

Valuation of IPOs in India-An Empirical study

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Abstract

In this paper, we examine two main propositions for Indian Equity Market: (i) important factors that determine short-run underpricing of initial public offerings (IPOs) (ii) impact of IPOs' mispricing on investment banks' reputation. Data is employed for 432 new IPO issues for India from April, 2001 to December, 2011. We find that 5 variables i.e. number of times an IPO issue subscribed, number of uses of IPOs' proceeds, Listing Delay, Industry PE ratio and dummy for companies representing new economies are positively related to the short run initial return on IPOs, while 4 variables, i.e. company size, investors' sentiment, investment banks' reputation defined in terms of share in IPO proceeds and dummy for private companies' IPOs bear a negative relationship with initial return. The IPOs seem to be overpriced and the Indian market takes about 6 months to fully incorporate information for discovering the fair value of IPOs. Mispricing of IPOs seems to negatively impact the investment banks' reputation in the next period. Our results are in conformity with the previous findings of developed market. The findings of this research have strong implications for the policy makers, market intermediaries as well as investors. The present study contributes to the capital market literature, especially for emerging economies.

Keywords: IPO, Underpricing, Investment Banks, Investor's sentiment, Short-run initial return

1. Introduction

In 1980s and 1990s, there was an increasing realisation on the part of the policy planners that an efficient and well developed capital market is essential for sustained growth in an emerging market economy like India. The capital market fosters economic growth by promoting channelisation of real savings for capital formation and raises productivity of investment by improving allocation of investible funds. However, it is quality of the market which determines effectiveness of this mechanism for capital flows. Accordingly, with the view to improve the quality of the market in terms of its efficiency, transparency and price discovery process and bringing the Indian capital market up to the international standards, a package of reforms comprising of measures to liberalise, regulate and develop the Indian capital market have been implemented since early 1990s. The reforms mainly covered areas like legislative framework, trading mechanisms, institutional support, etc.

As a result of the reforms initiated by the Government of India, primary market (including IPOs) started emerging as one of the major source of funds for Indian companies as well as an important avenue for retail investors to channelise their savings for higher return. A perusal of the trend in the Indian capital market shows that as a proportion of the total resources mobilised through primary market, the share of IPOs went up from 15.9 per cent in FY 2001-02 to 48.7 per cent in 2004-05 and then declined marginally to 39.9 per cent before reaching the peak of 85.1 per cent in 2006-07. Thereafter, it exhibited a sharp decline in the next two years before it started rising again in 2009-10 and reached the level of 50.3% in 2010-11. No doubt, on account of temporary phases of cyclical downturn due to domestic and international factors, there may be fluctuating trends in the IPO market. However, keeping in view the requirements of Indian corporates and the available sources of funding, IPOs segment will continue to remain an important component of Indian capital market in the medium to long-term horizon.

As far as IPO market is concerned, the available IPO literature indicates that there are significant underpricing of IPOs expressed in terms of positive abnormal returns measured from either the opening or the closing price on the first day of trading versus the offer price of IPOs in US and other international markets. In other words, there is a significant underpricing of IPOs. A review of the existing literature on IPOs shows that a number of studies have already been undertaken on underpricing of IPOs for developed capital markets as discussed in section 2 of this study. It will be interesting to examine whether the underlying factors identified in these studies also influence pricing behavior for IPOs in an emerging market like India. Past studies have also shown that pricing of IPOs is always an issue and one needs to analyse factors that determine the level of underpricing especially for an emerging market like India. A review of studies on the subject reveals that no significant attempt has been made so far in the direction of developing a model that explains the underpricing of Indian IPOs as discussed in Section 2 of this study. Most of the studies on Indian IPOs have mainly focused on testing various theoretical explanations/hypotheses explaining underpricing, identifying determinants of IPO underpricing both in the short-run and long-term performance of IPOs, comparative studies of underpricing under fixed price and book building method of allocation of IPOs etc. Since IPOs are now a major source for investment especially by the Indian retail investors, and have gradually emerged as one of the important source for raising fund in the

Indian primary market, it is important that the pricing of IPOs truly reflects the intrinsic value of the company. With strong market fundamentals and good prospect for growth, a sound capital market with a transparent mechanism for price discovery process for IPOs will go a long way in leveraging India's potential as a preferred destination for investment by both domestic as well as international investors. Hence from the policy perspective, an attempt has been made in this paper to develop a model for explaining the possible level of short run underpricing in India.

Past studies also show that investment banks with high reputation tend to underprice IPOs to a lesser degree as due diligence by highly reputed investment banks reflect less riskiness of an issue among the investor community. By subscribing to an IPO, investors are taking a bet on the reputation of investment banks that have managed/co-managed the issue and hence willing to subscribe to the issue at a lesser discount. A logical corollary to this argument is that if the pricing of the issue is not done accurately by an investment bank, the market may penalize them in subsequent period, which could then be reflected in terms of decline in the market share of investment banks for the period under reference. Accordingly, it is always in the interest of investment banks to enforce underpricing equilibrium to the extent possible. Hence, the hypothesis relating to IPO mispricing and its impact on investment banks' market share needs to be tested in case of India so that policy changes with respect to the role of investment banks, if any, could be suggested. An attempt has accordingly been also been made in this study to examine the relationship between mispricing by an investment bank during a given period and change in its market share in the subsequent period.

The study comprises of 7 sections, including the present one. Section 2 of this study provides theoretical explanation and a brief review of studies undertaken on underpricing of IPOs, both in the international as well as Indian context. While section 3 describes the details of the data and their sources for the study, section 4 covers performance of the Indian IPOs market over the study period. A detailed analysis of the factors influencing short term initial return on IPOs for developing an underpricing model is covered in section 5 of this report. In section 6, of this study examines the relationship between investment banks' reputation and underpricing of Indian IPOs. Summary and concluding remarks are provided in section 7 of this study.

2. Review of Literature

Past international studies on short-run underpricing of IPOs show that these research mainly focused on variables/parameters which could broadly be classified under 4 categories, i.e., company/issue specific parameters, industry specific parameters, market specific information and country specific macro parameters. Beatty & Ritter (1985) in their study, inter alia, postulated the hypothesis that greater is the ex-ante uncertainty, the higher was the expected underpricing. The authors have used (i) the log (1+no. of uses of proceeds) listed in the prospectus and (ii) inverse of gross proceeds as proxies for ex-ante uncertainties. Both these variables are found to be positively related to the degree of underpricing. According to Karlis (2000), IT and other new economy industries IPOs tend to be underpriced leading to higher initial return. This is based on the argument that industry with shorter & less informative history will be more underpriced because there is more uncertainty about the issuing firm.

Kooli & Suret (2001) examined ex-ante uncertainty hypothesis, underwriter reputation hypothesis and market climate hypothesis in the context of the Canadian IPO market for the period 1991-1998. According to this study, a negative relationship existed between the level of underpricing vis-à-vis ex-ante uncertainty (issue proceeds used as a proxy for ex-ante uncertainty) and the reputation of the underwriter. The results are consistent with the findings of Beatty and Ritter as former used gross proceeds instead of inverse of gross proceeds as in the case of latter study. Kooli & Suret have further observed that the IPOs issued during an upswing in the stock market experienced a higher underpricing than IPOs issued during a falling market. Guner, Onder & Rhoades (2004) examined the relationship between reputation of an underwriter and the initial-day IPO return in the emerging market of Turkey from January, 1993 to June, 1999. The authors used two reputation measures: the first measure assumed that two underwriters with the highest number of IPOs managed or co-managed were the prestigious underwriter and the rest are not. This variable measured the visibility of underwriters in the IPO market. The second reputation variable was a proxy for the volumes of IPO business (either in dollar amount or in number) lead or co-lead by an underwriter. According to their model, a negative relationship between the initial day IPO returns and the visibility measures was found. This indicated that since these underwriters were well known by the investors, they underpriced IPOs to a lesser degree. On the other hand, initial day IPO returns was found to be positively related to the volume of IPOs indicating that the more IPOs an underwriter handled, the harder would be to sell the shares. Therefore, these underwriters had to underprice the issues to a higher degree.

Procianoy and Cigerza (2007) in their comparative study of IPOs in emerging markets of Brazil, India and China used multivariate linear regression model with a mix of variables covering IPO specific information, market related factors and macro-parameters. The variables used are offer size, Investment bank reputation, final offer price, market performance, dummy for goods produced using high-tech content, interest rate, FDI, GDP, inflation, etc. In this study, the authors found market performance (before and after the issue) and the high-tech dummy were the only variables influencing short run initial return with acceptable statistical significance at 10% or below. The independent variables used in the multivariate analysis of the first day trading performance of the IPOs in the Brazilian Market between January, 2004 to April, 2007 by Faria (2007) included age of the firm, ratio of primary offer size to the total offer size and nine key ratios: sales, growth in sales, solvency, liquidity, fixed asset turnover, total asset turnover, return on equity, return on assets and operation profit margin. The author observed that out of all the above independent variables, only return on equity was statistically significant with negative correlation with underpricing. While examining the determinants of initial IPO performance in Hong Kong and Taiwan, Lin & Hsu (2008), inter alia, found that 'allotment ratio' of the subscribed shares (total IPO shares issued over the number of shares subscribed by the participants applicants) was the most consistent determinant for IPO underpricing in both the Hong Kong as well as Taiwanese market, thereby supporting Rock's (1986) adverse selection theory of underpricing .

In the Indian context, Krishnamurti & Kumar (2002) in their study analysed 386 IPOs issued between 1992 and 1994 on the Bombay Stock Exchange and documented time-lag between

final allotment and listing as one of the important reasons for underpricing of IPOs in India as it increased the perceived risk of the investors and hence they demanded more return. They also suggested but not tested that there is higher IPOs underpricing in India because of the presence of individual and small investors, who are less informed than the large investors. Presence of a large number of uninformed investors would require the issuers to underprice their IPOs to a large extent to induce these investors to invest in IPOs (Rock 1986). Ghosh (2002) in his study examined the uncertainty and signalling models of underpricing in the Indian context over the last decade. The empirical findings showed that there existed positive relationship between IPO underpricing and ex-ante measures of risk proxies. The relationship between underpricing and age of the company in a simple OLS framework showed that the age of the company could not explain the variations in the initial returns. This could possibly be due to the fact that since most of the companies that tapped the capital market were young in terms of their age, it seemed that the Indian investors did not frame their opinion about the viability of a corporate from its age profile. Kumar (2007) analysed the short run and long run performance of Book built IPOs in India by performing a cross sectional regression with the short run initial returns as dependent variable and size (the natural log of the issue size), dummy for before market conditions and quotient of offered price to the upper price as independent variables. From the regression results it was observed that only offer price quotient was found to be significant and the remaining variables were not statistically significant. Pandey & Vaidyanathan (December 2008) studied the underpricing of IPOs listed on National Stock Exchange during 2004 to 2006. The multivariate regression analysis was based on factors like dummy for demand for the IPOs, listing delay, issue size and marketing expenditure (in millions of rupees). The results of this study showed that the coefficient of demand is positive and significant indicating more underpricing if the issue is finally priced towards the higher end of the price band. Similarly, the coefficient of listing delay had a significant positive relation with underpricing. Bansal & Khanna (2012) inter-alia analysed the factors which affected the degree of underpricing after the global economic crisis during 2008-11. The study found a negative relationship between variables like number of shares offered, issue size and private IPOs vis-à-vis the level of underpricing.

Prior studies in India have focused on a limited no of variables to explain IPO underpricing and generally cover a time horizon of 4-5 years. In the present study, we employ a comprehensive set of macro-economic, industry, market and company related factors that may influence the level of underpricing in India. The study also covers a longer study period from April 2001 to December, 2011. This study period has witnessed market upswings as well as downswings due to domestic as well as international factors and therefore covers all phases of market cycle. In addition, the study also examines the relationship between IPO pricing error and the Investment bank reputation, an issue which has not been addressed so far in prior literature for India. Hence the paper fills an important research gap in equity market literature.

3. Data and Their Sources

Data for companies issuing IPOs from March, 2000 to December, 2011, have been obtained from Prime Database, an organisation dedicated to the primary capital market covering fund raising by the Indian corporate sector and the Government through equity, debt or

securitisation, in India or abroad. Information obtained from the Prime Database covers opening and closing date of issue, price band, offer price, employees share, date of listing, closing price at the end of 1st day, 7th day, 1 month, 3 months, 6 months, details of the lead manager/co-manager, industry/sector, uses, etc. The details of income of the company, industry P/E ratio, date of certificate of incorporation, etc. are taken from the draft prospectus filed by each of these issuing companies with Securities and Exchange Board of India (SEBI), the market regulator in India. However, since there are a lot of missing data in respect of the IPOs issued between April, 2000 to March, 2001 especially in regard to the listing and closing price details for different moments, the reference period for this study that has subsequently been used is April, 2002 to December, 2011 thereby covering 432 IPO issues.

The details of GDP, Wholesale Price Index (WPI) and Index of Industrial Production (IIP) for the reference period have been obtained from the Central Statistical Organisation (CSO), Ministry of Statistics and Programme Implementation (www.mospi.nic.in) and the Department of Industrial Policy and Promotion (DIP&P), Ministry of Commerce and Industry website (www.dipp.nic.in). While WPI time series data has been used to calculate the time series data on inflation, IIP series have been used to estimate the rate of growth of industry. The implicit yield at cut-off price for the 91 days Treasury Bills in the last week of the month immediately preceding the month in which offers for IPOs have been closed is obtained from RBI monthly bulletin as provided on the central bank website (www.rbi.org.in). The T-Bill yield has been used as proxy for opportunity cost of capital. The Put-Call ratio of NIFTY index option as a proxy for investors' sentiment is sourced from National Stock Exchange (NSE).

4. Review and Performance of Indian IPOs Market over the Study Period

In this study, we estimate the short term initial return for the sample IPOs as the difference between the first day closing price and offer price. The average short run initial return for all the 432 IPOs from April, 2002 to December, 2011 is 24.93 per cent. The short-run initial return has come down significantly over time as shown in prior research (see Table 1). According to Kumar (2007), this decline is probably due to the introduction of book-building process, an important change that the public issue process has witnessed from the early nineties to the present day. According to Pandey & Vaidyanathan (2008), the reduction in underpricing could also be attributed in part to the change in regulation whereby the allocation to informed institutional investors was allowed.

Table 1. Short-run performance of Indian IPOs – A comparison with prior studies

Studies	Period	First Day Return (after Listing)
Kakati (1999)	1993-96	34.9% (un-annualised)
Krishnamurti and Kumar (2002)	1992-94	72.34% (un-annualised)
Jaitly and Sharma (2004)	1993-94	72% (un-annualised)
S S S Kumar (2007)	1999-2006	26.35% (un-annualised)
Present studies	2002-2012 (up to Dec. 2011)	24.93% (un-annualised)

The year-wise pattern of short-run Initial Return on Indian IPOs over the study period is provided in Table 2. While the first day return is with respect to the offer price, return for subsequent periods have been estimated with respect to the first day closing price of the IPO. An analysis of the trend in initial return across short term and medium-term time horizon (up to 6 months period) indicates that the first day initial return which is highly positive at about 24.93 per cent for the first day becomes negative and is -1.21 per cent for the 6 month period from the issue date, excluding the first day return. The trend is also in conformity with the international findings that as time passes and more information becomes available, divergence of opinion between optimistic and pessimistic investors will narrow down and consequently price will drop in the market.

Table 2. Short-run & Medium-term return on IPOs

Year	IRD1	IR 7D/ day 1 closing	IR 1 month/ day 1 closing	IR 3 months/ day1 closing	IR 6 months/ day 1 closing
2002-03	0.127	0.023	0.177	0.470	1.448
2003-04	0.527	0.045	0.016	-0.004	0.057
2004-05	0.458	0.008	0.029	0.172	0.420
2005-06	0.356	0.021	0.060	0.020	-0.005
2006-07	0.170	0.012	-0.016	0.081	0.138
2007-08	0.390	-0.029	-0.055	-0.097	-0.124
2008-09	0.122	-0.072	-0.192	-0.348	-0.357
2009-10	0.054	-0.017	-0.022	-0.09	-0.010
2010-11	0.157	-0.039	-0.094	-0.082	-0.148
2011-12 (up to Dec. 11)	0.013	-0.093	-0.173	-0.204	-0.215
Overall Return	0.249	-0.014	-0.033	-0.037	-0.012

IRD1-First day initial return (calculated w.r.t. offer price), IR7D-Seventh day return (calculated w.r.t. first day closing price), IR1 month- return at the end of 1 month (calculated w.r.t. first day closing price), IR3 months- return at the end of 3 months (calculated w.r.t. first day closing price), IR 6months- return at the end of 6 months (calculated w.r.t. first day closing price)

A snapshot of the IPO activities during the reference period i.e. April 2002 to December 2011 in India is provided in the Table 3 of this study. It can be observed that the Indian market saw a steady rise in terms of IPO issues up to 2007-08. Thereafter, the market started declining on account of global economic crises. The effect of global economic slowdown was reflected in terms of decline in the number of IPO issues which came to the market during 2008-09 and 2009-10. Then, there was a recovery period of one year when the number of IPO issues went up to 52 in 2010-11. The subdued IPO market of 2011-12 thereafter could be regarded as the fall-out of impact of Euro Zone crises on India growth story as reflected in terms of decline in

IPO issues as shown in the table. It has also been observed that the Indian companies took advantage of the bullish phase of the Indian capital market as the period of market upturn is followed by high issue volumes in the market. In other words, when investors are overoptimistic, firms respond by issuing equity in a window of opportunities. The average issue size of Indian IPOs during the reference period increased from USD 35.77 million in 2002-03 to USD 145.22 million in 2004-05. It subsequently declined to USD 33.10 million in 2005-06 and exhibited a mixed trend thereafter before reaching a peak of USD 139.67 million in 2010-11.

Table 3. IPO activities in India –An overview

Year	Avg. Issue Size (in USD mn#)	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Obs.
2002-03	35.77	0.128	0.022	0.404	-0.058	0.196	0.535	1.633	6
2003-04	37.86	0.528	0.312	1.791	-0.023	0.574	1.082	3.058	18
2004-05	145.22	0.458	0.322	2.097	-0.206	0.542	1.426	4.941	22
2005-06	33.10	0.356	0.258	2.582	-0.881	0.537	1.886	8.588	82
2006-07	72.24	0.170	0.013	2.303	-0.422	0.468	1.955	8.216	78
2007-08	122.10	0.390	0.237	2.863	-0.240	0.596	1.978	7.371	84
2008-09	20.70	0.122	-0.018	1.596	-0.672	0.557	1.276	4.025	22
2009-10	131.70	0.055	0.019	0.636	-0.372	0.247	0.515	3.015	39
2010-11	139.67	0.157	0.091	1.144	-0.529	0.344	0.824	3.483	52
20011-12 (up to Dec. 2011)	36.39	0.013	-0.137	1.535	-0.731	0.573	0.723	2.927	29

Based on average annual exchange rates

5. Determinants of Short Run Underpricing of IPOs

Linear regression model (OLS framework) has been used in this study to identify variables that may explain the level of underpricing. To start with, initial return (dependent variable) has been regressed vis-à-vis 20 independent variables identified on the basis of the past research. Based on the results of bivariate regression analysis, 13 variables are identified in the first stage as variables significantly influencing short run initial return on Indian IPOs at 20 per cent level of significance or below. Since there are prior results hypothesising and explaining the relationship of the shortlisted variables vis-à-vis short run underpricing of IPOs including the direction of relationship, one tail test has been applied to check the level of significance of the short listed variables. The internal returns are then regressed on 13 variables identified at the first stage within the framework of multivariate regression analysis. Pair-wise cross correlation are estimated for sample independent variables to verify whether there is an overlap among the 13 factors identified at the first stage of regression analysis. Four variables, namely CDROI (proxy for opportunity cost of capital), D1 (dummy for offer price), IGP (inverse of gross proceeds), INF (inflation) have been dropped due to multicollinearity problem and 9 variables are finally selected for underpricing model as discussed below. White test has been performed on the residuals to check the presence of Heteroscedasticity in the cross-sectional model suggested for predicting the possible level of underpricing. It is observed that no significant Heteroscedasticity is present and hence the OLS estimation for the proposed model is satisfactory.

Based on past studies, it is observed that the variables affecting IPOs underpricing could broadly be classified into the following four categories and the variables for the present study have accordingly been selected as shown in Exhibit A:

Exhibit A. Sample Variables used for explaining IPO underpricing

A. Company/issue related variables

IGP	Inverse of the Gross Proceeds -Gross Proceeds being defined as the total number of shares issued multiplied by the final offer price.
Uses	Log (1+no. of uses uses). No. of uses as indicated in the draft prospectus.
CS	Proxy for Company size /IPO Deal Size – defined in terms of the log value of the proceeds raised through the IPO route.
IRR	Insider Retention – The proportion of issued stock retained by the original owners and/or reserved for the employees of the company as indicated in the draft prospectus.
TS	Times Subscribed-no of times an issue subscribed by all class of investors.
LD	Listing Delay – Defined in terms of time lag between the closing date of the offer and listing of the issue at the Stock Exchange.
Age	Age of the Company-Log value of number of years calculated from the date of certificate of incorporation of the company to the offer date of the issue.
Offer Price	Dummy for Offer Price D1 If the final offer price is nearer to the lower end of the price band of the IPO, the dummy will take a value of 1 otherwise 0. D2 If the final offer price is nearer to the upper end of the price band of the IPO, the dummy will take a value of 1 otherwise 0.
Pvt. companies IPO	D5 - for private companies IPO. It takes a value of 1 for the private company issuing IPO, otherwise 0.
Income	Total Income of the company – Log value of the total income of the company as reported in the prospectus for the year immediately preceding the year in which IPO was issued.

B. Industry specific information

Industry PE ratio	Industry's Price to Earning (P/E) Ratio – Taken as the proxy for the overall growth potential of the industry.
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C. Market related information

Investor sentiment	Proxy for Market Investment Sentiment –The put-call ratio of NIFTY index option taken as proxy for investor's sentiment in the markets.
Market Climate	D3 -Dummy for market performance: If the market return (return on NIFTY index) during the month immediately preceding the date of issue of IPO is greater than the average of the last three months (including the immediate preceding month), then the dummy variable takes a value of 1 otherwise 0.

Cos representing new economies	D4- Dummy for the companies representing new economy: Biotech, pharma, telecom media, entertainment, IT/ ITES) takes a value of 1 otherwise 0.
IBRP	Proxy for the Investment Bank Reputation – The proxy being defined in terms of share of an underwriter in the value of IPO business (in rupee amount) during the reference period.
IBRI	Proxy for the Investment Bank Reputation – The proxy being defined in terms of share in IPO business defined in terms of no. of issues
D. Country Specific Macro Variables	
GDP Growth	GDP annual growth
Net FII	Net Foreign Institutional Investment (FIIs) Inflow – Net FIIs flows during the month immediately preceding the month in which the IPOs are issued
Inflation	Inflation – Change in Wholesale Price Index during the month immediately preceding the month in which the IPOs are issued.
IIP	Industrial Growth – Represented by the IIP figures released by the Ministry of Statistics & Programme Implementation/ Department of Industrial Production and Policy (DIP&P), Govt. of India during the month immediately preceding the month in which the IPOs are issued
CDROI	Proxy for opportunity cost of capital - The yearly effective rate in percentage points for the 91 days Treasury Bills issued by the RBI on behalf of the Government of India in the last week of the month immediately preceding the month in which the IPOs are issue

The details methodology is described as follows. As a first step the short-run initial return (IR) is regressed vis-à-vis each of the 20 variables one at a time (bivariate regression) to analyse their significance in explaining the level of underpricing in Indian IPO market. The results of the bivariate regression analysis are reported in Table 4 of this study.

Table 4. Results of Bivariate Regression Analysis

The Table below shows the result of the bivariate regression analysis with IR as the dependent variables.

Variables	Co-efficient (t statistics)
CDROI	-0.029323(-1.515098*)
CS	-0.130401(-3.567408*)
I_Sentiment	-0.382349(-2.508626*)
IBRP	-0.005595(-1.332057*)
IBRI	0.005123(0.734003)
IGP	0.063896 (3.585411*)
IIP	0.003436 (0.522147)
IPE	0.003618 (2.231194*)
Income	-0.096729 (-0.417389)
Age	0.039093 (0.423853)

Variables	Co-efficient (t statistics)
TS	0.011147 (11.84548*)
USES	0.193183 (1.475995*)
LD	0.019239 (3.749942*)
Net _FII	8.98E-06 (0.642232)
INF	-0.026800 (-2.793067*)
IIP	0.003436 (0.522147)
IRR	0.005035 (0.698123)
GDP_Growth	-0.003452 (-0.178378)
D1	-0.295059 (-3.564244*)
D2	0.046116 (0.851441)
D3	0.005035 (0.698123)
D4	0.209422 (3.663342*)
D5	-0.190367 (-1.534628*)

IR- Initial Return; CDROI – interest rate expressed in terms of 91 days GoI T – bill, CS – Proxy for company size defined in terms of log value of proceeds raised, I_Sentiment – investors sentiment expressed in terms of put/call ratio, IBRP – proxy for investment bank reputation in terms of proceeds raised ; IBRI - proxy for investment bank reputation in terms of no. of issues managed/co-managed ; IGP – log value of inverse of gross proceeds, IPE – industry PE ratio, Income – log value of total income of the company, Age – log value of the age of company expressed in terms of no. of years, TS - time subscribed, Uses - Log (of 1 + no. of uses), LD – Listing Delay, Net _FII - net foreign institutional inflows, INF – inflation, IIP- industrial growth, IRR – insider retention by employees/ original owner, GDP_growth – annual growth rate of GDP, D1 – dummy for final offer price in the lower end of the price band, D2 - dummy for final offer price in the upper end of the price band, D3 – dummy for market performance, D4 – dummy for companies representing new economy, D5 - dummy for private companies IPO.

*Variables significant at 20% level and below (One tail test).

Based on the result of the bivariate regression analysis, all independent variables significant at 20% and below level are initially shortlisted in the first stage for multivariate regression analysis. As mentioned above, since there are prior results hypothesising and explaining the relationship of the shortlisted variables vis-à-vis short run underpricing alongwith the direction of relationship, one tail test has been applied to test the level of significance. Based on these criteria, the independent parameters which qualify for multivariate modelling exercise includes Times Subscribed (TS), Company Size (CS), Listing Delay (LD), Interest Rate (CDROI), log value of inverse of gross proceeds (IGP), USES, Put- Call ratio taken as proxy for I_Sentiment, Inflation (INF), Industry PE ratio (IPE), Proxy for an Investment bank reputation in terms of value of IPO business (IBRP), Dummies for (i) Offer Price (D1) (ii) companies representing new economy (D4) and private companies IPOs (D5). The 13 variables identified at the first stage as detailed above are then regressed vis-à-vis initial return within the framework of multivariate regression analysis. It is then observed that factors like CDROI, D1, IGP, and INF, become insignificant even at 20% level because of their multicollinearity with some of the identified variables.

Table 5. Pairwise correlation between pricing factors

	CDROI	CS	D1	D4	I_SENTI MENT	IBRP	IGP	INF	IPE	D5	TS	USES	LD
CDROI	1	-0.07619	0.035123	-0.03149	0.191211	-0.05489	0.105696	0.286417	0.010925	0.092337	-0.05938	0.057765	-0.11019
CS	-0.07619	1	0.071122	-0.11796	0.061239	0.001335	-0.9031	-0.0452	0.011149	-0.15396	0.143529	-0.16479	-0.22238
D1	0.035123	0.071122	1	-0.01247	0.044616	-0.00897	-0.11439	0.124261	0.08794	0.061748	-0.16094	0.027418	-0.20962
D4	-0.03149	-0.11796	-0.01247	1	-0.06675	0.060296	0.154566	-0.06811	0.033867	0.109231	0.16059	0.094776	0.045226
I_SENTIMENT	0.191211	0.061239	0.044616	-0.06675	1	-0.2312	-0.04551	0.045454	0.147312	0.211686	0.093207	0.219737	-0.03132
IBRP	-0.05489	0.001335	-0.00897	0.060296	-0.2312	1	0.00071	-0.07864	-0.07873	-0.17035	-0.02393	-0.01026	0.071672
IGP	0.105696	-0.9031	-0.11439	0.154566	-0.04551	0.00071	1	0.062248	-0.02345	0.213153	-0.17522	0.184565	0.251051
INF	0.286417	-0.0452	0.124261	-0.06811	0.045454	-0.07864	0.062248	1	-0.04505	0.090511	-0.18164	-0.14042	-0.35234
IPE	0.010925	0.011149	0.08794	0.033867	0.147312	-0.07873	-0.02345	-0.04505	1	0.014994	0.101511	0.021046	0.108089
PVTIPO	0.092337	-0.15396	0.061748	0.109231	0.211686	-0.17035	0.213153	0.090511	0.014994	1	-0.0881	0.269157	-0.07596
TS	-0.05938	0.143529	-0.16094	0.16059	0.093207	-0.02393	-0.17522	-0.18164	0.101511	-0.0881	1	-0.02164	0.024527
USES	0.057765	-0.16479	0.027418	0.094776	0.219737	-0.01026	0.184565	-0.14042	0.021046	0.269157	-0.02164	1	0.111024
LD	-0.11019	-0.22238	-0.20962	0.045226	-0.03132	0.071672	0.251051	-0.35234	0.108089	-0.07596	0.024527	0.111024	1

CDROI – interest rate expressed in terms of 91 days GoI T – bill, CS – Proxy for company size defined in terms of log value of proceeds raised, D1 – dummy for final offer price in the lower end of the price band D4 – dummy for companies representing new economy, I_Sentiment – investors sentiment expressed in terms of put/call ratio, IBRP – proxy for investment bank reputation in terms of proceeds, IGP-log value of inverse of gross proceeds, INF – inflation, IPE – industry PE ratio, D5 - dummy for private companies IPO. TS - Times subscribed, Uses - Log (of 1 + no. of uses), LD - Listing Delay.

After taking into consideration the pair-wise correlation as provided in Table 5 of this study and further filtering of variables, the model becomes more robust with TS, CS, I_Sentiment, Industry PE ratio, uses, D4 and D5 at 20 per cent level of significance and below. Thereafter, variables relating to CDROI, D1, IBRP, IGP, INF, LD are added one at a time to see their likely impact on the overall goodness of fit of the model. It is observed that after incorporating CDROI, D1, IGP, INF, one at a time, there is no change in the statistical parameters of the significant variables already present in the model as well as on the overall performance of the model. As the significance of variables have been tested at 20% level and below (one tail test), it is observed that when IBRP and LD with ‘t’ value of -1.12 and 1.15 respectively are added to the multivariate regression model, both the variables also exhibit significant relationship vis-à-vis short run underpricing at 20% and below (one tail test). Further, overall of performance of the model also improves in terms of explanatory power of the model. Apart from these 9 significant factors, additional factor(s) do not contribute to augment the explanatory power of the model. The final result of the multivariate regression analysis is summarised in Table 6 of this study. The sign of the co-efficients of variables of this model are also found to be in conformity with the findings of international/ Indian studies on underpricing of IPOs. The detailed economic explanation of the relationship between the dependent and independent variables of the model is as under:

Times Subscribed: It is observed that TS is the most important factor affecting short run underpricing of IPOs. This variable is positively related with short run underpricing of IPOs with a ‘t’ value of 11.691. The TS ratio is regarded as one of the important indicator of uncertainty in the literature on IPOs. Higher the extent to which an issue is subscribed higher is the uncertainty about getting shares allotted in oversubscribed issues. Hence, a representative investor will submit purchase order if more money is “left on the table” in the form of higher discount resulting into higher underpricing.

Company Size: The variable CS representing company size is found to be negatively related to short run underpricing with ‘t’ value of -4.79. The negative relationship is explained by the facts that large IPO offers in India are expected to have less initial underpricing because they tend to be fairly priced and a less risky.

Investor Sentiment: The investor sentiment represented by the put-call ratio is negatively related to the short run underpricing with a ‘t’ value of -2.63. This relationship is explained by the fact that a bearish trend in the stock market represented by high put call ratio results into lower demand for IPOs and hence higher underpricing of IPOs.

Uses: The log value of (1+ number of uses of IPO proceeds) listed in the prospectus have been taken as one of the important proxy for ex-ante uncertainty for an IPO issue. The greater the number of uses listed in the prospectus of a company, greater is the uncertainty about the end utilization of the IPO proceeds. The investor view investment opportunities in such issues risky and therefore demands a higher level of underpricing. Accordingly, the finding of this study is in conformity with international findings with a 't' value of 1.81.

Listing Delay: The LD is positively related with short run underpricing with a 't' value of 1.74. As there is a delay in listing of the issue, the market starts revising its expectation about the company resulting into higher uncertainty and the investors accordingly demanding a higher degree of underpricing.

Industry PE Ratio: The Industry PE ratio is considered to be one of the most important indicators of the growth potential of an industry. The positive relationship between industry PE ratio and short run underpricing with a 't' value of 1.63 could be explained in terms of the fact that the investors are not very sure whether a company accessing the IPO market with a new issue will be able to catch up with the pace of the growth of the industry/sector expressed in terms of high PE ratio. To compensate for this uncertainty, the investors demand a higher degree of underpricing of IPOs.

Investment Bank Reputation: The investment bank's reputation defined in terms of share in the total value of IPO business managed or co-managed by an underwriter during a given reference period is found to be negatively related with the degree of underpricing with a 't' value of -1.18. When IPOs are managed/underwritten by reputed investment banks, it gives signal to the market that there has been a proper due diligence of these issues and hence their pricing truly reflects the fundamentals of the companies. Investors are accordingly willing to subscribe to these issues at lower discount. Hence, an investment banks with high reputation will tend to underprice IPOs to a lesser degree. However, the impact of investment bank's reputation on underpricing of IPOs seems to be weak in our case.

Dummy D4: The dummy D4 representing the new economy companies such as IT and ITeS, media and entertainment, telecom, biotech, Pharma etc. is found to be positively related with the short run underpricing with a 't' value of 1.40. This indicates that industries with shorter and less information history will be more under-priced as there is more uncertainty about the issuing companies. Further, owing to the intangible nature of their assets, these companies are difficult to value and thus expose investors to greater uncertainty.

Dummy D5: The negative relationship between the dummy D5 (representing private companies IPOs) and short run underpricing (with 't' value of -2.60) indicates that there will be less underpricing for private companies' IPOs vis- à-vis the public sector IPOs as the former are perceived to be better managed with good growth potential. The majority shareholdings of the Government in the public sector IPOs gives the impression that there will be more interference by them in the day to day operation of such companies, and as such, the management will have less financial and operational autonomy. This may adversely affect operational efficiency and future growth potential of such public sector companies. The stated policy of the disinvestment of public sector undertakings gives further impression that Government is not able to meet its

expenditure out of its own revenue resources and hence resorting to divestment of their share in these companies to meet the shortfall. All these factors give rise to uncertainty and hence demand for a higher degree of underpricing by investors in case of public sector enterprises.

Table 6. Empirical Results for Multivariate Regression Model

The Table below shows the result of the multivariate regression analysis with IR as the dependent variable.

Variables	Co-efficient (t statistics)
Intercept	1.942443 (4.540695)
CS	-0.176552 (-4.788974)
D4	0.079010 (1.396525)
I_Sentiment	-0.415502 (-2.632723)
IPE	0.002170 (1.630414)
D5	-0.289732 (-2.603667)
TS	0.010435 (11.68961)
USES	0.236813 (1.806345)
LD	0.008974 (1.737816)
IBRP	-0.001041 (-1.182188)
R Squared	0.380261
Adj. R-Squared	0.362993

IR- Initial Return; CS – Proxy for company size defined in terms of log value of proceeds raised through IPOs, D4 – dummy for companies representing new economy, I_Sentiment – proxy for investor sentiment expressed in terms of put-call ratio, IPE – industry PE ratio, D5 - dummy for private companies IPO, TS - time subscribed, Uses - Log (of 1 + no. of uses), LD – Listing Delay, IBRP – proxy for investment bank reputation in terms of proceeds;

*Variables significant at 20% level and below (One tail test).

Based on the multivariate regression model developed for determining the possible level of short run underpricing, the average predicted short-run initial returns is 26.11 % which is higher than average actual short-run underpricing of 24.93%. This shows that the market for Indian IPOs is overpriced and the difference of (-) 1.18 % is recovered through price correction over 6 months period when the average return on IPOs becomes (-) 1.21%. It is further observed that R square and adjusted R square in this model are low at 38.02% and 36.30% respectively which are in conformity with ex-ante uncertainty hypothesis of underpricing. In the other words if the R square was high, it would imply that the actual initial return on an offering is predictable. The theory states that there is a positive relation between ex-ante uncertainty and expected initial return. The reason for this positive relation is that it is difficult for investors to predict the actual initial return for an issue coming to the market, giving rise to the winner's curse problem, even though the average initial return in a large sample can be predicted with reasonable accuracy. Accordingly, R square and Adjusted-R square ratio arrived at in the final model of this study is consistent with the positive relationship between ex-ante uncertainty and level of underpricing.

6. Investment Banks' Reputation and Underpricing of IPOs

A perusal of past research shows that proxy for an investment bank reputation has been used in number of studies in various countries as a variable influencing the initial returns, but none of the studies have attempted to look into the relationship between investment banks reputation and underpricing of IPOs. However, it was Beatty and Ritter (1985) who attempted to analyse the relationship between investment bank reputation and underpricing. Beatty and Ritter, *inter alia*, have documented that investment banks will not be able to attract investors if there is insufficient underpricing and not be able to satisfy issuers if the discount offered is too large. Investment banks who commit new issue pricing errors experience adverse impact on their businesses.

To test the proposition, Beatty and Ritter have split the sample of common stock issued during 1977-82 in US market into two approximately equal time period for testing the hypothesis. The first sub-period included the 483 firms that went public between 1977 and the first quarter of 1981. The second sub-period included the 545 firms that went public between second quarter of 1981 and 1982. They divided the sample into two periods because the proposition predicts changing market shares, so dividing the samples into sub-period is required to test this proposition. They have further analysed whether there is a relation between mispricing by an investment bank and subsequent change in its market share.

To analyse the relation, they defined the “absolute standardized average residual” as a measure of “mispricing”. For this purpose, they have first computed the predicted initial return based on the regression coefficient arrived at while testing their first proposition in the same paper, i.e. higher the ex-ante uncertainty higher the level of expected underpricing. Using the absolute standardised average residuals as the measure of mispricing, they regressed the percentage change in the market share of the investment banks in sub-period II as the dependent variable on absolute standardized average residual for the 49 underwriters (who had 4 or more initial offerings in the sub-period I) within the OLS framework. As observed by Beatty & Ritter, the slope co-efficient of -10.83 per cent in their OLS regression implies that as the value of the explanatory variable changes from 1 Standard Deviation(SD) below the mean to 1 SD above the mean, the expected market share of investment banks drops by 27.3 per cent. With a ‘t’ statistics of 1.94 on the slope co-efficient, the one tailed t value is significant at 3 per cent.

For testing the mispricing hypothesis, the model developed for predicting the possible level of underpricing in this study is used to calculate the predicted short run initial returns, which are then subtracted from the actual initial returns to arrive at the residuals that are termed as pricing errors. Thereafter, based on the study of Beatty and Ritter, absolute standardised average residual are calculated for each of the 432 IPO issues for taking them as a measure of mispricing.

To begin with, the data is divided into 7 overlapping sub-periods of 3 years each, generated by taking 1 year moving average. Standardised pricing error is then individually estimated for all Investment Banks for each of the sub-periods as under:

- For each underwriter the average of absolute residual is computed after taking into account the total number of offerings taken public by an underwriter during a given sub-period.

- The average of absolute residual is further divided by the ratio of standard deviation of the pricing errors of an underwriter in a given sub-period and the square root of the total number of offerings taken public by it in the same sub-period so as to arrive at the “standardized pricing error”.

$$S_{pe} = \left[\frac{\sum_{i=1}^n |pe|}{n} \right] / \frac{\sigma_{pe}}{\sqrt{n}} \dots\dots\dots(1)$$

Where, σ_{pe} denote standard pricing error and pe pricing error for each issue for a given merchant bank observed in the three year sub-period. σ_{pe} exhibits standard deviation of pricing errors for each underwriter in a given sub-period. n indicates the number of issues managed/co-managed by an underwriter in a given sub-period.

As a measure of Investment Bank’s reputation, the annual market share (defined in terms of share in the total proceeds raised) for each Investment Bank is then estimated in a particular year. The change in the market share is then computed by taking the difference of the market share in the year $t+1$ and the average market share in 3 previous years ($t, t-1, t-2$) which were also used for estimating the pricing error variables. The change in the market share is then regressed on pricing error using the regression equation as under:

$$\Delta MS_{t+1} = \gamma_0 + \gamma_1 S_{pe,t} + \varepsilon_t \dots\dots\dots(2)$$

Where, ΔMS_{t+1} denotes change in market share in the year $t+1$. $S_{pe,t}$ is the standard pricing error at time period t . γ_0 and γ_1 are the co-efficient. ε_t is the stochastic or error.

The relationship between Investment Banks’ reputation and pricing error shall be evaluated by examining the sign and magnitude of γ_1 . Since our data is both cross-sectional (across Investment Banks) as well as time period (across 7 sub-periods), we employ panel regression methodology by selecting the appropriate panel data model based on Hausman Specification Test. Table 7 reports the results.

Table 7. Results for panel estimation involving regression between mispricing of IPOs and Investment Banks’ reputation*

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.408191	1	0.5229
Cross-section random effects test comparisons:			

Variable	Fixed	Random	Var(Diff.)	Prob.
MISPRICING	-0.112922	-0.089783	0.001312	0.5229
Dependent Variable: IBRP				
Method: Panel EGLS (Cross-section random effects)				
Sample: 2005 2011				
Periods included: 7				
Cross-sections included: 7				
Total panel (balanced) observations: 49				
Swamy and Arora estimator of component variances				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.259903	0.747867	-0.347525	0.7297
MISPRICING	-0.089783	0.027390	-3.277957	0.0020
Effects Specification			S.D.	Rho
Cross-section random			0.000000	0.0000
Idiosyncratic random			3.856437	1.0000

*The negative relationship still holds when the same methodology is used to study the relationship between mispricing of IPOs by an investment bank vis-a-vis change in its market share (proxy for reputation) defined in terms of its share in number of issues.

Although, the methodology followed in this study to calculate mispricing is largely based on study of Beatty and Ritter (1985), the present study is an improvement over the former because of the following reasons:

i. Beatty and Ritter have computed the predicted initial return based on the regression co-efficient arrived at while testing their first proposition in the paper i.e. higher the ex-ante uncertainty, higher is the level of expected underpricing. They have used only two proxies for uncertainty, namely, the log value of (1+ number of uses of proceeds listed in in the prospectus) and the inverse of gross proceeds in the regression analysis for predicting initial returns. An analysis of the available literature on underpricing of IPOs show that factors influencing underpricing are much more diverse and relate to company/issue specific parameters, industry related factors, market related information and macro-economic parameters. Accordingly, predicted initial return based on only two issue related parameters used in the regression analysis of Beatty and Ritter makes the factor structure incomplete for underpricing model. This also raises the possibility of gross underestimation of the initial return along with overestimation of pricing errors. The model developed in this paper for studying the possible level of underpricing is based on multivariate linear regression (OLS framework) in which the initial return (dependent variable) has been regressed vis-à-vis 9 independent variables using

multivariate regression framework. The use of multi-factor model for underpricing shall provide better prediction of initial returns and more precise estimates of pricing errors.

ii. To test the proposition, Beatty and Ritter have split the sample of common stock issued during 1977-82 in US market into two approximately equal length periods for testing the hypothesis as mentioned above. The two period methods assumes that these variables are stationary and regression results may, therefore, give static estimates of investment bank reputation and mispricing. As these parameters are dynamic in concept, the result of the regression analysis may be biased because the independent variable in the model may have measurement error problem. To address this issue, the reference period for the present study has been divided into 7 sub-periods of 3 years each for calculating the mispricing of IPOs by investment banks on a rolling average basis. Similarly the change in the market share during a given year has been calculated vis-à-vis the average of 3 consecutive preceding years. This is based on the presumption that investors, on an average, have a 3 years' past memory of average mispricing of IPOs by investment banks. It is further presumed that investors take into consideration this period into consideration while deciding to subscribe to a particular issue managed/ co-managed by investment banks in the subsequent period. As mentioned above, the change in the market share is then computed by taking the difference of the market share in the year $t+1$ and the average market share in 3 previous year ($t, t-1, t-2$) which were also used for estimating the pricing error variables.

iii. While Beatty and Ritter estimate the relationship between pricing errors and investment bank's reputation using OLS regression, our estimation procedure involves use of panel regressions which is more desirable. Panel regressions involve data pooling across cross-section as well as time-series and hence model coefficients are estimated at a higher degree of freedom.

As mentioned above, the change in the market share is regressed on pricing error using the regression equation (2) above. The Correlated Random Effects-Hausman Test conducted to check the applicability of the fixed or random effect indicates the 'p' value as 0.5229 (> 0.05). This shows that the null hypothesis holds in the case and the random effect method is to be applied for the regression analysis. Accordingly, panel EGLS (Cross Section Random Effects) method is used to regress change in the market share (proxy for investment bank reputation IBRP in terms of share in IPO proceeds) on mispricing as the independent variable and a negative relationship is confirmed with a coefficient and t value of mispricing being -0.089 and -3.28 (p value of 0.002) respectively. In other words, if an investment bank misprices an issue by 1 % during a particular period, it will lose its market share by around 9 % in the subsequent period. The summary of the regression analysis is reported in Table 6 of this study.

7. Summary & Conclusion

In this paper, we covered 432 IPO issues from April, 2001 to December, 2011 for India. Two propositions were specifically examined:

- i. Fundamental determinants of short run initial returns;
- ii. Impact of IPOs' mispricing on investment banks' reputation.

We find that 5 variables i.e. times subscribed (TS), no of uses of IPO proceeds (USES),

Listing Delay (LD), Industry PE ratio (IPE) and dummy for companies representing new economies (D4) have a positive relationship with short run initial return, while 4 variables, i.e. company size (CS), investors' sentiment (I_Sentiment), investment bank reputation defined in terms of share in IPO proceeds (IBRP) and dummy for private companies' IPOs (D5) are negatively related to initial return on IPOs. The results are in conformity with prior literature on the subject. Our multi-factor model projects an average initial return of 26.11% for the sample IPOs while the actual average initial return was 24.93%. The Indian IPOs seemed to be overvalued initially and as more information flows into the system reducing the degree of uncertainty, the pricing moves back to the equilibrium value resulting in a negative return between the second trading days to the end of 6th month. Thus the Indian market takes about 6 months to fully incorporate information relating to IPOs. From the policy perspective, with a view to control excess speculation in the short run, the Government may consider a lock-in-period of 6 months for IPOs, till the time they are able to achieve their equilibrium value. In other words, public trading of newly listed IPOs may begin six months from the listing date. In addition, the capital market regulator may recommend a comprehensive model as a benchmark for determining the fair pricing of IPOs. It is further observed that IPOs mispricing significantly impacts Investment Banks' reputation and hence pricing of IPOs has long term implications for policy makers, market intermediaries, as well as investors. The present study contributes to the capital market literature, especially for emerging economies.

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