



## IPO Underpricing and Aftermarket Liquidity: Evidence from Tehran Stock Exchange

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### Abstract

*In literature, underpricing initial public offerings (IPO) is described as asymmetric information and basic risk. Basically, the issuer of Initial Public Offering must leave enough ‘‘money on the table’’ to reduce investors’ uncertainty about the share’s value to attain sufficient interest. However, empirically, it is still unclear how aftermarket liquidity is connected to the IPO’s underpricing. Therefore, this study investigates the effects of IPO’s underpricing on the aftermarket liquidity based on 80 qualified initial public offerings listed at Tehran Stock Exchange during the nine-year period from 2001 to 2010. The relationship between IPO underpricing and aftermarket liquidity has been investigated in three periods: 30, 120, and 240 trading days after the initial public offering, specifically after the initial return period. The multiple regression results indicate that there is a significant positive relationship between IPO underpricing and aftermarket liquidity measured using turnover ratio. Consistently, this paper also found that IPO underpricing is negatively and significantly affect the Amihud’s illiquidity factor.*

**Keywords:** *Initial Public Offerings, Underpricing, Aftermarket Liquidity, Initial return, Tehran Stock Exchange*

### 1. Introduction

In general, the main role of financial and capital market is to absorb private sectors’ liquidity and then channel them to the productive activities. In other words, the role of capital markets is to transfer funds from providers (lenders, savers) to the applicants (for example, manufacturing sectors). Recently, one of the methods to raise funds through capital market that became popular among companies globally is initial public offering (IPO). The term IPO was first introduced in the literatures in the late 1970s and it was referred as the first public sale of company’s shares. Since then IPO has become one of significant events in a company’s life-cycle as well as for the domestic capital market. Subsequently, IPO has become a research interest among capital market practitioners as well as academic researchers. In general, most of the studies were concentrated on three anomalies: price drop in long-term, underpricing and hot initial public offerings (Hagbin, 2008). There were also studies that analyzed the influence of

IPO characteristics on the liquidity and trading activity of the shares. This paper focuses on underpricing and liquidity issues of IPO.

IPO underpricing refers to the situation where companies offer their shares to the market at lower price than their intrinsic value in order to encourage potential investors and to ensure a successful public offers. There are abundant empirical evidences that suggested IPO underpricing is a universal phenomenon which happened in almost all stock exchanges all over the world (Bakar ad Uzaki, 2012). Meanwhile, determining the appropriate investment criteria has always been a major concern for investors. Many investors and investment analysts give special attention to liquidity as a determining factor in their decision to purchase or sale shares in addition to risk and return. This is due to the fact that higher liquidity reduces transaction costs in future deals (Ibbotson and Ritter, 1995), increases the company's value (Amihud and Mendelson, 1986), creates a better environment for managers' incentive plan and improves the market's control by encouraging speculators to release the information (Holmström and Tirole, 1993). On top of this, improving liquidity by increasing the number of owners can be an effective mechanism in preventing unwanted integration (Vishny, 1986). The issue this paper investigates is whether there is a relationship between the liquidity of the company's share and the underpricing of their IPO. Specifically, this paper investigates the existence of significant relationship between underpricing and liquidity of IPOs after the new issues are traded for the first time.

Liquidity can be defined as the ability of the market to absorb the huge volume of transactions without creating excessive volatility in the price. Liquidity indicates the ability to quickly trade a large amount of securities with low cost and low price impact (Bigdeli Eslami and Saranj, 2008). Studies on the relationship between liquidity and IPO underpricing mostly had been done in developed countries. Only few studies were focused on developing stock markets. Therefore, this paper intends to shed light on this issue by identifying the relationship between IPO underpricing and aftermarket liquidity specific to the IPO market in Iran. As far as we can ascertain, there is no study conducted on this issue with special reference to Iranian IPO. Most of the studies on Iranian IPOs were concentrated on factors that affect IPO underpricing (for example, a study by Bagherzadeh, 2011; Randideh, 2014; and Abdi and Basti, 2015), short-term and long-term performance of IPOs (Zabihianamiri, 2012; Sohrabi et al., 2013; and Zamanian et al., 2013), and earnings management in IPOs (Karami et al., 2014; and Rahbar and Khodadady, 2015). Investigating this relationship is important in an emerging market like Iran. Rouwenhorst (1999) mentioned that share's liquidity is one of the firm's characteristic that investors pay attention to when investing in an emerging market. Therefore, investor's knowledge on the factors that affect the liquidity level in the market would help them in their investment decision.

The rest of the paper is organized as follows: the next section reviews the related literature on the relationship between underpricing and aftermarket liquidity; the following two sections describe the data and methodology and the empirical analysis of findings; and the last section presents the final conclusions and implications of the study.

## **2. Literature Review**

Most of previous researches are concentrated on the anomalies arisen in IPOs and their impact on the companies' efficiency and performance (Ritter and Welch, 2002; Gompers and Lerner, 2003; and Raveh and Abedini, 2014). However, only few studies addressed the influence of IPO characteristics on the aftermarket liquidity of shares (Miller and Reilly, 1987; Hanley,

1993; Schultz and Zaman, 1994; Li et al., 2005; and Hahn et al., 2013). These studies (for example, Miller and Reilly, 1987; Hanley, 1993; and Schultz and Zaman, 1994) have observed a higher aftermarket turnover for underpriced IPOs compared to overpriced IPOs, but the evidences are not conclusive yet.

One of the first outstanding studies on this subject is a study by Booth and Chua (1996) that examines a sample consisting of 2,151 IPOs in NYSE, AMEX, and the NASDAQ markets. The results show that IPOs are underpriced in order to spread the companies' ownership and ultimately increase the liquidity of the secondary market of new shares. Habib and Ljungqvist (2001), based on the assumptions of "investor attention", found that IPOs underpricing directly affect liquidity through increasing companies' turnover. More recently, Hahn et al. (2013) investigated the relationship between underpricing and stock liquidity after IPO while controlling for a market microstructure factors effective on liquidity. Results from their study indicated that underpricing causes liquidity of shares in the new secondary market that measured by turnover, price gap and cost effects of turnover.

The relationship between ownership structure and liquidity after IPO is still unclear. It is obvious that a less concentrated ownership structure decreases the significance of information asymmetry, which leads to deduction in adverse selection costs thus encourages trading activity and improves market liquidity (Bhide, 1993). Therefore, companies that go public in order to gain liquidity can be expected to underprice their offering to entice the uninformed investors. Pham et al. (2003) investigated the relationship between the level of underpricing, ownership structure and stock liquidity in the period of one month after the IPO. They argued that greater underpricing not only enhances trading turnover, but also decreases bid-ask spread due to the dispersal of ownership after IPO. They concluded that underpricing, which changed the ownership structure of the company, affects liquidity positively.

Like the relationship between ownership structure and liquidity, the relationship between share retention and liquidity after IPO is also unclear. Zheng et al. (2005) argued that liquidity decreases since the number of shares retention increases by pre-IPO owners. Due to this, the company needs to underprice more in order to increase the liquidity. This implies that an increase in firm value is due to share retention, since pre-IPO owners expect a higher cash flow in the future (Brealey et al., 1977). On the other hand, Li et al. (2005) examined the relationship between underpricing, share retention and IPO aftermarket liquidity on NASDAQ market. Consistent with signalling theory, the results show a positive relationship between underpricing and liquidity of shares in the period of 30 days and 240 days of trading after the IPO. For emerging markets, Yüksel and Yüksel (2006) studied the relationship between initial return, share retention and the volume of transactions on the Istanbul Stock Exchange (ISE). The results show there is a significant relationship between underpricing and volume in short-term (three weeks) in ISE. This relationship, however, is not observed in the long-term (three years).

Empirical studies generally support the Booth and Chua's theory (1996) regarding the positive relationship between underpricing and aftermarket liquidity. Ellul and Pagano (2006), however, proposed the hypothesis of compensation for illiquidity. In their model, investors worry about the aftermarket illiquidity that may create from asymmetric information after the IPO. Therefore, low liquidity creates an expectation of high initial return in IPO. Their empirical evidence was supported by a sample of 337 IPOs in the UK between 1998 and 2000. Study by Gajewski and Gresse (2006), however, showed that liquidity after IPO is positively and significantly correlated with initial returns. Meanwhile, ownership concentration is significantly and positively correlated with illiquidity after issue.

Several other studies were conducted regarding this topic. For example, Chang et al. (2008) investigated the direct effect of underpricing liquidity of new shares without the involvement of ownership structure factor after shares allocation. They found that underpricing has a direct effect on stock liquidity up to 240 trading days after issuing. Chong and Pua (2009) analysed the relationship between IPO transactions volume, initial returns and economic conditions of the Malaysian market. Their study shows that initial return and economic conditions have a positive relationship with IPO volume in the long term. Meanwhile, in the short term, the initial return and underpricing are also the reasons for the changes in trading volume and liquidity. More recently, Ramírez et al. (2011) investigated the relationship between IPO characteristics and post-offering liquidity of stocks in the Spanish stock market. The results showed that there is a significant negative relationship between underpricing and illiquidity factor. However, they also found a positive relationship between underpricing and liquidity factor in the period of 120 days after IPO.

### 3. Methodology

#### *Data and Regression Model*

This study uses a sample of 80 IPOs that listed on Tehran Stock Exchange from 2001 to 2009. Since the liquidity of new shares is investigated for up to 240 trading days (about one year) after IPOs, the population of the study covers only the period 2001-2010. In this study, the following conditions are considered in order to include the IPO in the final sample: 1) Companies' financial statements and notes should be available during the study period; 2) The financial year of the companies should not be altered and it should be end of March of each year; 3) Companies should not publish notifications or important information during the initial return of IPO. The data are collected from Rahavard Novin and Tadbir Pardaz softwares and Tehran Stock Exchange official website. The SPSS and Eviews softwares are used for further statistical analysis. In order to examine the relationship between underpricing and IPO aftermarket liquidity of listed companies on Tehran Stock exchange, this study uses multiple regression equation to test the hypothesis statically. The regression equation is as follows:

$$LIQ_{it} = \alpha_{it} + \lambda_{it}D_{it} + \beta_2 MAR_{it} + \beta_3 MR_{it} + \beta_4 SIZE_{it} + \beta_5 MB_{it} + \beta_6 RISK_{it} + \beta_7 DEBT_{it} + \beta_8 P/E_{it} + \beta_9 TML_{it} + \varepsilon \quad (1)$$

Where, LIQ represents IPO aftermarket liquidity of company *I*; D stands for dummy variables for amplitude of company *I*; MAR denotes market-adjusted return of company *I*, which measures underpricing; while MR represents market return. SIZE and MB denote size and growth potential of company *i*, respectively; and RISK represents the risk level of company *i*. DEBT stands for company leverage; P/E represents company's price-earnings ratio; and TML denotes company's market liquidity on listing day. Parameter  $\alpha$  and  $\varepsilon$  are the intercept term and error term of regression equation, respectively, while  $\beta_i$  is estimated coefficient.

Studies showed that factors other than underpricing have meaningful impact on IPO aftermarket liquidity. For example, risk has been identified as a variable that directly affects IPO aftermarket liquidity (Pham et al., 2003; Li et al., 2005). Meanwhile, size, growth potential and DEBT (Pham et al., 2003) are factors that could indirectly influence a stock's liquidity through their effect on IPO ownership structure. In addition, MR and TML are used to control the market conditions from the viewpoint of boom and bust, while P/E ratio is added to control the effect of

industry factor. In this study, the regression model will be estimated based on 80 IPO for three period; 30, 120 and 240 trading days after the IPO.

### ***Liquidity***

In this study, liquidity (LIQ) will be measured using two proxies; first, turnover ratio (based on trading volume) as a proxy to assess the liquidity of shares by the speed of transactions. And second, Amihud's illiquidity (2002) as a composite index to measure stock liquidity through a dual focus on speed and price effects of stock. The turnover ratio (TOR) is calculated based on the equation similar to Bigdeli Eslami and Saranj (2008):

$$TOR = \frac{TV}{S} \quad (2)$$

Where, TV is total trading volume for the period and S is number of outstanding shares. Meanwhile, Amihud' illiquidity factor is calculated based on the following equation:

$$ILLIQ_t^i = \frac{1}{Days_t^i} \sum_{d=1}^{Days_t^i} \frac{|R_{td}^i|}{V_{td}^i} \quad (3)$$

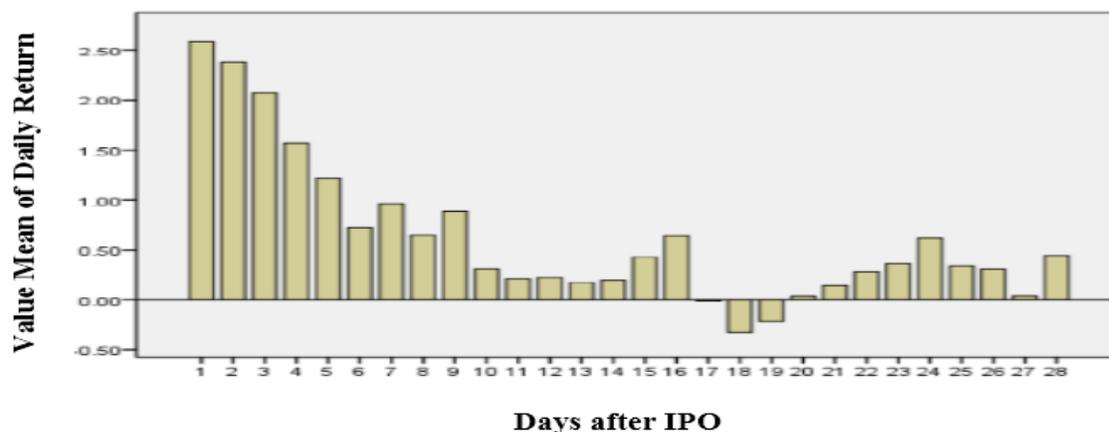
Where, R and V are measured return and volume on the day d of the period t, respectively, and Days is equal to the number of trading days of stock i for the period t. Amihud's illiquidity is based on the principle that if the stock price changes significantly in reaction to a small volume of transactions, stock liquidity is lower. This proxy considers the price effects in addition to turnover (Zhang, 2010).

### ***Underpricing***

In most studies, the concept of the return (return generated on the first trading day) is used to calculate underpricing. However, due to limitations of daily price limit and different mechanism of IPOs in TSE, the return of first trading day does not represent the level of underpricing accurately. Therefore, to minimize these effects, underpricing is calculated in longer period (until the market reaches to the real price of stock).

In order to determine the period of initial return, the average excess market return of the IPO within 30 trading days after issuing is calculated and the first period in which the excess market return is positive and contrary to zero is considered as the period of initial returns. Based on the results of this study (Figure 1), the sample companies have positive excess market return on average 17 days after IPO. Therefore, the return period of 17 days is considered in this study.

Figure 1: The average daily excess market return of sample companies



After determining the period of IPO initial return, market-adjusted returns are computed based on the following equation similar to previous studies (for example, Pham et al., 2003):

$$MAR = \frac{P_{1t} - P_0}{P_0} - \frac{M_{1t} - M_0}{M_0} \quad (4)$$

where, MAR refers to the market-adjusted return of each IPO at the end of listing date,  $P_{1t}$  is the closing price at the end of initial return period,  $P_0$  is the closing price on the first trading day.  $M_{1t}$  and  $M_0$  are the market index at the end of initial return period and market index on the listing day, respectively. The rest of variables in the study are calculated based on Table 1 as below:

Table 1: Calculation of Research Variables

Variable	Formula
MR	Market index returns of Tehran Stock Exchange during the studied period
SIZE	The natural logarithm of market value of company's share
MB	The natural logarithm of the market-to-book ratio
RISK	The standard deviation of daily share returns based on the closing price during the studied period
DEBT	Book value of debt divided by total assets
P/E	The closing price divided by the company's earnings per share at the end of studied period
TML	The average of total value of daily trading of the market divided by daily value of the market during the studied period

#### 4. Results and Discussion

The regression model in Equation (1) was estimated for three different periods after the initial returns; 30 days (first period), 120 days (second period) and 240 days (third period). Table 2 presents the descriptive statistics of each variable involved in all three periods. In this study, before testing the hypothesis, the Kolmogorov-Smirnov test was conducted to examine the normality of the dependent variable. The normality tests were conducted for all three study periods separately. The results from Kolmogorov-Smirnov test show that the normal distribution is observed when the data are in the logarithm form. Therefore, in the estimation process, the data were transformed into natural logarithm.

Table 2: Descriptive Statistics

Variable	Days	No. of Companies	Average	Mean	Std. Dev.	Skewness	Kurtosis
ILLIQ	30	80	-5.063	-4.700	2.212	-0.310	-0.442
	120		-4.686	-4.300	2.151	-0.392	-0.602
	240		-4.077	-3.990	2.033	-0.153	-0.470
TOR	30	80	-3.274	-3.259	1.171	-0.325	0.293
	120		-1.996	-1.897	1.140	-0.310	-0.177
	240		-1.239	-1.143	1.002	-0.623	0.774
MR	30	80	0.175	0.118	0.233	1.245	2.110
	120		0.175	0.118	0.233	1.245	2.110
	240		0.175	0.118	0.233	1.245	2.110
MAR	30	80	0.055	0.026	0.115	1.903	4.490
	120		0.218	0.182	0.375	1.256	1.313
	240		0.271	0.051	0.564	1.217	0.653
RISK	30	80	5.081	3.393	5.301	1.804	4.067
	120		5.808	4.839	4.514	0.827	0.108
	240		7.308	5.401	6.428	1.948	4.169
MB	30	80	1.264	1.187	0.908	0.513	-0.228
	120		1.205	1.300	0.900	0.077	0.081
	240		1.160	1.109	0.957	0.647	0.254
DEBT	30	80	0.628	0.625	0.183	-0.036	-0.792
	120		0.611	0.605	0.209	-0.360	-0.327
	240		0.638	0.650	0.221	-0.220	-0.173
SIZE	30	80	27.225	27.074	1.868	0.389	-0.580
	120		27.286	26.881	1.894	0.402	-0.346
	240		27.325	27.003	1.860	0.445	-0.270
TML	30	80	0.0010	0.000	0.0004	0.920	1.723
	120		0.0010	0.001	0.0003	0.421	0.024
	240		0.0009	0.000	0.0002	0.248	-0.536
P/E	30	80	10.023	7.742	6.870	1.760	3.660
	120		9.194	7.673	5.761	1.341	1.521
	240		7.749	6.639	4.107	1.638	3.400

The estimation results of the regression model are presented in Table 3. In the case of illiquidity (ILLIQ) as a dependent variable, the model that estimated using 30 days data after initial return seems to produce higher adjusted R-squared (0.616) compared to 120 days (0.571) and 240 days (0.368). However, similar pattern cannot be observed in the case of regressions for liquidity (TOR) where a regression that used 120 days data provided better adjusted R-squared than the regression for 30 days and 240 days. The estimation results for illiquidity were also found to have generally higher adjusted R-squared compared to the regression that used TOR as a dependent variable.

For the TOR, the coefficients of underpricing variable (MAR) was found positive for the all three periods, thus indicate higher underpricing may contribute to higher liquidity. However, the underpricing coefficients are significant only in the first (30 day) and second (120 day) period. The regression results from ILLIQ are also consistent with the results from TOR regressions. In the case of ILLIQ, all underpricing coefficients are significant regardless the periods used in the estimations. The negative relationship between underpricing and ILIQ indicates that low liquidity may due to low underpricing of the IPO. Findings from this study are consistent with previous studies (Pham et al., 2003; Li et al., 2005; Zheng and Li, 2008; and Hahn et al., 2013), which suggested that underpricing has direct and significant relationship to

the aftermarket liquidity of IPO, particularly within 120 days after the share is listed. Meanwhile, for 240 days after IPO, the regression results show that the underpricing variable is only significant in the case of illiquidity regression but not in the case of turnover ratio as a dependent variable.

Table 3: Results of Cross-Sectional Model

		For the period of 30 days after IPO: With the elimination of initial return		For the period of 120 days after IPO: With the elimination of initial return		For the period of 240 days after IPO: With the elimination of initial return	
		Dependent Variables					
Independent Variable		ILLIQ	TOR	ILLIQ	TOR	ILLIQ	TOR
$\alpha$	Coefficient	21.933**	-3.799	21.236**	2.572	22.564**	3.288
	t-stats	(6.196)	(-1.284)	(6.848)	(0.941)	(5.382)	(1.407)
D	Coefficient	-0.5234	-0.021	-0.650	-0.722	-2.332**	-0.404
	t-stats	(-0.765)	(-0.043)	(-1.172)	(-0.875)	(-2.871)	(-1.171)
MAR	Coefficient	-1.884**	1.238**	-1.9537**	1.217**	-1.690**	0.562
	t-stats	(-1.757)	(2.091)	(-1.876)	(2.419)	(-2.054)	(1.283)
MR	Coefficient	4.569**	-0.669	1.2035**	-0.3191	0.469	-0.335
	t-stats	(3.703)	(-0.569)	(2.132)	(-1.018)	(1.117)	(-0.733)
SIZE	Coefficient	-0.964**	-0.021	-0.9398**	-0.1737**	-0.8687**	-0.2141**
	t-stats	(-8.062)	(-0.215)	(-8.797)	(-3.026)	(-6.192)	(-2.801)
MB	Coefficient	-0.264	0.301	-0.5461**	0.5957**	-0.0326	0.227**
	t-stats	(-1.143)	(1.625)	(-2.54)	(4.032)	(-0.159)	(2.035)
RISK	Coefficient	-0.050	0.065**	-0.0028	0.0440	-0.0597**	0.046**
	t-stats	(-1.319)	(2.045)	(-0.074)	(1.521)	(-1.6756)	(2.901)
DEBT	Coefficient	-1.970**	1.642**	-1.0328	1.6408**	-0.7388	1.183**
	t-stats	(-3.269)	(2.545)	(-1.274)	(3.203)	(-1.106)	(2.619)
P/E	Coefficient	0.066**	-0.021	0.0929**	-0.0520**	0.1115**	-0.019
	t-stats	(1.960)	(-0.913)	(3.131)	(-2.345)	(2.166)	(-0.783)
TML	Coefficient	879.939**	550.177**	728.307	840.434**	1704.91**	446.79
	t-stats	(2.043)	(1.696)	(1.301)	(1.847)	(3.863)	(0.832)
Adj-R <sup>2</sup>		0.616	0.198	0.571	0.379	0.368	0.323
F-stat		15.098	3.176	12.690	6.363	6.111	5.185

\*\*Significant at 0.05 levels. Figures in parenthesis are t-value.

With regards to the controlled variables, this study found that several variables indicate significant effects on the IPOs aftermarket liquidity. Specifically, the regression results show that there is a positive and significant relationship between market index returns (MR) of Tehran Stock Exchange and Amihud' illiquidity (ILLIQ) indicator for regression period 30 days and 120 days after IPO, but not in the case of 240 days. In contrast, the MR was found to not significantly affect liquidity (TOR) in all three periods studied. Meanwhile, size (SIZE) negatively influences liquidity as it indicates smaller IPO firms are more liquid. In addition, the growth potential (MB) has strong positive effect on liquidity (turnover ratio) where the coefficients are significant for the second and third period of the study.

A consistent positive relationship is found between firm's risk (RISK) and liquidity, which is significant for the period of 30 days and 240 days after IPO. This finding could be due

to the characteristics of the studied periods or market. In a developing market like Iran, the liquidity might be considered as an advantage that investors would acknowledge as a compensation for tolerating the higher risks. On top of this, a company's leverage has a consistent significant positive influence on turnover ratio. This result indicates that investors are not cautious in getting involved in IPOs with indebted companies.

The company's price-earnings ratio (P/E) is found to be consistently and positively related to Amihud' illiquidity, where the coefficients are significant at 0.05 confidence levels for the overall studied period. Finally, a company's market liquidity on listing day (TML) positively influences turnover ratio and Amihud' illiquidity. However, the coefficient of illiquidity for the second period and liquidity for the third period are not significant. This result indicates that higher market liquidity on listing day increases liquidity ratios, thus enhances price effect of large transaction.

## 5. Conclusions

This study is conducted to examine the relationship between underpricing and the aftermarket liquidity of IPOs in Iran as an emerging market. Publishers and investment bank are interested in the pricing of IPOs. Due to the acceleration of the privatization process in the country, the pricing of initial public offerings should be more accurate to prevent creation of failed offers, hence reduce the attractiveness of these offerings.

The results of first and second period, respectively, show that there is a significant positive relationship between underpricing and liquidity of the company's shares during the 30 and 120 trading days after the initial return. This finding is compatible with the other studies' results (for example, Chang et al., 2008; Ramírez et al., 2011; and Hahn et al., 2013). In the third period studied, according to the concept of liquidity, the ability to quickly deal large amounts of securities with low price impact and the fact that turnover ratio are only focused on trading volume; while not concerned on the price effects of trading volume, it can be said that there is a significant positive relationship between underpricing and liquidity of company's share after IPO during the 240 trading days after initial return. This result is aligned with the findings of different studies (for example, Chang et al., 2008; Zheng and li, 2008; and Chong and Puah, 2009). The results show that companies that issue new shares at a lower price effects and increases liquidity of shares in the IPO aftermarket trading is consistent with Booth and Chua's theory (1996).

The main result of this study has great implication on the IPO market of Tehran Stock Exchange. The investors take advantages of a liquid stock market and accordingly, the advantages transfer to the economy completely. More liquid stock market provides better opportunity for its investors, either local or foreigner, to sell their shares for the first time to public in the suitable time at more competitive price. This situation provides an opportunity for local companies to increase external equity funds from IPO market and encourages more companies to go public indirectly. Apparently, IPO as an external financing will help companies to sustain growth and generate income, which consequently leads to gain greater national incomes and higher economic growth.

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