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Relationship of IPO post listing performance with IPO pricing parameters

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Abstract

An IPO helps a retail investor to acquire shares in an attractive company and broaden his investment portfolio. Hence it is necessary that the performance of IPOs truly reflect the intrinsic value of the issuing company. This study was undertaken to find the post listing performance of IPOs in India and their relationship with pricing parameters at the IPO issue period.

The IPO's listed from 2003 to 2013 in BSE was the sampling frame for the study. 75.24 % of the sampling frame (313 IPOs) was used for the analysis of research objectives. The share prices of Companies were taken from www.bseindia.com. The details of the Issuing Companies were obtained from www.sebi.gov.in. The pricing parameters were selected as per SEBI guidelines. The post listing performance of IPOs was studied using BHAR. Regression analysis was used to study the impact of pricing parameters on BHAR.

It was studied that if investors buy shares during IPO offer period, they can hold the IPO till 2 years to get positive returns. If the IPOs are bought on the listing day, the IPO can be exit only after 3 or 4 years. It is ideal to invest in IPO during offer. The overpriced IPOs, bought on listing day, gave positive returns after 6 months post listing and can be held upto 4 years. Overpriced IPOs bought through offer underperformed the market up to 5 years. The underpriced IPOs bought on listing day gave negative returns throughout the holding period. Underpriced IPOs bought through offer gave positive returns up to 1 year.

For the sample IPOs, the variables EPS, IPE and RoNW were found to have a significant impact on BHAR. For the overpriced IPOs, the variables EPS, IPE and RoNW were found to have a positive significant impact on BHAR. For the underpriced IPOs, the variables EPS, IPE, RoNW and NAV were found to have a significant impact on BHAR.

The results obtained from the study provide important information to investors intending to invest in IPO's for a long term.

Key Words: IPO Investment, pricing parameters, Offer price, listing price, Post listing performance.



Introduction

Initial Public Offer (IPO) or Public issue is the most common way for firms to raise capital in the primary market. In an IPO, a company issues new securities for subscription by the public. An IPO is an important landmark in a firm's life cycle. According to Ritter and Welch (2002), firms go public for three reasons, first, is to raise external equity for capital structure reasons and to enhance growth. Second, reason is increase in liquidity. Third are nonfinancial reasons, such as prestige, market recognition, analyst coverage, and media attention. IPOs are also good avenue for investment. But average retail participation in IPOs has considerably reduced over time (Prime Database). SEBI has brought in many policy developments to increase retail participation in IPOs, which was necessary to increase economic growth of the country. The Indian IPO market has undergone many structural changes which has improved its transparency and efficiency.

Rationale for the study

An IPO helps an investor to acquire shares in an attractive company and broaden his investment portfolio. Literature has well documented the extent of under pricing across countries on the first day of IPO listing itself. Performances of IPOs have also been widely studied. Indian IPO Performance varies over time. Mostly, IPO's are underpriced initially, they over perform in the short run, followed by underperformance for a longer period and thereafter an over performance. This study is aimed at understanding the relationship between performance of IPO's and the IPO pricing parameters at the time of the issue. It is important that the pricing of IPOs truly reflects the intrinsic value of the company. This will develop a degree of confidence among the potential investors and enable them to make informed investment decisions vis-à-vis offerings in the Indian IPO market. For a researcher in the arena of IPOs, it is inevitable, to explore the twin concepts IPO pricing and Post Listing Performance. The relationship between them would enable a rule driven decision making in IPO investments. The study is relevant to academicians, investors, capital market intermediaries and policy makers to empirically understand the relationship between IPO pricing and performance, select the right IPOs for investment and investment advises and make relevant policy decisions.

Research Questions

The Low average IPO subscription in India by retail investors has led to the following research questions. Do IPOs perform in the long run, post listing? Is there a relationship between pricing parameters and post listing performance of IPOs?

Research Objectives

The research was conducted with the following objectives:

1. To analyse the post listing performance of IPO's.
2. To study the relationship between pricing parameters and long run performance of IPO's.

Literature Review

Long-run performance refers to the price behaviour of the IPOs beyond the listing day. Several empirical studies have proven that Investors are able to get high rate of return in comparison with



market index on the listing day (Ritter, 1984; Purnanandam and Swaminathan, 2004) by investing in IPOs. But subsequently the underperformance of the IPOs persists in the long run. Hoechle and Schmid (2007) found a significant underperformance of IPO firms over the first year after going public. But they do not document underperformance after one year. Ritter (1991) and Jaskiewicz *et al* (2005) found that post listing underperformance continue usually up to three to five years post listing. Madhusoodanan and Thiripalraju (1997) analysed both short-run and long-run after-market pricing performance of the Indian IPOs issued before 1997. They indicated that in the short run, the Indian IPOs generate more market-adjusted initial return than the international IPOs. Even after one year listing, Indian IPOs generated higher returns compared to the negative returns found in other countries.

In UK, underperformance up to 36 months have been found by Khurshed *et al* (2008) and up to 60 months have been found by Espenlaub *et al* (2000). IPOs in USA have also recorded underperformance upto 36 months (Ritter, 1991). It could be seen that IPO underperformance ranged from a period of 12 months to 36 months across various countries.

Studies on the long-run performance of IPOs in India are limited and the evidence on long-run underperformance is mixed.

To explain long-run underperformance for Indian IPOs, factors like under pricing rate (Agarwal, Chunlin and Rhee, 2008), offer size (Brav *et al* , 2000), leverage at IPO date, ex-ante uncertainty (Sohail & Nasr , 2007), timing of issue (Hoechle and Schmid , 2007), age of IPO firm (Bhabra and Pettway , 2003), rate of subscription (Aggarwal, Liu and Rhee , 2008) and promoter groups retention (Peristiani & Hong , 2004) have been considered.

There is immense literature on IPO underpricing and post listing performance. But the research on the long term stock performance of IPOs issued in the Indian market, relative to Issue characteristics of firms is a relatively unexplored area in India. The predictive relationship between the IPO firm characteristics at the time of issue and long-run performance can be used to make an efficient investment decision.

Research Design

The scope of the study is limited to selected IPOs listed between 2003 - 04 to 2012-13 in Bombay Stock Exchange (BSE). The 416 IPO's listed from April 2003 – March 04 to April 2012-March 13 was the sampling frame for the study. The IPOs with missing information were excluded from the sample. 75.24 % of the sampling frame was used for the analysis of research objectives. The share prices of Companies were taken from BSE Website (www.bseindia.com). The details of the Issuing Companies were obtained from SEBI Website (www.sebi.gov.in). Further details were collected from Prime Database, 2015 and CMIE Prowess.

The pricing parameters of IPOs have been considered as per SEBI guidelines and are taken from Prime database. The long run performance of IPOs is calculated using Benchmark Adjusted Buy and Hold Return (BHAR). The objectives of the study were accomplished by a Causal Research design. Regression analysis was used to study the impact of selected variables on BHAR.



Hypothesis

H0: The Pricing parameters NAV, RNOW, IPE, P/E and EPS at issue time of IPOs do not have an impact on BHAR.

H1: The Pricing parameters NAV, RNOW, IPE, P/E and EPS at issue time of IPOs have an impact on BHAR

Independent Variables

The independent variables for the research are listed below:

The pricing parameters, NAV, RNOW, IPE, P/E and EPS at issue time were studied to analyze their impact on BHAR.

Table 1: Determinants of Issue Price

NAV	NAV per equity share (Rs.) is used for the study. This is shareholders' equity less miscellaneous expenses as divided by weighted average number of equity shares.
RoNW	(Wt. Avg) Return on Net worth
IPE	(Wt. Avg) Industry PE ratio
P/E	Price Earnings Ratio is a market prospect ratio that calculates the market value of a stock relative to its earnings by comparing the market price per share by the earnings per share.
EPS	Earnings per share are the portion of a company's profit allocated to each outstanding share of common stock. Earnings per share serve as an indicator of a company's profitability. (Wt. Avg) EPS is used.

Source: Compiled from IPO prospectus, explained as basis for Issue price

Tools of Analysis

Computation of listing day returns of IPOs

The under-pricing of IPOs is studied using the measure, Market Adjusted Abnormal Return (MAAR).

Miller and Reilly (1987) calculated MAAR using the formula as given in Eq. (1). The MAAR for the IPO stock (i) on day 1 is calculated using Eq. (1)

$$MAAR_{i1} = \left[\frac{(1 + R_{i1})}{(1 + R_{m1})} - 1 \right] \times 100 \dots \dots \dots (1)$$

Where, $MAAR_{i1}$ is the market-adjusted abnormal rate of return for the stock i on day 1, R_{i1} is the percentage change in list price *vis-à-vis* offer price. R_{m1} is the percentage change in closing market index value on the listing day to market index on the date of closure of issue. The initial return of each IPO has been calculated by using Eq. (1). The sensx closing value has been used to calculate the market index return.



Methodology for Computation of Long-run Abnormal Returns

Post-listing Long-run price performance for IPOs was evaluated by using BHAR for a period upto 60 months from the listing day. BHAR is evaluated with reference to IPO issue price and listing day closing price. Multivariate regression was carried out to find the impact of selected variables on BHAR. The study also explores whether the firm characteristics known at the time of IPO are good predictors for subsequent share price performance.

As in international literature (Bessler and Thies, 2007), the study uses BHAR to evaluate long-term performance for a period of upto 60 months from the date of listing. BHAR is calculated with using both issue price and list price.

The market-adjusted BHAR as the excess return for the IPOs over and above the market return is computed as:

$$BHAR_{it} = \prod_{t=1}^T (1 + R_{it}) - \prod_{t=1}^T (1 + R_{mt}) = \dots \dots \dots (2)$$

R_{it} is the percentage change in list price *vis-à-vis* offer price. R_{mt} is the percentage change in closing market index value on the listing day to market index on the date of closure of issue. The sensex closing value has been used to calculate the market index return.

The average BHAR for the entire sample is also calculated to find out the overall performance of the portfolio of IPOs for a specific period of time. The mean BHAR is computed as the arithmetic average of abnormal returns on all IPOs in the sample of size N . Mean BHAR is computed by the following formula:

$$\overline{BHAR} = \frac{1}{N} \sum_{i=1}^N BHAR_{it} \dots \dots \dots (3)$$

A positive BHAR for a specific time period is interpreted as a better performance for the IPOs compared to the benchmark return for the same period.

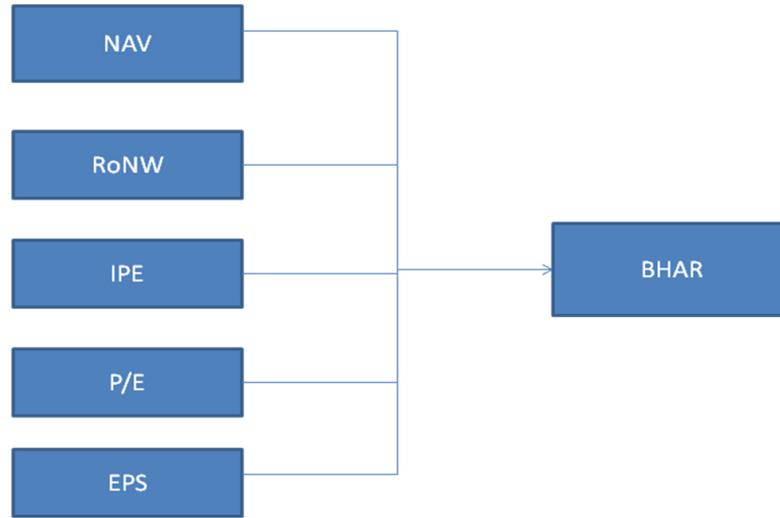
Multivariate regression (OLS) is used to test the influence of the selected variables on the long-run performance, measured by BHAR. OLS regression has been used by Agarwal et al (2006) for explaining the IPO underperformance.

Conceptual model of the study

This model discusses the impact of pricing parameters on BHAR. The basis for issue price (pricing parameters) is discussed in SEBI Guidelines for Public Issue.



Figure 1: Conceptual Model: BHAR and selected Pricing parameters



Multiple regression equation for Model is of the form:

$$\text{BHAR} = a_0 + b_1(\text{NAV}) + b_2 (\text{P/E}) + b_3 (\text{EPS}) + b_4 (\text{IPE}) + b_5 (\text{RoNW})$$

-----Equation1

Calculation of MAAR of IPOs

The table 2 depicts the year wise distribution of overpriced and underpriced IPOs in the sample data. Approximately 58% of the IPOs in the study period were underpriced and left money on the table for the investors.

Table 2: Year wise frequency of overpriced and under-priced IPO's

		Pricing		Total
		Overpriced	Underpriced	
Year	03-04	0	2 (100.00%)	2
	04-05	2	10 (83.33%)	12
	05-06	25	24 (48.97%)	49
	06-07	25	27 (51.92%)	52
	07-08	18	41 (69.49%)	59
	08-09	5	9 (64.28%)	14
	09-10	16	22 (57.89%)	38
	10-11	19	28 (59.57%)	47
	11-12	17	14 (45.16%)	31
	12-13	4	5 (55.55%)	9
Total		131	182 (58.14%)	313

Source: Prime Database



Analysis of post- listing performance of IPOs

Post Listing performance of sample IPOs from Listing and Offer Price using BHAR

The post listing performance of IPOs was calculated for a period up to 60 months from both offer and listing price.

Table 3: Market adjusted BHAR of sample IPOs calculated using Listing price

	Mean	Std. Deviation
LBHAR1M	-7.18	74.71
LBHAR6M	-3.74	79.13
LBHAR12M	-5.73	170.59
LBHAR18M	-49.20	250.44
LBHAR24M	-16.19	244.45
LBHAR36M	7.95	280.82
LBHAR48M	9.91	207.78
LBHAR60	-31.74	176.39

Source: Data Analysis

The analysis shows that the mean IPO returns from listing price is negative (-7.18) when measured after 1 month of listing. The returns increased (though negative) up to 6 months. The return further reduced (-5.73) and the post listing returns was least at 1.5 years of listing (-49.20). Again the post listing returns turned positive at 3 years post listing. Therefore the IPOs underperformed Sensex throughout 2 years. This implies that the investors did not gain positive returns on investing in IPOs on the listing day and selling the stocks before 2 years. On further holding the stocks beyond 4 years, the returns again turn negative. The volatility of the returns was least in the first month. There after volatility increased and was maximum at 3 years post listing. The analysis shows that, if an IPO is bought on the listing day, the investor can get maximum returns by holding it for 4 years.

Table 4: Market adjusted BHAR of sample IPOs calculated using offer price

	Mean	Std. Deviation
OBHAR1	14.73	44.45
OBHAR1M	10.39	59.38
OBHAR6M	10.98	84.39
OBHAR12M	8.17	107.33
OBHAR18M	-90.63	169.71
OBHAR24M	7.07	282.56
OBHAR36M	-10.72	203.71
OBHAR48M	-31.95	117.69
OBHAR60M	-64.07	89.98

Source: Data Analysis



Sample IPOs showed mean positive returns up to 1 year, if BHAR is calculated from offer price. But mean return decreased after one year, but continued to be positive at 2 years, which further reduced. So if investors buy IPO through offer, their returns will be positive up to 1 year. There after their returns will be less than Market Index. The volatility of the returns was least in the first month. There after volatility increased and was maximum at 2 years post listing.

Therefore if investors buy shares during IPO offer period at offer price, they can exit the IPO till 2 years to get positive returns. If the IPOs are bought on the listing day, the IPO can be exit only after 3 or 4 years. It is ideal to invest in IPO during offer.

Post Listing performance of Overpriced IPOs from Listing and Offer Price using BHAR

The post listing performance of overpriced IPOs was calculated for a period up to 60 months from both offer and listing price.

Table 5: Market adjusted BHAR of overpriced IPOs calculated using Listing price

	Mean	Std. Deviation
LBHAR1M	-6.16	42.84
LBHAR6M	-3.00	70.88
LBHAR12M	10.15	187.56
LBHAR18M	55.93	338.25
LBHAR24M	40.34	167.17
LBHAR36M	102.17	357.54
LBHAR48M	107.24	293.06
LBHAR60	45.42	251.44

Source: Data Analysis

The analysis shows that the mean IPO returns from listing price is negative (-6.16) when measured after 1 month of listing. The returns increased (though negative) up to 6 months. Thereafter the overpriced IPOs over performed Sensex throughout the holding period. This implies that if the IPOs are overpriced, it is not advised for the investors to exit the IPO before 6 months of post listing. Maximum mean return was recorded at 4 years post listing. Beyond 4 years, the returns decreased. The volatility of the returns was least in the first month. There after volatility increased and was maximum at 3 years post listing. The analysis shows that, if overpriced IPOs are bought on the listing day, the investor can get maximum return by holding it for 4 years, but the risk involved is also higher at this period.



Table 6: Market adjusted BHAR of overpriced IPOs calculated using offer price

	Mean	Std. Deviation
OBHAR1	-19.17	22.55
OBHAR1M	-25.60	27.70
OBHAR6M	-24.44	56.10
OBHAR12M	-28.69	59.18
OBHAR18M	-60.00	172.65
OBHAR24M	-38.14	53.98
OBHAR36M	-44.13	71.98
OBHAR48M	-51.38	94.23
OBHAR60M	-78.11	88.49

Source: Data Analysis

Overpriced IPOs showed mean negative returns throughout the holding period, from offer price. The mean return (Negative, -19.17) was highest on the listing day and was lowest at 6 years. Therefore if overpriced IPOs are bought through offer, the returns would be negative throughout the holding period. The volatility of the returns was least in the first month. There after volatility increased and was maximum at 1.5 years post listing.

This implies that overpriced IPOs, bought on listing day, gave positive returns after 6 months post listing and can be held upto 4 years. Overpriced IPOs bought through offer underperformed the market upto 5 years.

Post Listing performance of Underpriced IPOs from Listing and Offer Price using BHAR

The post listing performance of Underpriced IPOs was calculated for a period up to 60 months from both offer and listing price.

Table 7: Market adjusted BHAR of Underpriced IPOs calculated using Listing price

	Mean	Std. Deviation
LBHAR1M	-7.915	90.890
LBHAR6M	-4.258	84.610
LBHAR12M	-16.654	157.504
LBHAR18M	-130.075	94.069
LBHAR24M	-51.715	277.576
LBHAR36M	-54.370	195.041
LBHAR48M	-52.016	83.873
LBHAR60	-81.250	70.334

Source: Data Analysis

Underpriced IPOs showed mean negative returns throughout the holding period if bought on listing day. The mean return (Negative, -04.25) was highest at 6 months. Therefore if an investor buys an underpriced IPO on listing day, the returns would be negative throughout the holding period. The volatility of the returns was least at 6 months. There after volatility increased and was maximum at 2 years post listing.



Table 8: Market adjusted BHAR of Underpriced IPOs calculated using offer price

	Mean	Std. Deviation
OBHAR1	39.143	40.120
OBHAR1M	36.304	62.561
OBHAR6M	36.095	91.889
OBHAR12M	33.719	124.595
OBHAR18M	-114.574	164.777
OBHAR24M	35.485	355.976
OBHAR36M	11.377	254.428
OBHAR48M	-19.242	130.064
OBHAR60M	-55.073	90.619

Source: Data Analysis

Underpriced IPOs showed mean positive returns up to 1 year, if bought through offer. The highest return (39.14) was recorded on the listing day, further returns decreased. The mean return was negative at 1.5 years. The volatility of the returns was least in the first month. There after volatility increased and was maximum at 2 years post listing.

Therefore underpriced IPOs bought on listing day gave negative returns throughout the holding period. Underpriced IPOs bought through offer gave positive returns up to 1 year.

Studies conducted for developed markets documents listing day positive returns for IPOs, followed by persistent underperformance up to the end of 12 months of trading and thereafter a positive market-adjusted return. (e.g., Ritter, 1991; Purnanandam and Swaminathan, 2004; and Hoechle and Schmid, 2007). In contrast to literature, this study documents Positive BHAR from offer price upto 1 year post listing. This could be because of High level of under pricing in Indian IPOs.

Therefore the initial underperformance, followed by over performance and subsequent underperformance is a pattern in IPOs for BHAR from listing price. Initial over performance, followed by under performance and subsequent over performance is a pattern in IPOs for BHAR from Offer price.

Analysis of factors affecting post-listing performance of IPOs

The Post-Listing Performance of IPOs, measured using BHAR, is regressed with the selected variables to analyse their significance in explaining the BHAR up to 60 Months in Indian IPO market. BHAR from Listing and Offer price are used for analysis. The following tables depicts the summary of OLS Regression analysis of pricing parameters on BHAR for sample IPOs.



Table 9: Summary of OLS Regression analysis: Pricing parameters with significant impact on BHAR for sample IPOs

BHAR	EPS	IPE	RNOW	r-square	Sig value	Model
LBHAR1M				.027	.315	Not significant
LBHAR6M				.002	.996	Not significant
LBHAR12M				.010	.838	Not significant
LBHAR18M	+	-		.408	.000	Significant
LBHAR24M		-		.149	.035	Significant
LBHAR36M		-		.094	.280	Not significant
LBHAR48M		-		.281	.006	Significant
LBHAR60M		-		.284	.007	Significant
OBHAR1M		+		.034	.191	Not significant
OBHAR6M				.012	.763	Not significant
OBHAR12M				.004	.977	Not significant
OBHAR18M	+			.392	.000	Significant
OBHAR24M				.016	.942	Not significant
OBHAR36M		-	+	.188	.021	Significant
OBHAR48M				.091	.437	Not significant
OBHAR60M			+	.164	.130	Not significant

Source: Compiled from regression analysis



For the sample IPOs, the variables EPS, IPE and RoNW were found to have a significant impact on BHAR. EPS is positively related to BHAR. IPE is negatively related to BHAR, except for OBHAR1M. RNOW is positively related to BHAR.

Table 10: Summary of OLS Regression analyses: Pricing parameters with significant impact on BHAR for overpriced IPOs

BHAR	EPS	IPE	RNOW	r-square	Sig value	Model
LBHAR1M				.054	.482	Not significant
LBHAR6M				.040	.650	Not significant
LBHAR12M				.047	.578	Not significant
LBHAR18M	+			.573	.000	Significant
LBHAR24M				.466	.009	Significant
LBHAR36M				.254	.279	Not significant
LBHAR48M				.565	.025	Significant
LBHAR60M			+	.658	.006	Significant
OBHAR1M				.056	.448	Not significant
OBHAR6M				.042	.611	Not significant
OBHAR12M				.022	.877	Not significant
OBHAR18M	+			.865	.000	Significant
OBHAR24M				.170	.471	Not significant
OBHAR36M				.400	.053	Not Significant
OBHAR48M				.499	.046	Significant
OBHAR60M		+		.538	.037	Significant

Source: Compiled from regression analysis

For the overpriced IPOs, the variables EPS, IPE and RoNW were found to have a positive significant impact on BHAR.



Table 11: Summary of OLS Regression analyses: Pricing parameters with significant impact on BHAR for underpriced IPOs

BHAR	EPS	IPE	RNOW	NAV	r-square	Sig value	Model
LBHAR1M					.025	.658	Not significant
LBHAR6M					.009	.942	Not significant
LBHAR12M					.008	.957	Not significant
LBHAR18M			-		.131	.354	Not significant
LBHAR24M					.050	.801	Not significant
LBHAR36M	+	-		-	.279	.031	Significant
LBHAR48M					.131	.529	Not significant
LBHAR60M					.291	.093	Not significant
OBHAR1M					.021	.744	Not significant
OBHAR6M					.013	.893	Not significant
OBHAR12M					.003	.994	Not significant
OBHAR18M					.085	.634	Not significant
OBHAR24M					.023	.957	Not significant
OBHAR36M					.243	.065	Not significant
OBHAR48M					.070	.829	Not significant
OBHAR60M			+		.289	.095	Not significant

Source: Compiled from Regression analysis

For the underpriced IPOs, the variables EPS, IPE, RoNW and NAV were found to have a significant impact on BHAR. EPS is positively related to BHAR. IPE is negatively related to BHAR. RNOW is negatively related to BHAR during initial periods, further becomes positively related to BHAR. NAV is negatively related to BHAR.



Summary of findings

If investors buy shares during IPO offer period, they can hold the IPO till 2 years to get positive returns. If the IPOs are bought on the listing day, the IPO can be exit only after 3 or 4 years. It is ideal to invest in IPO during offer. The overpriced IPOs, bought on listing day, gave positive returns after 6 months post listing and can be held upto 4 years. Overpriced IPOs bought through offer underperformed the market up to 5 years. The underpriced IPOs bought on listing day gave negative returns throughout the holding period. Underpriced IPOs bought through offer gave positive returns up to 1 year.

For sample IPOs, the regression model was significant for LBHAR18M, LBHAR24M, LBHAR48M, LBHAR60M, OBHAR18M and OBHAR36M. For overpriced IPOs, the regression model was significant for LBHAR18M, LBHAR24M, LBHAR48M, LBHAR60M, OBHAR18M, OBHAR48M and OBHAR60M. For underpriced IPOs, the regression model was significant for LBHAR36M only.

Explanation for Long run performance of IPOs

EPS at IPO offer period has a positive significant relationship with BHAR. IPE, RoNW and NAV at IPO offer period has a negative positive relationship with long run BHAR. In the short run, the investors are not very sure whether the company issuing the IPO will be able to catch up with the high industry growth exhibited in terms of a high PE ratio, which is the indicator of the growth potential of the specific industry/sector. However, as information about the growth potential and the business opportunities of the company starts diffusing over time, uncertainty about the catching up effect declines and accordingly investors start demanding lower return on IPOs. The relationship is not very strong during the first few months as the information flow may not be sufficient enough to form opinion about the growth potential of the company by the investors. However, with more information diffusing over a time, this relationship becomes very stronger by the end of two years.

Conclusion

The IPO pricing and performance is dependent on various factors. The study throws light on the necessity of IPO data transparency and help investors understand IPO pricing in the short as well as long run. The results obtained from the study provide important information to investors intending to invest in IPO's for a long term.

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Annexure

OLS Regression of BHAR with pricing parameters for sample IPOs:

The regression equations are

$$\text{LBHAR1M} = -13.580 + 0.077 (\text{NAV}) + 0.027 (\text{P/E}) + 0.049 (\text{EPS}) + 0.120 (\text{IPE}) - 0.026 (\text{RoNW})$$

$$\text{LBHAR6M} = -2.657 + 0.016 (\text{NAV}) + 0.016 (\text{P/E}) + 0.019 (\text{EPS}) + 0.007 (\text{IPE}) - 0.029 (\text{RoNW})$$

$$\text{LBHAR12M} = -5.401 + 0.034 (\text{NAV}) - 0.013 (\text{P/E}) + 0.040 (\text{EPS}) - 0.041 (\text{IPE}) - 0.081 (\text{RoNW})$$

$$\text{LBHAR18M} = 34.124 - 0.049 (\text{NAV}) - 0.015 (\text{P/E}) + 0.629 (\text{EPS}) - 0.207 (\text{IPE}) - 0.089 (\text{RoNW})$$

$$\text{LBHAR24M} = 70.824 - 0.037 (\text{NAV}) - 0.032 (\text{P/E}) + 0.218 (\text{EPS}) - 0.356 (\text{IPE}) - 0.042 (\text{RoNW})$$

$$\text{LBHAR36M} = 172.154 - 0.091 (\text{NAV}) - 0.078 (\text{P/E}) + 0.170 (\text{EPS}) - 0.274 (\text{IPE}) - 0.019 (\text{RoNW})$$

$$\text{LBHAR48M} = 159.229 + 0.037 (\text{NAV}) - 0.026 (\text{P/E}) + 0.308 (\text{EPS}) - 0.516 (\text{IPE}) + 0.028 (\text{RoNW})$$

$$\text{LBHAR60M} = 76.051 + 0.038 (\text{NAV}) + 0.017 (\text{P/E}) + 0.325 (\text{EPS}) - 0.519 (\text{IPE}) + 0.074 (\text{RoNW})$$



$$OBHAR1M = -10.105 + 0.030 (NAV) - 0.010 (P/E) - 0.010 (EPS) + 0.178 (IPE) + 0.037 (RoNW)$$

$$OBHAR6M = -6.694 + 0.020 (NAV) + 0.005 (P/E) - 0.014 (EPS) + 0.105 (IPE) + 0.014 (RoNW)$$

$$OBHAR12M = -12.489 + 0.027 (NAV) + 0.001 (P/E) + 0.002 (EPS) + 0.052 (IPE) - 0.016 (RoNW)$$

$$OBHAR18M = -121.862 - .012 (NAV) + .085 (P/E) + .667 (EPS) -.005 (IPE) -.117 (RoNW)$$

$$OBHAR24M = -5.362 - 0.033 (NAV) - 0.010 (P/E) + 0.049 (EPS) - 0.101 (IPE) + 0.056 (RoNW)$$

$$OBHAR36M = -27.731 - 0.258 (NAV) - 0.055 (P/E) + 0.230 (EPS) - 0.243 (IPE) + 0.244 (RoNW)$$

$$OBHAR48M = -50.177 - 0.051 (NAV) - 0.039 (P/E) + 0.125 (EPS) - 0.141 (IPE) + 0.214 (RoNW)$$

$$OBHAR60M = -106.660 - 0.108 (NAV) + 0.059 (P/E) + 0.088 (EPS) - 0.004 (IPE) + 0.378 (RoNW)$$

OLS Regression of BHAR with pricing parameters for overpriced IPOs

The regression equations are

$$LBHAR1M = -14.855 + 0.153 (NAV) + 0.110 (P/E) + 0.137 (EPS) - 0.018 (IPE) - 0.027 (RoNW)$$

$$LBHAR6M = 11.817 + 0.055 (NAV) + 0.113 (P/E) + 0.109 (EPS) - 0.153 (IPE) - 0.070 (RoNW)$$

$$LBHAR12M = 17.118 + 0.099 (NAV) - 0.069 (P/E) + 0.097 (EPS) - 0.131 (IPE) - 0.098 (RoNW)$$

$$LBHAR18M = 45.746 - 0.030 (NAV) - 0.194 (P/E) + 0.399 (EPS) - 0.212 (IPE) + 0.313 (RoNW)$$

$$LBHAR24M = 65.583 - 0.051 (NAV) - 0.109 (P/E) + 0.599 (EPS) - 0.231 (IPE) - 0.092 (RoNW)$$

$$LBHAR36M = 77.203 - 0.078 (NAV) - 0.117 (P/E) + 0.415 (EPS) - 0.096 (IPE) + 0.048 (RoNW)$$

$$LBHAR48M = -66.765 + 0.269 (NAV) - 0.184 (P/E) + 0.055 (EPS) - 0.435 (IPE) + 0.355 (RoNW)$$

$$LBHAR60M = -247.001 + 0.263 (NAV) - 0.180 (P/E) + 0.118 (EPS) - 0.356 (IPE) + 0.456 (RoNW)$$

$$OBHAR1M = -32.705 + 0.122 (NAV) + 0.131 (P/E) + 0.116 (EPS) + 0.075 (IPE) - 0.046 (RoNW)$$

$$OBHAR6M = -12.748 + 0.011 (NAV) + 0.160 (P/E) + 0.124 (EPS) - 0.060 (IPE) - 0.123 (RoNW)$$

$$OBHAR12M = -16.168 + 0.001 (NAV) + 0.010 (P/E) + 0.133 (EPS) - 0.036 (IPE) - 0.160 (RoNW)$$

$$OBHAR18M = -165.929 - 0.088 (NAV) - 0.115 (P/E) + 0.737 (EPS) + 0.145 (IPE) + 0.179 (RoNW)$$

$$OBHAR24M = -45.084 + .112 (NAV) + .023 (P/E) + .281 (EPS) - 0.171 (IPE) - 0.066 (RoNW)$$

$$OBHAR36M = -18.604 - 0.244 (NAV) - 0.357 (P/E) + 0.538 (EPS) - 0.047 (IPE) - 0.085 (RoNW)$$

$$OBHAR48M = -108.128 - 0.452 (NAV) - 0.332 (P/E) + 0.644 (EPS) + 0.248 (IPE) + 0.181 (RoNW)$$

$$OBHAR60M = -236.544 - 0.523 (NAV) - 0.255 (P/E) + 0.678 (EPS) + 0.716 (IPE) + 0.302 (RoNW)$$



OLS Regression of BHAR with pricing parameters for underpriced IPOs

The regression equations are

$$\text{LBHAR1M} = -9.783 + 0.040 (\text{NAV}) - 0.004 (\text{P/E}) - 0.002 (\text{EPS}) + 0.146 (\text{IPE}) - 0.041 (\text{RoNW})$$

$$\text{LBHAR6M} = -7.043 + 0.003 (\text{NAV}) - 0.029 (\text{P/E}) - 0.047 (\text{EPS}) + 0.088 (\text{IPE}) - 0.016 (\text{RoNW})$$

$$\text{LBHAR12M} = -16.929 + 0.006 (\text{NAV}) + 0.003 (\text{P/E}) - 0.021 (\text{EPS}) + 0.048 (\text{IPE}) - 0.071 (\text{RoNW})$$

$$\text{LBHAR18M} = -129.206 + 0.068 (\text{NAV}) + 0.174 (\text{P/E}) + 0.235 (\text{EPS}) - 0.032 (\text{IPE}) - 0.342 (\text{RoNW})$$

$$\text{LBHAR24M} = -33.112 - 0.098 (\text{NAV}) + 0.086 (\text{P/E}) + 0.232 (\text{EPS}) - 0.211 (\text{IPE}) + 0.034 (\text{RoNW})$$

$$\text{LBHAR36M} = -24.433 - 0.499 (\text{NAV}) + 0.030 (\text{P/E}) + 0.566 (\text{EPS}) - 0.431 (\text{IPE}) + 0.188 (\text{RoNW})$$

$$\text{LBHAR48M} = -34.184 - 0.163 (\text{NAV}) - 0.014 (\text{P/E}) + 0.296 (\text{EPS}) - 0.260 (\text{IPE}) + 0.182 (\text{RoNW})$$

$$\text{LBHAR60M} = -73.130 - 0.299 (\text{NAV}) + 0.194 (\text{P/E}) + 0.426 (\text{EPS}) - 0.306 (\text{IPE}) + 0.334 (\text{RoNW})$$

$$\text{OBHAR1M} = 26.283 - 0.020 (\text{NAV}) - 0.055 (\text{P/E}) - 0.037 (\text{EPS}) + 0.137 (\text{IPE}) - 0.029 (\text{RoNW})$$

$$\text{OBHAR6M} = 21.516 + 0.011 (\text{NAV}) - 0.048 (\text{P/E}) - 0.058 (\text{EPS}) + 0.102 (\text{IPE}) - 0.013 (\text{RoNW})$$

$$\text{OBHAR12M} = 13.064 + 0.017 (\text{NAV}) - 0.016 (\text{P/E}) - 0.031 (\text{EPS}) + 0.032 (\text{IPE}) - 0.039 (\text{RoNW})$$

$$\text{OBHAR18M} = -143.519 + 0.137 (\text{NAV}) + 0.193 (\text{P/E}) + 0.164 (\text{EPS}) - 0.070 (\text{IPE}) - 0.199 (\text{RoNW})$$

$$\text{OBHAR24M} = 43.102 - 0.105 (\text{NAV}) - 0.012 (\text{P/E}) + 0.097 (\text{EPS}) - 0.137 (\text{IPE}) + 0.031 (\text{RoNW})$$

$$\text{OBHAR36M} = -20.354 - 0.397 (\text{NAV}) + 0.049 (\text{P/E}) + 0.351 (\text{EPS}) - 0.308 (\text{IPE}) + 0.297 (\text{RoNW})$$

$$\text{OBHAR48M} = -29.594 - 0.046 (\text{NAV}) + 0.008 (\text{P/E}) + 0.119 (\text{EPS}) - 0.170 (\text{IPE}) + 0.195 (\text{RoNW})$$

$$\text{OBHAR60M} = -77.276 - 0.189 (\text{NAV}) + 0.227 (\text{P/E}) + 0.237 (\text{EPS}) - 0.221 (\text{IPE}) + 0.431 (\text{RoNW})$$

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