the new issue and 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 that there is more uncertainty about the value of recently established firms such as new issues (IPOs) than about well-known firms. This finding supports Beatty and Ritters's (1986) argument that investors seek higher returns to compensate for their anxiety about the future performance of IPOs.

Market capitalization also has a significant positive effect on the level of underpricing. In turn, secondary market issues have a negative but statistically insignificant effect on the level of underpricing. The reason might be that there are only six secondary issues out of 83 for the sample period. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) have suggested 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 was underpriced more is considered a healthy company. Allen and Faulhaber (1989) have 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. On the KSE, the results also suggest strong support for the signaling theories.

Market volatility has a significant positive effect on the level of underpricing. The result is also in accordance with the earlier studies as discussed in the literature review. In previous studies on the KSE by Sohail and Nasr (2007) and Sohail and Raheman (2009), the results of market volatility variable are not significant. The market volatility is considered as 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 earlier studies, Miller and Reilly (1987) indicated that IPOs which follow a rising market have higher underpricing levels than IPOs which follow a falling market. The KSE

experienced high volatility as compared with other markets of the world during the study period from 2000 to 2012, as the KSE index fluctuated between 1,333 to 15,470 points. The offer size has a significant negative effect on the level of underpricing. Finkle (1998) argued that the larger firms, 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 which are essential for firm survival and profitability. Another factor is that larger firms tend to attract more prestigious underwriters (Carter et al., 1998). This also holds true for the KSE. Our results support the findings of some previous studies which have also found the negative effect of firm size and underpricing (Carter et al., 1998).

Perotti (1995) argues that government prefers the steady sale of IPOs to show commitment of privatization, so they issue a small proposition and retain a large one. The percentage of shares retained by the original owners and insiders would logically signal high value. A negative relationship between the level of underpricing and the proportion of shares offered to the general public variable is observed in the previous studies as discussed in the literature review. However, in the case of IPOs on the KSE, on average, the proportion of shares offered to the general public remains at 25 percent, which is a high offered rate compared to other markets in the world. As a result, the highly positive significant relationship of this variable is observed with the level of underpricing. The results are contrary to the Perotti (1995) study but are in accordance with the IPO phenomena in the KSE where the high offered rate exists. The well-known Rock's (1986) winner-curse model demonstrates that only uninformed investors submit an order for over-priced stocks to win a 100 percent allocation. However, for underpriced shares, both the informed and uninformed submit purchase order for allocation, and as a result over-subscription appears. The same phenomenon is also observed on the KSE as the over-subscription variable has a significant positive effect on the level of underpricing. The price earnings ratio has a negative but statistically insignificant effect on underpricing. This result contrasts with Chen et al. (2004) who argue that the firms with better growth prospects have a higher price-to-earnings ratio which ultimately goes towards higher risk, which further increases uncertainty. The KSE is not confirming the positive effect of the price earnings ratio on the level of underpricing. The value of R-squared indicates that the 63 percent variation in the dependent variable is explained by all independent variables. In other words, the regression model fits the data well. The low *p*-value of F-statistics also indicates that all the explanatory variables have (jointly) a statistically significant effect on the dependent variables.

The regression analysis is also performed on the reduced sample for 61 IPOs using the five regression models. The results are reported in columns (2) to (6) of Table 13. In these five models the explanatory variables are the same but the dependent variable, the level of underpricing, is obtained by five different models, i.e. the market-adjusted model, the market model, CAPM, the Fama-French three-factor model and the four-factor model. The estimated results of all the regression models are almost the same and are in line with the results of the full sample (83 IPOs) regression model with a negligible variation in the significance level of explanatory variables. All these models validate the agency theory, asymmetry theory and signaling theory.

Table 14
Regression analysis – an extended model

Intercept	-0.0793
	-0.0472
ExAnte/Uncertainty	0.0350***
	1.6013
Market Capitalization	0.6747*
	3.6186
Secondary Market Issues	-0.4527
	-1.3552
Market Volatility	0.0005***
	1.9806
Size	-0.7787*
	-3.7369
Public Shares	3.5428*
	3.3404
Over / Under subscription	0.0540**
	2.4010
Price-to-earnings ratio	-0.0008
	-0.5802
BHARs	0.0534
	0.8875
Observations	61
R-square	0.5427
Adjusted R-square	0.4621
Standard error	0.5534
F-statistic	6.7265
p-value	0.0000

Note: *, ** and *** indicate that the value is statistically significant at 1%, 5% and 10% level of significance, respectively.

Source: authors' calculation.

The regression model is also used to find the relationship of the level of underpricing with the long-term performance of IPOs. Three years after the IPO is used as a long-term performance variable and is calculated on a monthly basis by the buy and hold abnormal return (BHARs) model. As far the relationship between the initial returns of IPOs and their long-term price performance is concerned, 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 (Carter and Dark, 1993). The KSE does not support the significant negative relationship of the level of underpricing and long-term performance variable as the coefficient on BHARs is positive and statistically insignificant (Table 14). This result is contrary to the asymmetric information theory supported by Welch (1989) and Grinblatt and Hwang (1989). Furthermore, the choice of model does not matter while measuring the risk adjusted returns of IPO firms on the first trading day. The determinants of the level of underpricing are observed on the KSE in light of the asymmetric and signaling theories, and the results of the regression model validate the prior theories of the asymmetric and signaling theories on the KSE.

CONCLUSION

The study examines the underpricing of 83 IPO firms on the KSE using data for the period 2000 to 2012. For long term performance the sample size is reduced to 61 IPOs. The estimated results reveal that IPOs are underpriced on the KSE. The year-long analysis of underpricing shows that the level of underpricing has decreased from the years 2000 to 2012. However, the highest level of underpricing is observed in 2007. Furthermore, the level of underpricing is observed in all the sectors except equity investment instruments, technology hardware and equipment, and personal goods. More than a 100 percent return (without risk adjusted) is observed in the sectors of oil and gas producers, real estate investment and services, and general industrials.

The level of underpricing for the market adjusted model is found to be 28.28 percent for the full sample of 83 IPOs, which suggests that investors can make a market adjusted profit of 28.28 percent by investing in the new issues of the firms. The matched firm technique is also used to calculate the level of underpricing by considering different risk factors i.e. market, size, value and momentum factors. The results of tracking error show that

matched firms are the true proxy of IPO firms. The level of underpricing is observed to be 39.64 percent for market adjusted model, 42.63 percent for the market model, 42.31 percent for CAPM, 42.84 percent for the Fama-French three-factor model and 42.99 percent for the four-factor model. All the five models give consistent and significant results. The amount of underpricing increases when risk factors are considered, i.e. size, value and momentum. The regression analysis is performed to find the determinants of the level of underpricing with the help of *ExAnte*, 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 the asymmetric and signaling theories.

The paper has some important policy implications. *ExAnte/uncertainty* has a significant positive effect on underpricing. This supports the asymmetric information theory, which explains that if new IPO firms have high uncertainty, they will be highly underpriced. Since underpricing is an indirect cost to an IPO firm, the regulatory authorities should help the new IPO firms to reduce the level of underpricing. As in the book building process, the amount of underpricing is lower compared to the fixed method, so the regulatory authorities, i.e. the Securities and Exchange Commission of Pakistan (SECP) should encourage the book building process to reduce the amount of underpricing, which will lead to boosting the IPO activity process and private firms can decide to opt for IPOs. As a result, it will contribute to the development and further strengthening of the capital market in Pakistan. This study will help firms, managers, researchers, investors, lenders and regulatory authorities to judge the determinants, performance and efficiency of IPOs.

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