

An Assessment of Valuation Methods of Stock Initial Public Offerings on Tehran Stock Exchange

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Abstract

Every day hundreds of companies all over the world are entering capital market for the first time by issuing stocks. By doing so, they decide to invest capital necessary for continuing activity and expanding operations accordingly. For this reason, it is important to the companies that price specified for their stock demonstrate real value of assets and their growth and development opportunities in the future. The purpose of this research is to study valuation methods of stock initial public offerings at the Tehran Stock Exchange. Population and study sample consisted of firms publicly offered their stocks for the first time at Tehran Stock Exchange during 2009-2014, and experienced no trading halt, i.e. 45 companies of which seven companies were eliminated due to lack of trading on the stock exchange and 38 firms were chosen. The research method is correlational-descriptive and the research is an applied research by purpose. The research is based on cross-sectional time regression analysis, for which simple multivariate regression estimation based on ordinary least square method was used, and models under consideration were examined by Eviews and SPSS. After analysis of results, the research findings showed that some variables such as firm size have no influence on the price of initial public offering but variables such as risk, size of initial offerings, amount of firm capital, etc. have significant effect on the price of stock initial public offering. In the end, it is recommended that companies price their stocks in the way that it paves the way for growth and development of their assets, given that there are a lot of factors and variables that affect the price of stock initial offering.

Keywords: Price, Initial Public Offering, Valuation Methods, Tehran Stock Exchange

1. Introduction

The developmental process of world financial markets and public offerings of new companies at stock exchanges, which is called IPO, have led IPO matter to receive attentions

from different aspects in recent years. Initial public offerings are important to stock exchanges and capital markets because new companies or maybe new investors can enter market. For investors, profitability of buying at IPO invariably have attraction and importance.

Not to mention the fact that initial offerings of new companies can lead market to grow and improve the process of capital formation, something that stresses the need for further attention to it, it is important to pay attention to mechanisms and practices of IPO. As can be seen, although there has been no vast research on initial public offerings in Iran, there is no research that exclusively studies the behavior of price in initial public offerings of state-owned companies and compare them with privately-owned companies. In this regard, it has to be said that the goals of privatization are different due to economic features and situation of every country with respect to other countries. Despite this, in all countries where privatization has been accomplished the main goal is to improve economic situations and circumstances. In addition to this main goal, there is another one among them, this research aims to study determining factors in pricing stocks of state-owned and privately-owned companies in order to develop capital market, particularly stock market, by focusing on “creating boom in capital market” and “building a balanced system for distribution of income among different strata of people”, which is a new and essential research of its kind.

Reflection on techniques of price detection and details of offering procedure is a topic that can negatively affect following goals and functions if disregarded. Thus, today a special interest is shown to different aspects of IPO on stock exchange, and Tehran Stock Exchange has carried out studies and takes effective measures in this regard. Given the developmental process of new offerings in this stock exchange, it is hoped that we witness its improvement and efficiency so that investor’s and investee’s trust and reliance grow in capital market, and we can approach the ideal prosperity and development of this market like never before.

2. Theoretical foundation and research background

2.1. Definition of initial public offering (IPO)

Initial offering which is shown as IPO includes the first sale of stock by a private company, during which it turns into a public company. Stock initial offering make investors spend part of their money on buying new stock instead of available stock, causing effective demand for existing stock to decrease, while total offering of stock is increasing in market. Such a circumstance leads to price decrease. The term IPO referring to booming markets of the 1990s holds that a company sets out to offer stock to the public for the first time during its activity (Yavari, 1998).

On the other hand, stock initial public offering and admittance to stock exchange involve spending and limitations, the most important of which are the cost of providing information in accordance with stock exchange rules, auditing cost of enterprise, presentation of audited financial statements, cost of underwriting and issuing stocks as well as some quality costs such as time spent by senior directors of enterprises in order to undertake IPO procedure; however, the amount of these costs vary according to the volume of offering and restructuring power of companies.

Stock initial public offering is a financial phenomenon for which a variety of studies have been carried out and theories proposed all over the world. Investors are usually in pursuit of good

opportunities for achieving short term return. Because of this, initial days of stock issuance can be a good opportunity for investors in all capital markets around the world.

Every year, many companies meet their financial needs by offering their stocks to the public through capital market. However, the companies ponder and make decision about underpricing of their stocks or unusual short-term return which accrue to their investors. It appears that earning positive unusual return is to the advantage of buyers and then to the disadvantage of former shareholders who set out to pursue initial offerings.

The puzzle of unusual short-term return challenges the classic economic theory of efficient market. Researchers had always had the chance to show the power of the theory supporting the puzzle by solving it. One of the successful theories in this regard is behavioral finance theory and information asymmetry theory, which have been proved to be successful in explaining this phenomenon in recent decades.

Initial public offering is referred to as the first offering of company stock to the public during the period of its activity. Tehran Stock Exchange and its operating mechanism can have a good position in the financial and economic structure of Iran in order to develop and expand liquidity resources. One of the basics to economic development is success in attracting and meeting vast resources which might derail creation of value added and lead to decline of economic health, if they are not accumulated.

2.2. financial and non-financial factors affecting IPO

As a matter of fact, the problem that the price of new stock is on average about 10% to 15% more than the average of other stocks in the early days of issuance has been espoused by researchers and analysts all over the world.

Early studies of the short-term performance of IPO date back to about 50 years ago. Ibbotson and Sindelar (1960) are among the early researchers who conducted vast studies in this regard; they explored the return of new stocks in early days of trading and found an unusual short-term return of IPO. Following them, various researchers around the world studied this financial phenomenon in capital markets of their own country. In the subsequent studies, researchers nearly confirmed an unusual short-term return in most capital markets, attempting to explore determining factors in this financial phenomenon. Since the existing theories and efficient market hypothesis failed to present reasonable accounts, the study of the effect of factors has taken priority. A variety of theories and hypotheses in this regard have been proposed.

Around the world, the impact of various factors on short-term return of IPO has been investigated. For the first time, by introducing financial and non-financial factors affecting IPO, Ibbotson and Jeff (1975) and Sindelar and Ritter (1988) measured their impact. In most markets in the world, the effect of financial and non-financial factors on the phenomenon short-term IPO has been studied and analyzed every year. However, it should be noted that the effect of these factors on long-run performance of IPO as well as on short-term return of IPO has been explored. In what follows, some examples of financial and non-financial factors are presented.

Financial factors

The effect of various financial factors on short-term return of new stock has been investigated and tested by researchers across the globe; for instance:

- company's financial ratios, company's sale, risk, sale growth, capital, inflation rate and economic factors, liquidity power, cost of issuance, etc.

Non-financial factors affecting IPO

In regard to on-financial factors affecting short-term performance of IPO which has been studied and suggested by other researchers, there are two classes; the first is those having qualities of newly arrived companies and the second is non-financial factors which encompass company's external circumstances and the newly arrived companies are affected by these conditions. In this research, the reputation of the auditing institution comes from non-financial factors, which are considered company's external conditions, and state-owned and privately-owned ownership are themselves company's features. A number of factors are presented as follows;

- Firm age, ownership structure (amount of the ownership of capital owned), brokerage institution, reputation of audit institution dealing with financial statements, procedures of initial public offerings, etc.
- A number of researchers have often studied and analyzed the effect of the factors on short-term performance of IPO in different capital markets.

2.3. Research background

Stock underpricing of initial offering was initially identified by Ibbotson in the U.S. capital market. By studying 120 shares publicly and initially offered on New York Stock Exchange over the period of 1965-1969, Ibbotson found that the stocks could yield on average 11.4% positive initial return since the date of offering to the end of the first month of trading. According to Ibbotson and Jeff, stock underpricing of initial offering is a periodical phenomenon, in the sense that in each period the number of initial public offering is high (hot period) and underpricing prevails, while in periods that the number of initial offering is low in market (cold period) the amount of underpricing declines. The phenomenon unusual short-term return of initial offering is not simply reduced to the capital market of the United States, as this phenomenon has been identified and documented in other developed and developing capital markets. Loughran et al could confirm short-term return, i.e. stock underpricing of initial offering, in 25 developed and developing countries. Researchers have come up with a number of reasons for underpricing; the reasons have been disguised as classic theories such as information asymmetry to new theories such as behavioral theories, the most prominent theories are the one which is based on information asymmetry explaining different levels of information among different groups, theory based on control considerations and ownership structure, theories of institutional reasons and financial and behavioral theories (Tajiknia, 2010).

Ritter (1984, 1987) explored variables affecting underpricing. In his first study, the effect of hot offering on pricing was studied, as was the process of investment bank performance and total cost of entering capital market in the second research. He concluded that the cost of entering capital markets decreases as offerings grow in quantity.

Muscarella and Vetsuypens (1989) in their study concluded that new stock offered first in their offering on stock exchange was undervalued; the reason for this was reported to be information asymmetry. Some studies associated underpricing with firm managers' goals and

performance. The study conducted by Welch and Ritter (2002) into evaluation of US Stock Exchange from 1980 to 2001 showed that the trading prices were on average 18.6 percent greater than sold prices at the end of the first trading day regarding companies listed on the stock. In our country, some studies have been conducted into initial offering. Abdollahzadeh (1991) in his research "study of stock pricing methods" came to the conclusion that the method used on the Tehran Stock Exchange does not conform to rules and principles of investment as well as economic and environmental characteristics regarding determining stock basic price.

Welch (1989) states that stock issuing company hold more information on its value, so the more valuable the company, the more the underpricing is used as a signal to market. Blut and Huang (1989) hold that firm's intrinsic value is directly related to the amount of stock underpricing at IPO. Chemmanur (1993) maintains that underpricing covers the cost of gaining information in secondary market. The more the cost of information acquisition, the more the underpricing. Amihod and Mendelson studied the effect of liquidity on pricing assets. They analyzed the link between stock return and difference between supply and demand, and found evidence on liquidity premium. Amihod and Mendelson came to the conclusion that there is liquidity premium with respect to change in supply and demand difference. In an article entitled "pricing of capital assets and supply and demand difference", they studied liquidity. For them, supply-demand difference is a good representative for measuring liquidity. Fang et al explored the relationship between liquidity and firm value among 2642 members of Amex market for about six years. They explained the link by the effect of liquidity on price-to-income ratio, financial leverage, and operating return. In general, their result showed that stock liquidity is positively related to operating earnings ratio and amount of equity in companies with higher liquidity level, but the difference between liquidity, price-to-operating earnings ratio and different levels of liquidity is not significant. Chan (2010) in a research entitled "corporate governance and liquidity" experimentally studied corporate governance and liquidity relationship. In their study, they showed that there is a great positive correlation between corporate governance and stock liquidity anytime. Gledson and Tolentino (2010) studied the effects of determining price of initial offerings on long term liquidity, and found that there is a positive relationship between the two variables. Fauzi et al (2012) investigated the effect of world crisis on the price of initial offering on New Zealand Stock Exchange and came up with evidence on short-term performance of firms in the course of world crisis, showing that world financial crisis affects initial offering price. As the most important domestic studies in the field of IPO, we can refer to the first research into initial offering in 1995, which is entitled "problems of stock pricing of firms engaged in privatization", a suggestion for a good method of proper pricing by GhodratollahTalebnia. He aimed to confirm or reject a link between the first trade conducted by companies engaging in privatization and pricing in accordance with scientific theories, and finally the main hypothesis of the research was rejected. From 2009 to 2010, another research entitled "study of how stocks are priced at IPO" was conducted by Moradi; in this research a hypothesis about stock initial offering at stock exchange was developed, and the place of the stock exchange was Tehran during 2001-2008, and hypotheses included investor' reaction, the number of days during which new stock price is fixed, and how many daysdoes initial issuance take to be fixed, as well as accounting variables such as P/E and EPS as well as

other subsidiary hypotheses; the result of the research suggested that the number of days during which price is fixed at Tehran Stock Exchange is on average about 19 days during 2001-2008, and among variables of interest it was just P/E that affected short-term performance of IPO (Moradi, 2009). Another study was conducted in the same year 2009 by Elham Tajik Nia. In this research, the effect of financial and non-financial factors on short-term performance of stock initial offering on the Tehran Stock Exchange were studied during 2004-2008, in that some hypotheses about the effect of issuance volume and type of audit institutions and type of firm ownership were set against difference of short-term return of companies newly arrived on the Tehran Stock Exchange. The results of the research showed that volume of issuance and type of firm ownership have no impact on short-term return difference of companies listed on the Tehran Stock Exchange, but type audit institution affects return difference (Tajik Nia, 2010). The results of the studies suggest three unusual phenomena in the field of newly arrived stocks on stock exchange; namely

1. initial offering of underprice stock of newly arrived firms, causing their short-term return to grow more than short-term return of market in the same period
2. less long-term stock return of newly arrived companies in proportion to long-term stock return of similar firms in market
3. certain periods influencing the amount of stock initial offering and amount of company's underpricing in market

The research conducted on Tehran Stock exchange by Tabrizi and Demori (2003) deals with companies newly entered market during 1990-1995, and determining factors in long-term return of these companies were tested particularly. The factors discussed in this research regarding their effect on long-term return of newly arrived companies include annual stock trading volume, firm size, and short-term return earned by stock buying and selling by newly arrived firms. The result of this research shows more short-term stock return of new companies in market compared to market index, and less long-term stock return of the companies compared to index. According to this, we can relate stock pricing performance of newly arrived companies on Iran stock exchange to other capital markets in various countries.

Another research was conducted in the field of unusual phenomena of new stock market by Loj (1973). The result of this research shows a confirmation of these phenomena in stock market of newly arrived companies. The researcher holds that reputation or credit of funding institutions and auditing institutions are determining factors in underpricing offering, because the more famous the institutions become, the more optimistic about company future the investors will be, so they tend to pay more for buying stock share. In the study entitled "Pricing Initial Public Offerings in Premature Capital Markets: The Case of Hungary", in addition to giving an account on indicators of privatization program in Hungary, Shindele and Perotti (2002) explored the process of pricing under intrinsic value of initial public offerings in stock market of this country and believe that political motivations are responsible for this.

In the research entitled "Privatization versus Private Sector Initial Public Offerings in Poland", Aussenegg (2000) concludes that pricing under intrinsic value of state-owned companies is not greater than that of private sector.

Dewenter and Malatesta (1997) in a research entitled “Public offerings of state-owned and privately-owned enterprises: An international comparison” found that pricing under intrinsic value of initial public offering in state-owned companies becoming private is not greater than that in privately-owned companies.

In an article entitled “The Pricing of Initial Offerings of Privatized Companies on the London Stock Exchange”, Menyah et al (1990) pointed out that stock return of privatized companies is on average 31 percent more than that in private sector.

Kangarloe and Asgari (2010) in their research entitled “identifying determining factors in unusual return of stock at the time of initial public offering in companies listed on the Tehran Stock Exchange” reported a positive unusual return over twelve months and 24 months after initial stock offering of select companies on the Tehran Stock Exchange.

The results of Mehrani et al (2009), which is entitled “study of unusual return on stocks offered publicly and initially on Tehran Stock Exchange under circumstances of existence and lack of price bubble and determining factors affecting it”, suggests an unusual short-term and long-term return on stock offered publicly and initially on Iran capital market under lack of price bubble condition as well as existence of an unusual short-term return on initial offerings under a price bubble circumstance.

There is ample evidence that investors who buy initial offering stock at the first day and sell it after a short time (generally at the end of the same day) reap on average 10-30 percent initial return (Rock, 1986). In financial literature, formation of unusual short-term return of initial offering stock is associated with “underpricing” of this stock (Ibbotson and Ritter, 1994).

Many empirical studies in different countries acknowledge unusual short-term return of initial offering stock, though amount of unusual short-term return has been reported to be different from a country to another (Bagherzadeh, 2007).

By studying initial public offerings from 2002 to 2003, Imani (2006) in a research entitled “study of pricing company stock at initial offering of Tehran Stock Exchange” concluded that stock price is significantly different from its price in future trading in the first offering to stock exchange.

3. Research Method

This research is in search of evaluation methods of stock initial offering on the Tehran Stock Exchange. To do so, a three-month period was chosen for measuring this performance and price change of stocks newly arrived on the stock exchange was used as a benchmark for pricing in the market. The research method is descriptive-correlational and the research is an applied research by purpose, so the method of the present research is survey, correlational and causative-comparative. Part of this research is survey. In order to explain correlation, multiple regression methods and Pearson product-moment correlation coefficient were used.

This research is based on time-series cross-sectional regression, for which multivariate simple regression estimation was used with ordinary least square.

3.1. Information collection methods

In order to collect essential data for the purpose of this research, financial information and statements and annotations were used. In doing so, Rahavard software and official website of

Tehran Stock Exchange and official website of National Privatization Organizations were used. For data processing, Eviews and SPSS were used. This research aimed to retest theories and models in the emerging market of Iran capital by considering theories presented in the research literature as well as models employed in other countries.

Data and information of the present research consist of four parts; the first part is historical information on stock price of initial offering and subsequent volatilities, in an attempt to reach an answer to the research question if pricing is less than reality or more than reality and how to compute price deviation; the second part is information on how to calculate investor's unduly reaction; third part deals with financial information obtained from financial statements of companies as well as calculation of their financial ratios; fourth part deals with inflation rate calculated by using goods price index and consuming services issued by Central Bank.

3.2. Population and statistical sample According to information obtained from financial statements of companies listed from the beginning of 1388 SH (21 March, 2009) to the end of 1393 SH (20 March, 2014) on Tehran Stock Exchange and for the first time their stocks were offered comprised of 45 companies. Thus this sample included companies meeting the following conditions;

1. companies conducted initial offering from the beginning of 1388 SH (21 March, 2009),
- 2- companies whose trading on stock exchange experienced halt no more than three months during 2009-2014,
- 3- fiscal year of these companies ends in March 20 every years and companies underwent no fiscal year over the period of 2009-2014,
- 4- there was an access to financial statements and explanatory notes annexed thereto. By considering the abovementioned conditions and that companies newly arrived on the stock exchange are seven companies. Because of lack of trading, their stocks were excluded from research sample due to various reasons on stock exchange. Thus, sample size was about 38 companies.

Since short-term return of companies' new stock was measured according to changes of quarterly price of stock in this research, statistical data included the period of 1394 (2015) as well.

3.3. Research questions

Since the aim of the research was to compare the performance of valuation models with dependent variables by performing a pairwise comparison for obtaining solutions, we deal with raising the questions rather than developing hypothesis:

- 1- Result of which method has the least deviation from stock intrinsic price among valuation methods studied in this research?
- 2- which variable has the maximum effect on reducing initial offering price deviation among variables affecting stock price?

3.4. Main goals of conducting study:

1. to specify a model in which stock initial offering price is closer to intrinsic price and stock exchange follows it.
2. to give priority to each of factors and variables having the greatest effect on valuation of stock initial offering.

4. Research models and variables and interpretation of results

Model (1)

(1) $IPO\ Price = A_0 + A_1 \text{Type Industry} + A_2 \text{Time arrival} + A_3 \text{acquisition capital} + A_4 \text{Audit firm} + A_5 \text{Firm Size} + \varepsilon$

Type Industry: type of industry which is determined in accordance with frequency of each company.

Time arrival: time of company arrival to stock exchange based on boom/bust period

Capital acquisition: amount of capital ownership

Firm size:

ε : random error of regression model

Independent Variable:

Type of industry and activity of newly arrived company, which is categorized based on frequency and number of each company across industries

Time of company newly arrived to market: to measure boom/bust period, market return was measured over six years and return of special period of company arrival to market is compared with this return. In case this return is more than market return, the period is considered boom, or else it is recession period.

Amount of capital acquisition: by means of certain natural or legal persons, the companies which were newly arrived to market were split into two classes namely companies with natural shareholder or legal shareholder holding more 50 percent of company stock and companies without such shareholders. The reason behind such a classification is Iran's accounting standards, in that holding more than 50 percent of stock is tantamount to a complete influence over company activity.

Type of audit institution: companies classified in accordance with type of audit institution used by companies newly arrived to market are split into audit organization and other audit institutions.

Dependent variable:

Stock initial offering price is the only dependent variable.

Control variable: firm size obtained from total logarithm of company's assets

First we deal with the descriptive statistic of the first model.

Table 1: Descriptive Statistic of First Variable

Variable	Mean	Median	max	min	Standard deviation
Initial offering price	6632.4	2595	42000	1001	8799.5
Type of industry	4.08	2.63	7.89	2.63	1.696
Time of arrival	0.394	0.00	1	0	0.4953
Amount of capital acquisition	0.0789	0.00	1	0	0.273
Type of audit institution	0.368	0.00	1	0	0.488
Firm size	9.93	9.865	13.87	6.66	1.946
Number of observations	38	38	38	38	38

As seen, according to table 2 the variables are accepted because (0.10) error level is taken and time of arrival and type of audit institution and type of industry have a probability of less than 10 percent. Moreover, given the adjusted coefficient of determination, 42 percent of independent variables explain dependent variable.

Table 2: Results of First Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	8358.87	9387.32	0.8904	0.3799
Type of industry	245.11	886.74	0.2764	0.0840
Time of arrival	3491.994	3064.01	1.1396	0.0629
Amount of capital acquisition	-5267.104	5740.218	-0.9175	0.3657
Type of audit institution	1314.295	3196.285	0.4111	0.0837
Firm size	-420.11517	803.7024	-0.5227	0.6047
Coefficient of determination (R): 0.6537				
Adjusted coefficient of determination (R ²):0.42744				
α =0.10				

Model (2)

$$(2) \text{ IPO Price} = B_0 + B_1 \text{capital} + B_2 \text{C}_2 \text{IPO Size} + B_3 \text{Inflation} + B_4 \text{Age} + B_5 \text{Owner firm} + \epsilon$$

Independent variable:

Capital: amount of capital of companies newly listed on stock exchange

IPO size: size of initial offering refers to volume of stock issuance at initial offering day

Inflation: is obtained by Central Bank's statistics

Age: of company is obtained from date of establishment to date of initial offering

Owner firm: is type of corporate ownership (state-owned/privately-owned)

Descriptive statistic of second model:

Table 3. Descriptive Statistic of Second Model

Variable	Mean	Median	max	min	Standard deviation
Initial offering price	6632.4	2595	42000	1001	8799.5
Amount of capital	4.61	4000000	1.5	349000	2.45
Size of initial offering	1.06	1.69	9.92	1.81	1.92
Inflation	19.74	15.6	34.7	10.8	8.26
Company age	20.81	16	59	2	16.40
Type of firm ownership	0.342	0	1	0	0.480
Number of observations	38	38	38	38	38

Result of second model: according to table 4 the variables are not accepted because (0.10) error level of firm age variable and firm ownership type. Moreover, independent variables explain dependent variables according to 69 percent adjusted coefficient of determination.

Table 4. results of second model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	2380.778	5298.335	0.449	0.6562
Amount of capital	3.81	6.38	0.597	0.0548
Initial offering size	1.13	8.7	0.128	0.0984
Inflation	209.48	208.19	1.006	0.0219
Firm age	64.44	106.38	0.6057	0.5490
Type of firm ownership	-3419.6	3477.3	-0.9833	0.3328
Coefficient of determination (R):0.8322 Adjusted coefficient of determination (R ²):0.69258 α =0.10				

Model (3)

(3) $IPO\ Price = C_0 + C_1\ Liquidity + C_2\ Firm\ Size + C_3\ risk + C_4\ capital + C_5\ IPO\ Size + \epsilon$

IPO price: is obtained by final stock price at initial offering day.

Liquidity: is measured by (HUI & HEBEL) liquidity ratio.

Firm Size:

High Risk: technological industries are considered high risk and zero and one nominal variable is used.

Capital: amount of capital of companies newly listed on Stock

IPO Size: amount of initial offering refers to volume of stock issuance at initial offering day.

In model (3), we want to explore research variables.

Independent variable:

In financial markets, liquidity is the degree that trading in high volume can be undertaken during a short time and has the least effect on price. An ideal index for liquidity should include factors such as volume, time, and cost of trading. Indexes such as volume of trading or turnover rate cannot represent trading costs, though they are easily accessible. In addition, differences in stock sizes are not considered in these two indexes. In total, it can be said that there is no complete index to liquidity, and criteria used are just developed for predicting and estimating liquidity.

Liquidity criteria

We can categorize liquidity criteria into four categories (Rudgar, 2011):

- 1- transaction cost- based criteria
- 2- trading volume-based criteria
- 3- market-based criteria
- 4- equilibrium price based criteria

This criterion deals with transaction costs of financial assets in secondary markets. The gap between purchase and sale price may cover all these costs. The price gaps are usually seen as liquidity criterion. Price gap as a measure of liquidity can be measured as difference between absolute selling and buying price or as percentage of price gap.

$S_a = P_a - P_b$

P_a : proposed sale price

P_b : proposed buying price

Trading volume based criteria

In this criterion, cashable returns are identified by trading volume with respect to price changes. The criteria are used for measuring the range and depth of liquidity. One of the liquidity criteria in this regard is (HUI & HEBEL) liquidity ratio; this ratio shown as LR_{hh} is as follows;

$$LR_{hh} = \frac{(p_{max} - p_{min})}{\frac{v}{s} \times p}$$

P_{max} = highest stock price by day during a five-day period

P_{min} = lowest stock price by day during a five-day period

V = total volume of trading during a five-day period

S = number of issued stocks

P = average latest day price

In this model, basically the aim is to measure market expansion, in that trading volume is associated with their price effect. The lower this ratio, the more asset liquidity, and the greater its range.

Market-Based Criteria

In this criterion, an attempt was made to measure price detection by making a distinction between price changes and liquidity degree and other factors such as general conditions or inclusion of new information, flexibility. When a news is disseminated in the market, even small volume of transactions can be associated with extreme price volatility.

HUI & HEBEL measured liquidity risk by using CAPM method according to securities market (Amihod and Mendelson, 1968).

$$R_i = \alpha + \beta R_m + u_i$$

R_i : daily return of i th stock

R_m : daily return of market

U_i risk of (company) share regression residual

Adjusted liquidity criterion according to F market using CAPM and excluding it from systematic risk contribute to determining intrinsic liquidity of a financial asset (Yavari, 1998).

Equilibrium price based criteria

This criterion deals with measuring regular movements to equilibrium price in order to measure flexibility dimension.

Dependent variable: price of stock initial offering is obtained from final stock price at initial offering.

Control variables: are determined according to Fang et al (2009) by reviewing other texts fitting Iran's conditions. Control variables of this model include:

1- size of initial offering refers to volume of stock issuance at initial offering day and obtained by registered data at Securities and Stock Exchange Organization.

2- Firm size which is obtained by logarithm of total assets

3- Technological industries are considered high risk industries, for which zero and one nominal variable is used.

Descriptive Statistic of Model 3:

Table 5. Descriptive statistic of third model

Standard deviation	min	max	Median	Mean	Variable
8799.5	1001	42000	2595	6632.4	Price of initial offering
8791.1	0	42008	2585	6208.3	Liquidity
1.946	6.66	13.87	9.865	9.934	Firm size
0.48	0	1	1	0.657	Risk
2.45	3490001.81	1.5	4000000	4.61	Capital size
1.92	1.81	9.92	1.69	1.06	Initial offering size
38	38	38	38	38	Number of observations

Results of model 3: given table 6 and probability level of variables, variables other than constant coefficient and firm size which are greater than ten percent are accepted and significant at 10% error level. Moreover, dependent variables explain 92 percent of independent variable.

Table 6. Results of third model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant coefficient	1781.9	2273.06	0.7839	0.4388
Liquidity	0.962	0.0472	20.350	0.0000
Firm size	-157.79	22.056	-0.7106	0.4825
Risk	493.09	886.48	0.556	0.0819
Capital size	1.95	1.73	1.125	0.0687
Initial offering size	2.9	2.25	0.129	0.0981
Coefficient of determination (R):0.932 Adjusted coefficient of determination (R ²):0.921 $\alpha = 0.10$				

Model (4)

$$(4) \text{ IPO Price} = D_0 + D_1 \text{buyers IPO} + D_2 \text{volume traded shares IPO} + D_3 \text{Inflation} + D_4 \text{Housing growth} + D_5 \text{ Firm Size} + \epsilon$$

Independent variable:

IPO buyers: number of buyers at first offering

Volume traded shares IPO: volume of trading or issuance of stock at first offering, which is obtained by using the number of stock and multiplying price of share initial offering by initial offering point.

Inflation: which is obtained by Central Bank Statistics

Housing growth: housing growth index is obtained by information and reports of Central Bank.

Control variable:

Firm size:

Descriptive statistic of model 4:

Table 7. Descriptive statistic of fourth model

Variable	Prob.	t-Statistic	Std. Error	Coefficient	Variable
8799.5	1001	42000	2595	6632.4	Price of initial offering
16044.3	0	54376	3190	10941.3	Number of buyers at initial offering
1.92	1.81	9.92	1.69	1.06	Trading volume
8.26	10.8	34.7	15.6	19.74	Inflation
4.633	6	20.8	12.8	13.76	Housing growth index
1.95	6.66	13.87	9.865	9.93	Firm size
38	38	38	38	38	Number of observations

Results of model 4: this model was assessed according to previous models. As shown in table 8, this model explains 36 percent of the independent variable, i.e. price of stock initial offering. Moreover, given 10% error level, plus constant coefficient, the number of buyers at initial offering as well as housing growth, and firm size were all rejected, as their probabilities were greater than 10%.

Table 8. Results of fourth model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant coefficient	9779.5	8508.3	1.149	0.2589
Number of buyers at first offering	-0.0544	0.106	-0.511	0.6128
Trading volume	2.01	8.60	0.233	0.0170
Inflation	83.77	216.33	0.3872	0.0011
Housing growth index	362.33	409.45	0.8849	0.3828
Firm size	-946.68	803.27	-1.18	0.2473
Coefficient of determination (R):0.6069				
Adjusted coefficient of determination(R ²):0.36844				
α =0.10				

Model (5)

$$(5) \text{ IPO Price} = E_0 + E_1 \text{Percent IPO} + \text{Time IPO} + D_3 \text{ Type Industry} + D_4 \text{P/E} + D_5 \text{Capital} + \epsilon$$

Independent variable:

IPO percentage: percentage of initial public offering, which is obtained from ratio of traded stock number to total number of company stock on the date of initial offering

IPO time: time of stock offering, which is here divided into four seasons according to Solar Hejri calendar and companies listed at similar seasons were studied in the same categorization. The reason for year classification into four seasons is special quality of each season and its effect on company activity. For instance, in winter offices are usually shut down and companies' accounts are settled, while in spring companies are busy auditing financial statements, setting up assemblies and submitting tax returns. It is evident that this scheduling can change with respect to various qualities and circumstances governing national market and economy, and it is possible that other schedules such as boom/bust period which was mentioned in the former equation under other circumstances and in other markets.

Industry Type:

P/E: price to earnings per share

Capital: amount of company capital

Descriptive statistic of model 5:

Table 9: descriptive statistic of fifth model

Variable	Mean	Median	max	min	Standard deviation
Price of initial offering	6632.4	2595	42000	1001	8799.5
Percentage of stock initial offering	1.320	0.05	20	0	4.42
Time of offering	6.786	7.89	10.53	2.63	3.21
Industry type	4.08	2.63	7.89	2.63	1.696
P/E	9.61	5.76	82.83	0	14.50
Amount of company capital	4.61	4000000	1.5	349000	2.45
Number of observations	38	38	38	38	38

Results of model 5: table 10 shows the results of the latest model. As shown in the table, other variables except constant coefficient and percentage of stock initial offering are significant at 10% error level. According to adjusted coefficient of determination, independent and control variables explain 86% of the dependent variable, i.e. price of stock initial offering.

Table 10: Results of Fifth Model

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.8348	-0.2102	4946.7	-1039.9	Constant coefficient
0.6949	-0.3957	327.1934	-129.477	Percentage of stock initial offering
0.0330	1.541	459.36	708.162	Stock offering time
0.0437	0.3297	843.81	278.23	Industry type
0.0505	2.032	101.05	205.38	P/E
0.0917	-0.266	5.84	-1.56	Company capital size
Coefficient of determination (R):0.927				
Adjusted coefficient of determination (R ²):0.86091				
α =0.10				

Correlation coefficient

To determine if which variable has the least effect and which variable has the most effect on reducing price deviation of stock initial offering, we first separated variables analyzed in the former part, those having significant level, from those which were insignificant, and then we obtained correlation coefficient of significant variables and price of stock initial offering, as their results are shown in table 11. As shown in the table, according to correlation coefficient, initial offering size was chosen as the least effect on reduction of price deviation and liquidity as the most influential variable for reducing price deviation of initial offering.

Table 11. results of correlation coefficient

Variables	Correlation coefficient
X ₂ :: industry type	0.077284
X ₃ : audit institution type	0.225766

X ₄ : initial offering size	0.092263
X ₅ : capital size	-0.57584
X ₆ : initial offering size	0.021802
X ₇ : inflation	0.143927
X ₈ : liquidity	0.963379
X ₉ : risks	0.139214
X ₁₀ : time of stock offering based on four seasons	0.203820
X ₁₁ :P/E	0.293520

5. Discussion and Conclusion

The present research explored valuation methods of stock initial offering on Tehran Stock Exchange over the period of 2009-2014. For this purpose, in order to achieve a good method of pricing stock initial offering, companies offered their stocks from 2009 to 2014 for the first time were chosen in the first place, i.e. a number of 45 companies. Among the companies. Seven companies were eliminated because of lack of trading on the stock exchange, and 38 companies were chosen. Afterward, companies with same features were classified into some classes as mentioned in previous parts. The proposed stock price and intrinsic price of each company were reviewed. In doing do, many factors had an influence over price of stock initial offering; these factors and variables were identified and then their effect on dependent variable, price of stock initial offering, was examined once separately and once simultaneously as multivariate regression by Eviews and SPSS. After this, in the end the variable which had the least effect on price deviation and the variable with the most effect on price deviation of stock

initial offering were chosen and the model with small difference to intrinsic value of stock exchange was chosen as premier model.

In this research, we took five models into consideration. As it is evident in the results in the previous part, some variables were significant and some were not, so a model with more adjusted coefficient of determination was used as the best model.

As shown in table 12, given that adjusted coefficient of determination of model 3 is more than others, the model is chosen as the best model. Moreover, the table shows factors and variables influencing price of initial offering.

Therefore, we conclude that If the company and investors are using this model To come down to price IPO at the stock market price is closer.

$$IPO\ Price = C_0 + C_1\ Liquidity + C_2\ Firm\ Size + C_3\ risk + C_4\ capital + C_5\ IPO\ Size + \epsilon$$

Given that correlation coefficient with stock initial offering price, initial offering size which is obtained by multiplying the number of stocks by initial offering price is considered the least effect on reduction of price deviation with 0.02 correlation coefficient, and liquidity variable with 0.96 correlation coefficient has the most effect on reduction of initial offering price deviation.

Table 12. model results

Insignificant variable	Significant variables	Adjusted coefficient of determination (based on percentage)	Model
- capital acquisition size - firm size	- arrival time (boom and bust) - audit institution type - industry type	42	1
- firm age - type of company ownership	- amount of capital - initial offering size - inflation	69	2
Firm size	- liquidity - risk - company capital size - initial offering size	92	3
- number of buyers at	- trading volume	36	4

<p>IPO</p> <ul style="list-style-type: none"> - housing growth - firm size 	<p>(initial offering size)</p> <ul style="list-style-type: none"> - inflation 		
<p>Percentage of stock offering</p>	<ul style="list-style-type: none"> - stock offering time (based on four seasons), as in winter price of initial offering is greater than other seasons - industry type - P/E - firm capital size 	<p>86</p>	<p>5</p>

Suggestions for Research Users:

1. It is recommended that all investors use of these models and the factors that are closer to their intrinsic value until not misleading.
2. Recording and reporting systems of stock exchange should improve in order to provide further transparency in capital market, in the sense that effects resulting from information asymmetry are reduced to a minimum, and investor make decision based on transparent information available on capital market.
3. it is recommended that companies are required to provide more and stricter information for public at the time of stock offering. In other words, companies should market and introduce their stock by using a set of promotional activities by investment company.
4. to spread information providing and promotion system concerning companies engaging in the acceptance process of Tehran Stock Exchange.
5. to improve recording and reporting systems in relation to companies newly listed on Tehran Stock Exchange in order to provide more transparency in capital market
6. it is also suggested that price index of 50 active companies be used for price calculation of stock exchange initial offering instead of stock exchange price index.
7. since Stock Exchange Organization pays attention to stock exchange rial value increase and company acceptance in its upcoming programs, it is necessary to take account of determining factors in stock price when accepting companies, providing situations in which stock initial price of these companies is not greatly different from its intrinsic value by offering proper and timely information.
8. For efficiency of initial public offering process, pricing process and detection of stock price, order record method which is common in the world is replaced with the existing sale method.

By keeping a better balance between information collection and revenue maximization, this method has the potential to surpass both sale and fixed price methods. Moreover, official record method can encourage investors to pursue a complete and thriving offering, and given promotional activities there is the guarantee that a sufficient number of investors can participate in offering and marketing. In addition to this, since stocks of large state-owned companies are typically conferred via stock exchange, and determining this type of stock comes with many intricacies, it is necessary to conduct a vast study on situation of their future market, customer attraction and application of essential controls over participants in stock purchase. Accordingly, in order to meet the needs and foregoing goals, official record method seems wiser in order to be applied on stock exchange compared with other methods. Apart from expansion of investment banks' activity in due diligence operation, application of this method lay the foundations for getting closer to pricing based on scientific methods.

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