Impacts of Macroeconomic and IPO Factors on Under-pricing of Initial Public Offerings on the National Stock Exchange (NSE) in India

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ABSTRACT

Underpricing of Initial Public Offerings (IPO) is observed when companies go public as a means to raise capital. This results in significant first day returns for investors which also imply that issuers leave significant money on the table that they could have otherwise raised by correctly pricing their issues. This paper investigates the extent to which local economic as well as IPO specific factors explain first-day marginally adjusted return on opening (MAARO).

This study analyzes the MAARO of 239 underpriced IPOs observed for the 2000-2014 period on the NSE. Factors considered for Principal Component Analysis (PCA) wereovernight interbank lending rate, Exchange Rate, Bond Yield, GDP, Interest Rate, M1/M2, Trade Balance, IPI, CPI and average deposit Rate. The results suggest that local economic variables can be summarized by the repo rate and exchange rates. We useMAARO as the dependent variable and the issue type, issue size, subscription rate, repo rate and exchange rate as the independent variables.

There is a negative relationship observed between large cap and mid cap stocks to MAARO. There is also a positive relationship observed between subscription rate and repo rate to MAARO. As expected there is a strong negative relation between Bookbuilt IPOs and MAARO. The only exception is the exchange rate where we could not establish any statistically significant relationship between the exchange rate and the level of underpricing in the Indian context for the period 2000 until 2014.

Keywords: initial public offerings, macroeconomic factors, principal component analysis, underpricing, NSE

INTRODUCTION:

An "Initial Public Offering (IPO)" is the offering that a not yet publicly listed company carries out to obtain capital from the equity markets. A firm raises capital in the primary markets for various reasons such as acquisition, expansion, capital projects etc. There already exists abundant literature on why a firm may decide to go public. For the purpose of this paper, we will try to determine the extent of underpricing amongst IPOs in the Indian markets. Prior studies such as Ritter (2002), Aggarwal et al (2002), Faugeron-Crouzet et al (2003), Guo (2005), Benerjee et al (2011) on IPOs in the many countries with liquid markets have demonstrated that there is an evidence of underpricing i.e. the existence of a difference between the offer (subscription) price and the listing price on the first day of the secondary market. This clearly demonstrates that many firms by virtue of underpricing i.e. where the listing price exceeds the offer price,and "leave a lot of money on the table" due to imperfect pricing. This would mean that all market participants do not receive information in a manner that would suggest information symmetry.

This paper seeks to study IPO underpricing and impacts of microeconomic factors on underpricing in India for all IPOs (excluding SME IPOs as well as any follow on public offerings or Secondary Equity Offerings) for the period 2000 until 2014 issued on the NSE.Many studies internationally have concluded that macroeconomic

factors play a significant role in the underpricing of IPOs.Chinzara (2010) in his study of the South African stock markets shows that exchange rate volatility, short-term interest rate volatility, and financial crises have a very negative impact on stocks. Hsing (2011) observes that there is a positive relationship between stock returns and foreign exchange rate. Chen, Roll and Ross (1986) state that interest rateshave a positive impact on IPO stock returns. It is of interest to determine if macroeconomic factors and especially which factors play a significant role with IPO underpricing in India as well.

Impacts of Macroeconomic Factors on Underpricing:

Many studies have been carried out to understand the effect macroeconomic factors have on stock market returns. Ross (1976)models a theory called the Arbitrage Pricing Theory (APT). APT asserts the existence of factor variables that impede on stock returns but such variables were not completely identified by the theory. APT assumes that there are factors that influence returns to deviate from their expected values and hence IPO stocks performance are imperfect. In trying to understand this deviation from expected values, Ross developed the APT which assumes that some macroeconomic variables exist that influence returns on assets which leads to volatility. These macroeconomic factors are out of the control of the issuing firm as well as that of the investor in a way that diversification in different asset portfolios do not help.Chinzara (2010) in his study of the South African stock markets shows that macroeconomic factors affect the stock market volatility such that exchange rate volatility, short-term interest rate volatility, and financial crises have a very negative impact on stocks returns whereas variability in gold prices, oil prices and inflation rate have a smaller effect. Schwartz (1989)in his paper on the relationship between stock market volatility and volatility of real and nominal macroeconomic variables concludes that movements in inflation and real output has weak predictive power on volatility of stock market and return. Ross, Westerfield and Jordan (2010) documented that post the Bretton Woods agreement (post 1970s), fluctuations in the exchange rates between the UK pound and US dollar led to uncertainties. This led to market volatilities which means that the financial and economic activities are influenced by exchange rates fluctuations. Olweny and Omondi (2011)document that foreign exchange rate volatility significantly affects stock return volatility on the Nairobi Stock Exchange. Hsing (2011)observes that there is a positive relationship between stock returns and foreign exchange rate. Benita and Lauterbach (2007)observe that exchange rate volatility has real economic costs that affect price stability, firm profitability and the general economy's stability. Foreign exchange rate volatility impacts IPO stocks returns and variability because of its ability to impact the economy. This is because decisions on fiscal and monetary policies are dependent upon foreign exchange rate fluctuations and other macroeconomic factors.

Interest rates influence the attractiveness of investment opportunities. Interest rates determine the interest payments on investment assets. Many studies have been conducted to determine the influence of interest rates. For instance, Nugugi and Kabobo (1998) stated that interest rate is to assist the mobilization of financial resources and ensure efficient utilization of same in the promotion of growth and development. Chen, Roll and Ross (1986) stated that since interest rate promotes economic growth and development, it therefore, implies that it has positive impact on IPO stock returns. Chen, Kim and Kim (2005) observed the Taiwan stocks market and found that interest rate has no significant effect on Taiwan Hotel stock return. Similar observations were also made by Chiang and Kee (2009). They observed that interest rate also had a negative relationship toward Singapore Hotel stock market. Walsh (2010) observed that short-term interest rate changes that serve as the operational target for implementing monetary policy will affect aggregate spending decisions only if long-term real rates of interest are affected. He further narrates that while the use of interest rate-oriented policy reduces the importance of money demand in the transmission of policy actions to the real economy, it raises to prominence the role played by the term structure of interest rates. Similar conclusions were made by Shiller (1990) and Campbell and Shiller (1991) who observed that short-term interest rate variations influence general investment and spending, given an effect on long term rates of interest. This means that interest rate volatility sways investment patterns of investors.

An economy in over-drive results into high inflation rate. Inflation is observed when the general price level tends to experience simultaneous increases and a loss in purchasing. An economy heats up when the demand for consumption outstrips productivity. Many studies on the influence of inflation rates and stock market returns have been conducted. For instance, Yaya and Shittu (2010)find in a study in Nigeria, that previous inflation rates have significant effects on conditional stock market volatility. Changes in inflation rates, as measured by changes in these rates also have greater impact in predicting the stock market volatility. These results concur with Fisher's effect in international stock market, Fisher (1930). Similarly, Harvey and Huang (1991) observed that heavy trading by the Central Banks or news of any changes in the macroeconomic scenario can lead to higher volatilities in the fixed income and foreign exchange markets. This in turn affect stocks returns volatility.

DATA & SOURCES:

A sample of IPOs of firms listed from Jan 2000 until Dec 2014 on the National Stock Exchange (NSE) was selected for testing. All SME IPOs as well as any Follow-On public offerings also referred to as Secondary Equity Offerings (SEO) have been excluded from this study. Access to listing information as well as historical listing for each issue was retrieved from the Capitaline database.

Historical listing information obtained from the Capitaline portals included transaction dates, prices (open, low, high, adjusted close), volume, and number of trades, net turnover, and market capitalization. From these attributes, the stock return was calculated and from the NIFTY history, the market return was calculated. The difference between the stock return and market return was then recorded as abnormal return.

The IPO listing data from Capitaline yielded information that included the IPO issue type, open and close dates, the number of time the issue was subscribed, offer price, listing closing price (unadjusted), issue size, grading assigned by CARE, ICRA, CRISIL, FITCH and BRICK. Additional attributes were included to determine if an IPO was still active or delisted from the exchange.

Macroeconomic data was obtained from the "Tradingeconomics.Com" portal. Data points obtained from this portal were the INR exchange rate, Bond Yields, GDP growth rate (Quarterly), RBI Interest rate changes, Interbank lending rates as well as the money supply (M1, M2, M3). The data provided on "TradingEconomics.Com" is based on official sources. The resource has been cited by quite a few scholarly research articles and conference proceedings; for instance,Narasimham and Libison (2012), Bakhtyar (2012) and Kumar (2014).

METHODOLOGY:

To examine the possible relationship between MAARO and various economic factors, the paper starts by employing principal components analysis to identify relevant factors from the pool of macroeconomic data under consideration. The choice of domestic variables is essentially motivated by Chen et al.(1986) and Goswami and Jung (1997). Principal components analysis is a method which significantly reduces the number of variables from p to a much smaller set of k derived orthogonal variables that retain most of the information in the original p variables. The k derived variables which maximize the variance accounted for in the original variables are called principal components. After applying this analysis, the dominant principal components are then extracted and used as inputs into a regression analysis to explain the marginally adjusted returns on openings of the IPOs included in this study. PCA allows a large number of theoretically important factors that may affect IPO returns to be considered and second, it can be used effectively in conjunction with multiple regression analysis by addressing the problems of multicollinearity; specifically, because the k derived variables are orthogonal to each other, multicollinearity should not be present.

To determine underpricing, for each IPO, two measures of underpricing were calculated. First, the raw underpricing, defined as the difference in percentage between the official price of the share after the first day of listing and the offer price; and second, the adjusted underpricing, defined as the difference between the raw underpricing above and the market index return measured between the beginning of the public offering and the day of the first trading. In this analysis, the market index is historical NIFTY. The formula for calculating 'Marginally Adjusted Return on Opening (MAARO)' is calculated in three steps. In step 1, the raw returns which is the percentage difference between the offer price and listing price is calculated. In step 2, the percentage difference on an index is calculated. In this case, we are using the NIFTY as a proxy. In step 3, we calculate the difference between step 1 and step 2. This is done in order to adjust the raw returns for any volatility in the markets between the offer date and the listing date.

Stock Return (S_R) are calculated as

Stock Return $S_R = ((P - O)/O) * 100$ --(1)

Where S_R = Stock Raw Return

   P = Closing price of the stock on day of listing (day 1)

   O = Offer Price

and Market Return (M_R) are captured by

Market Return $M_R = ((I_L - I_O)/I_O) * 100$ --(2)

Where I_L = Closing Index on day 1 of listing

   I_O = Closing Index on day of offer

Finally, MAARO (Market Adjusted Return on Opening) is calculated as follows

MAARO $= (((1+S_R)/(1+M_R))-1) *100$ --(3)

Many important results in statistical analysis follow from the assumption that the population being sampled or

investigated is normally distributed with a common variance and additive error structure. When the relevant theoretical assumptions relating to a selected method of analysis are approximately satisfied, the usual procedures can be applied in order to make inferences about unknown parameters of interest. Towards achieving results on non-normalized data, some variables were transformed using Box-Cox (1964) transformation.

For determining classification based on issue size, the IPOs were categorized into Small Cap (Issue Size <= 200 Cr), Mid Cap (Between 200 and 1000 Cr) and Large Cap (Greater than 1000 Cr). The issue size for all IPOs was adjusted for 2015 current prices using a GDP deflator.

To ascertain the major determinants of MAARO, the following explanatory variables were chosen for the regression model

Issue Type (BB):
These could be either Bookbuilt or Fixed Price. The presence of bookbuilt pricing mechanism in IPOs is shown with value equal to 1 and 0 otherwise.
H1: There is a negative relationship between IPOs issued using the bookbuilt mechanism and level of underpricing.

Issue Size:
This is the number of offered shares times the issue price. The issue size has been adjusted using a GDP deflator value. To achieve normality, the Issue Size attribute was normalized using Box-Cox transformation. Issue size was then classified into a categorical variable to identify an IPO issue as small, mid or large cap. The same classification scheme was utilized as that of sub-objective (c). Two dummy variables were then created for mid and large cap issues to be used in the regression analysis. These variables are identified here as ISMC – Issue Size Mid Cap and ISLC – Issue Size Large Cap.
H2: There is a strong negative relationship between large cap IPOs and level of underpricing.
H3: There is a strong negative relationship between mid caps IPOs and level of underpricing.

Subscription Rate (SR):
This is a value that provides information on the popularity of the IPO. For issues that have a high interest among investors, there is a possibility that the subscription rate may exceed 1 and vice versa. This would indicate a positive relationship between the subscription rate and MAARO.
H4: There is a positive relationship between the subscription rate and level of underpricing.

Repo Rate (RR):
This is the overnight lending rate amongst banks. This variable is chosen as a proxy for the short-term interest rates. A higher short-term interest rate should return a higher MAARO.
H5: There is a positive relationship between overnight lending repo rate and level of underpricing.

Exchange Rate (ER):
The appreciation of the Indian Rupee (INR) against the US Dollar (USD) negatively affects the exports to her trading partners and increases imports of goods. An appreciation of the INR may cause a decrease in stock prices for the export sector and an increase in stock prices in the import sector of the economy. Historically, since India's trade balance has been negative, we conclude that appreciation of INR against the USD is negatively related to stock prices.
H6: There is a negative relationship between the exchange rate and level of underpricing.
The regression equation is specified as
$$MAARO = \alpha + \beta_1 (BB) + \beta_2 (ISMC) + \beta_3 (ISLC) + \beta_4 (SR) + \beta_5 (RR) + \beta_6 (ER) + \varepsilon$$
Where α = Constant and ε = Error term.

EMPIRICAL RESULTS:

Principal components analysis (PCA) was run on macroeconomic factors to determine factors for a multiple regression test. The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.804 with individual KMO measures all greater than 0.7 (with the exception of exchange rate 0.671 and 10 Yr Bond Yield 0.658), classifications of 'middling' to 'meritorious' according to Kaiser (1974). Bartlett's test of sphericity was statistically significant (p< .0005), indicating that the data was likely factorizable.

PCA revealed two components, the repo rate and exchange rate that had eigenvalues greater than one and which explained 56.204%and 31.822% of the total variance, respectively. Visual inspection of the scree plot indicated that two components should be retained as per Cattell (1966). In addition, a two-component solution met the interpretability criterion.

The two-component solution explained 88.025% of the total variance. A Varimax orthogonal rotation was employed to aid interpretability. The rotated solution exhibited 'simple structure' as explained by Thurstone (1947). Component loadings, communalities of the rotated solution and Eigenvalues for each component are presented in Table 1 below.

Table 1: Rotated Structure Matrix for PCA with Varimax
Rotation of two macroeconomic components. Source: Computed.

Factors	Rotated Component Coefficients			Initial Eigenvalues	
	Componen 1	Componen 2	Communalities	Total	% of Variance
M1 Money Supply	0.995	0.056	0.993	0.158	1.575
M2 Money Supply	0.995	0.057	0.993	0.096	0.959
CPI	0.987	0.104	0.986	0.003	0.035
GDP	0.974	0.087	0.956	0.000087	0.001
IPI	0.951	-0.019	0.904	0.027	0.271
Exchange Rate	0.711	0.153	0.528	*3.182*	*31.822*
Repo Rate	0.165	0.937	0.905	*5.620*	*56.204*
Interest Rate	0.152	0.909	0.849	0.282	2.817
10 Yr Bond Yield	-0.196	0.908	0.863	0.623	6.225
Avg. Deposit Rate	0.170	0.892	0.825	0.009	0.092

Note: Major loadings for each item are bolded. Retained components are italicized.

For a multi-regression test, the variables under consideration are marginally adjusted returns on opening as the dependant variable and the issue type (dummy bookbuilt), issue size (dummy variables for mid & large cap), subscription rate, repo rate and exchange rateas the independent variables. There were 239 cases considered for this multiple regression. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.90.

Table 2: Summary of Multiple Regression Analysis

Variable	B	SE_B	β	Sig.
Intercept	1.47	0.49		
BB	-0.35	0.08	-0.24[*]	.000
ISMC	-0.34	0.07	-0.30[*]	.000
ISLC	-0.49	0.10	-0.30[*]	.000
SR[**]	1.01	0.13	0.48[*]	.000
RR[**]	-0.21	0.09	0.125[*]	.026
ER	0.002	0.01	0.011	.850

Source: Computed.

Note: *$p < 0.05$; B= unstandardized regression coefficient; SEB = Standard error of the coefficient; β = standardized coefficient; ** Normalized values utilized.

The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met. All variables statistically significantly predicted marginally adjusted return on opening, $F(6,232)=18.28$, $p<.005$, adj. R2 = .303. As shown in Table 2 above, five out of thesixindependent variables added statistically significantly to the prediction, p< .05.

DISCUSSION:

Based on the multiple linear regression results (see Table 2 above), it is clear that all the independent variables except the exchange rate were regressed against the level of underpricing i.e. MAARO. As expected, there is a negative relationship observed between large cap and mid cap stocks to MAARO. This result is a confirmation of the result found by Deb and Marisetty (2010) in their study. We conclude that that large issue size leads to an increase in the supply of shares in an issue and hence reduced underpricing.

There is also a positive relationship observed between subscription rate and repo rate to MAARO. Our study

uses the repo rate as a proxy for short term interest rates and the conclusions are similar to those made by Shiller (1990) and Campbell and Shiller (1991) who observed that short-term interest rate variations influence general investment and spending, given an effect on long term rates of interest. This means that interest rate volatility sways investment patterns of investors. The findings are also similar to that from Chen et al (1986). However, the study by Choe et al (1992) concluded that while business cycle variables are significant explanatory variables, interest rate variables are generally insignificant.

Our results indicate a strong negative relation between bookbuilt IPOs and MAARO.This is different from the study conducted by Bansal and Khanna (2012) where their study indicated no relationship between bookbuilt issues and the level of underpricing.

We could not establish any statistically significant relationship between the exchange rate and the level of underpricing in the Indian context for the period 2000 until 2014.

There is a significant negative relationship between IPOs issued using the bookbuilt mechanism and MAARO at the 5% significance level. We therefore reject the null hypothesis and accept alternate hypothesis H1. There is also a strong negative relationship between large cap and mid cap IPOs to MAARO. We therefore reject the null hypothesis and accept alternate hypothesis H2 and H3. There is a positive relation between subscription rate and repo rate to MAARO. We therefore reject the null hypothesis and accept alternate hypothesis H4 and H5. In the case of exchange rates, we expect to see a strong negative relationship between exchange rates and MAARO. This is however not observed and hence, we accept the null hypothesis and reject the alternate hypothesis H6.

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