

# Mandatory Price Support of the Underwriter: Evidence from the putback option

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## ABSTRACT

Regulatory changes regarding the price supporting role of the underwriter can alter the pricing of the IPO and the relationship between the underwriter and institutional investors. We examine a unique period of time in Korea during which there was a mandatory market making role of the underwriter called the putback option. Under the putback option, individual investors of the IPO have a put option which allows them to sell shares of the IPO firm back to the underwriter at 90% of the IPO offer price within one month after the IPO. We compare between the period when the putback option was enforced and the period after the putback option was abolished. We find that during the period when the putback option was enforced, the higher risk of the underwriter resulted in more underpricing of IPOs. We also find that the significant selling activity by institutions and the predictive power institutions' trading for future performance is found not on the days following the IPO but on days following the expiration of the putback option. Overall, our study suggests that the regulation of imposing a mandatory price supporting role of the underwriter results in only a temporary delay in institutions' behavior.

## 1. INTRODUCTION

Some of the well-documented findings in IPO are that institutions' selling of IPO shares is related to the relationship between the institution and the underwriter, and that institutional investors' selling of IPO shares has a predictive power for future firm performance. (Krigman et al., 1999; Loughran and Ritter, 2002; Ljungqvist and Wilhelm, 2003; Boehmer et al., 2006; Chemmanur et al., 2010) A regulatory change that alters the payoff scheme of the underwriter will affect not only the underwriter's pricing of the IPO, but also the dynamic between the underwriter and institutions that invest in IPO firms. An important regulatory enforcement that took place was a mandatory price supporting role of the underwriter called the putback option in Korea. In this study, we examine the effect of the putback option on the underpricing of IPO firms, the trading behavior of institutions, and the predictive power of institutions' trading.

Putback option was introduced in the Korean stock market in September, 2003. The putback option is an option given to the individual investors of the IPO. If the market price of the IPO firm falls below 90% of the IPO offer price within one month after the IPO, individual investors can sell their shares of the IPO firm to the underwriter at 90% of the IPO offer price. The intention of implementing the putback option was to protect the retail investors from the IPO market.<sup>1</sup> Under the existence of putback option, underwriters are exposed to the risk of having to purchase shares at above-market price. Therefore, putback option can be viewed as a mandatory price support by the underwriter. One of the well documented phenomenon of the IPO market is that underwriters engage in price support by repurchasing shares of poorly performing IPO firms in an attempt to stabilize the market price. While the price supporting activity of the underwriter is done voluntarily in most markets around the world including the U.S., the putback option rule in Korea strictly requires the underwriters to purchase shares at a specific price if the price falls beyond a certain level. The putback option was abolished in July, 2007 as part of the Korean government's move to liberalize the stock market. Since then, underwriters are not regulated for their market making activities. We examine the period of time during which the underwriters were subject to a mandatory price supporting role due to the regulation of the putback option. We compare the period during which the putback option was enforced versus the period after the abolishment of the putback option.<sup>2</sup> Specifically, we examine how the mandatory price supporting role alters the

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<sup>1</sup> Throughout our sample period (both during the period of putback option and the period after the abolishment of the putback option), underwriters were required to allocate at least 20% of the IPO shares to the individual investors.

<sup>2</sup> Before the putback option was introduced, there was another form of market stabilization role of the underwriter. Under the previous law before the putback option, the underwriters were required to maintain the market price of the IPO firm's share above 90% of the IPO offer price

underwriters' IPO pricing and the institution investors' trading behavior. We also analyze the predictive power of institutions' trading activity for the two different periods.

We contribute to the literature by examining how regulation of the underwriter can alter the behaviors of the underwriter and institutional investors. Another contribution of our study is that on the identification of institutional trades. Whereas previous studies on IPO that analyzed institutional trades were limited in precisely classifying the identity of the trader type (for example, Krigman et al. 1999; Boehmer et al., 2006; Chemmanur et al., 2010), our trade data has the identification of trader types and can identify institutional trades for all IPOs during our sample period.

We find that during the period in which the putback option was enforced, there is greater level of underpricing. This suggests that underwriters set the price lower in order to reduce the likelihood of share price going below the option strike price. We also find evidence that institutions' trading is aligned with the incentive of the underwriter as they delay their selling of shares until the putback option expires. Also, whereas the institutions' selling volume right after the IPO has no predictive power for the future long-run performance of IPO firm, their selling volume after the expiration of the putback option has a significant predictive power for the IPO firms' long-run performance. Overall, evidence suggest that the regulation of imposing a mandatory price supporting role had an effect of delaying the trading of institutions until the regulation expires.

The rest of the paper is organized as follows. In Section 2, we explain our data on IPOs in Korea. In Section 3, we examine the changes in the level of underpricing during the putback option period and the period after the abolishment of the putback option. We analyze the effect of putback option on the flipping behavior of institutions in Section 4. The predictive power of institutions' trading on IPO firms' future performance during the two different periods is shown in Section 5. We conclude the study in Section 6.

## **2. Data on IPOs in Korea**

In 1999, the Korea Securities Dealer's Association adopted the bookbuilding system as the official

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until one month of the IPO. Since we are trying to compare the two periods with and without market stabilizing regulation, we do not include the period before the putback option because while there was a mandatory market stabilization role of the underwriter, the degree of price supporting obligation was different. Rather, we compare the period during which the putback option was enforced and the period after it was abolished.

flotation method for IPOs in Korea. According to the Korean FSS regulation, the final offer price is determined within a 30% interval around a weighted average of bidding prices during the bookbuilding process. This restriction was lifted in May, 2007, allowing the underwriters to have full discretion over the pricing of IPO shares.

The Korea Financial Investment Association (KOFIA) guides the allocation of IPOs. 20% of IPO shares need to be allocated to the Direct Share Participation (DSP) program, and at least 20% should be allocated to retail investors.<sup>3</sup> Any unsubscribed shares of the IPO are conventionally allocated to institutional investors. Shin (2010) finds that the allocation to institutional investors is about 65% during the period of 2001-2007.

We collect data on IPOs for the period of September, 2003 to December, 2014 in Korea from the Korea Exchange ([www.krx.co.kr](http://www.krx.co.kr)). September, 2003 is the start date of the enforcement of the putback option. It was abolished in July, 2007. Detailed offering and bookbuilding information is collected from the Data Analysis, Retrieval and Transfer System in the Financial Supervisory Service (<http://dart.fss.or.kr>), the registration document, and the final prospectus. We use the FnGuide database to retrieve the firms' financial and stock price data, and the institutional investors' trading data.

Table 1 shows the number of firms in our sample during the period where the putback option was enforced versus the period after the putback option was abolished. During the period of putback option, 32 firms are IPOs listed in the Korean Stock Exchange (KSE) and 210 firms are IPOs in the Korea Securities Dealers Automated Quotations (KOSDAQ).<sup>4</sup> In the period after the enforcement of the putback option, 55 firms are IPOs in the KSE and 325 firms are listed in KOSDAQ.

[Table 1]

### **3. Putback Option and Underpricing**

Schultz and Zaman (1994) and Aggarwal (2000) show that price supports can be a complement to

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<sup>3</sup> Under the DSP program, employees of the IPO firm has an option to buy IPO shares at discounted price.

<sup>4</sup> KOSDAQ was set up as an independent stock market from the KSE and benchmarked the U.S. counterpart NASDAQ. Currently KOSDAQ operates as SME Market Division of Korea Exchange (KRX).

underpricing. The putback option is different from a voluntary price support because the putback option forces the underwriters to purchase shares at a specific price from the investors. Since the obligatory price support brought by the putback option is a source of risk to the underwriter, the underwriter may have a greater incentive to underprice IPOs to lower the possibility of the share price falling below the exercise price of the option which is 90% of the IPO offer price.

We examine the effect of the putback option on the underpricing of IPO shares by comparing the degree of underpricing during and after the period in which the putback option was enforced. The degree of underpricing is measured as the difference between the closing stock price on the third trading day after the IPO and the IPO offer price, divided by the IPO offer price. The reason that we use three-day trading period instead of the typical one-day initial return is because in Korea, there is a daily stock price change limit of 15% during the sample period. Since this price band can constrain the stock price in reaching the market consensus, we measure underpricing, or initial return, as the three-day return.

In Table 2, we find that there is significant amount of underpricing of IPOs in Korea. This is consistent with previous studies that examine underpricing of IPOs in Korea. (See Choi, 2011 for a review). The average (median) initial return is 50.47% (36.18%) during the period where the putback option was enforced, and 37.39% (15.54%) after the abolishment of the putback option. The difference in the initial return between the two periods is statistically significant at 99% level.

[Table 2]

Also, the degree of price adjustment, measured as the IPO offer price less the average price of the offer price range, divided by the average price of the offer price range, is more negative during the period of the putback option. The mean (median) price adjustment is -4.27% (-2.94%) during the putback option period and 0.87% (6.25%) after the abolishment of the putback option. The difference is statistically significant at 99% level. The result shows that underwriters were more likely to revise their share price downwards when the putback option was enforced. We also find that for three trading days after the IPO offer, there is greater selling by institutional investors during the period after the abolishment of the putback option compared to the period of the putback option enforcement. When we examine their selling activity for three trading days after one-month of the IPO, we find that there is greater selling during the period of the putback option enforcement compared to the period after it is abolished. In Section 4, we will further analyze the institutions' selling activity. The greater offer size of the IPOs after the termination of the putback option reflects the growth of the IPO market during our sample period.

In order to examine whether there were any time-series patterns in the level of underpricing, we

plot the average annual underpricing from 2003 to 2014. Figure 1 shows the result of the annual trend in underpricing. We do not observe any significant monotonic trend in the level of underpricing in our sample years. Therefore, the decrease in the level of underpricing after the abolishment of the putback option does not seem to be driven by time-series trend.

[Figure 1]

#### **4. Putback Option and Flipping**

Flipping of IPO shares can put a downward pressure on the stock price. Underwriters can discourage flipping of institutional investors through the underwriters' discretionary allocation of IPO shares. The power of the underwriter's discretionary allocation has been documented in previous studies. Benveniste and Spindt (1989) theoretically show that investors are compensated by favorable allocation for providing private information to the underwriter. Ljungqvist and Wilhelm (2003) and Loughran and Ritter (2002) show that underwriters reward investors that have business relationship with. Boehmer et al. (2006) show that compared to retail investors, institutions receive more allocations in IPOs with better long-run performance. Chemmanur et al. (2010) find that while institutional investors on average sell 70.2% of their IPO allocations in the first year after the IPO, institutions that hold shares of IPO firms with weaker post-issue market performance for a longer period are rewarded with more IPO allocations. Collectively, studies illustrate the importance of the relationship between the underwriter and institutional investors. While the discretionary allocation power of the underwriter is somewhat weaker in Korea as underwriters do not change their scheduled allocation as much as in the U.S. (Eom and Jun, 2013), an informal gentlemen's agreement between the underwriter and the institutions can affect the institutions' trading behavior. As the putback option is an impactful regulation regarding the price supporting role of the underwriter, the existence of the putback option can alter the relationship between the underwriter and institutional investors, thus changing the flipping behavior of the institutional investors.

We measure flipping by the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable (floating) shares. We compare the net selling of IPO shares by the institutional investors between two different trading periods; one for three trading days after the IPO, and the other for three trading days starting from one calendar month after the IPO. During the putback option enforcement years, the latter 3 trading day period corresponds to three trading days following the expiration of the putback option. After the abolishment of the putback option, the same three-day period is used as a control period.

Because the underwriter is faced with greater price pressure under the existence of the putback option, we hypothesize that institutions are less likely to flip their IPO shares during the era of the putback option compared to the era after the abolishment of the putback option. We further hypothesize that during the period when the putback option is enforced, institutions will sell their shares once the putback option expires in order to avoid the long-run underperformance of IPO firms.

In Figure 2, we plot the average proportion of net selling of IPO shares by the institutional investors for two different trading periods as mentioned above. A larger number indicates greater flipping activity by the institutional investors. Figure 2 shows that for both periods after the IPO, there is net selling activity by the institutional investors for all years in our sample period. In Panel A for the three-day period following the IPO, there is less selling by institutional investors during the put-back option enforcement era compared to the period after the abolishment of the putback option. However, in Panel B for the three-day period following one-month post IPO, there is more selling by institutional investors during the putback option era. These patterns support our conjecture that institutional investors delay selling their shares until the expiration of the putback option. We also find that while there is a notable difference in institutions' selling activity before and after the abolishment of the putback option, there is not a significant monotonic trend in their trading activities within each of the two different regimes.

[Figure 2]

Figure 3 shows the daily figures for the net selling proportion by institutional investors for all years in our sample period. D0 is the day of the IPO and E1 is the expiration date of the putback option (or one calendar month after the IPO for period after the abolishment of the putback option). The solid line represents the pattern during the putback option era while the dotted line represents the pattern after the putback option was abolished.<sup>5</sup>

[Figure 3]

In Figure 3, we find greater flipping activity for a few days (especially on the day of the IPO) after the abolishment of the putback option compared to the putback option era. Furthermore, during the period of putback option enforcement, there is significant increase in institutions' selling activity after the putback option expires.

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<sup>5</sup> The graph cannot be drawn without a break because the putback option expires one month after the IPO in terms of calendar days. Therefore, the number of trading days between the date of the IPO and the date of the put option expiration can be different for different IPOs.



Table 3 shows the result of the statistical test of the institutional investors' flipping behavior. Consistent with the previous results in Figures 2 and 3, we find that within three days after the IPO, there is less selling by institutions during the putback option period compared to the period after the putback option is abolished. The mean (median) difference in institutions' net selling activity is 0.1423 (0.1446).

[Table 3]

We also find that during the period of putback option, there is a large net selling by institutions once the putback option expires. The mean (median) difference in institutions' net selling activity between three days after IPO and three days after the expiration of the putback option is -0.0519 (-0.0149). On the other hand, after the abolishment of the putback option, there is significantly more selling during the first three days after the IPO compared to selling during three days after one-month post-IPO. These results together imply that the putback option had an effect of merely delaying the flipping of the institutional investors until the putback option expires.

An additional observation in Figure 3 and Table 3 is that even in the period after the putback option is abolished, there is net selling activity during three days after one month of the IPO date. This may be due to some IPO firms' lockup period expiring around one month after the IPO. The potential effect of the lockup expiration on the institutional investors' selling activity can be a concern. To test for this, we calculate for every IPO the proportion of shares with lockups expiring within one month of the IPO relative to the total number of shares outstanding. We then categorize IPOs into tercile based on the above proportion. Table 4 shows the proportion of net selling activity of institutional investors for each tercile of IPOs. Result in Table 4 shows that for both periods of putback option enforcement (Panel A) and after the abolishment of the putback option (Panel B), there is statistically insignificant difference in institutions' selling activity for three days of one-month anniversary of IPO between firms that have high proportion of lockups expiring within one month and firms that have low proportion of lockups expiring within one month. This result implies that the lockup expiration would not have much confounding effect on the institutional investors' selling activity shown in Figure 3 and Table 3.

[Table 4]

## **5. Putback Option, Flipping, and IPO Performance**

It is well documented that institutions show better performance than retail investors. Since IPO

market is characterized by greater information asymmetry, institutional investors' trading of IPO firms can have a predictive power of the IPO firms' long-run performance. Krigman et al. (1999), Boehmer et al. (2006), and Chemmanur et al. (2010) find a predictive power of flipping or institutional trading for long-run performance of IPO firms. The biggest obstacle in testing the effect of institutional trading activity lies in precisely indentifying the type of traders. For example, Krigman et al. (1999) infers institutional flipping by searching for block sales in the Trade and Quote (TAQ) data. However, some institutional trades may not occur in blocks and some block trades may also be done by individuals. Chemmanur et al. (2010) use a proprietary institutional trading data of 48 institutions in their analysis, and note that institutions included in their sample is larger than an average institution in the market. Boehmer et al. (2006) also use a proprietary data on flipping and allocation, but covers only a subsample of IPO firms that spans three different time periods. In our study, we have data on all trading activities based on the identification of trader types and can precisely indentify all institutional trades for all IPOs during our sample period.

Figure 4 shows the trend of annual long-run performance of IPO firms. Long-run performance of the IPO firm is measured as the buy-and-hold abnormal return starting from the closing price 3 trading days after the IPO until 12 calendar months after the IPO. The benchmark return for calculating the abnormal return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices.<sup>6</sup> We see in Figure 4 that there is on average a long-run underperformance of IPO firms in Korea as documented in Kim and Jung (2010). We also observe that there is some improvement in the long-run performance over our sample period.

[Figure 4]

We compare the predictive power of institutional investors' trading on the long-run performance of IPO firms during and after the period in which the putback option was enforced. As in the previous section, we measure institutions' net selling activity defined as the ratio of net selling of stocks to the total number of tradable shares. The net selling of institutions is measured at two different point in time; one which spans three trading days after the IPO, and the other which spans three trading days from one month after the IPO (which corresponds to the putback option expiration date during the period where the putback option was enforced).

Table 5 shows the long-run performance of IPO firms based on the level of institutions' selling

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<sup>6</sup> KOSPI industry group indices classify the KOSPI market into 22 industries and the KOSDAQ industry group indices classify the KOSDAQ market into 34 industries. The classification of industries can be found at <http://eindex.krx.co.kr/main/main.jsp>.

activity. IPO firms are categorized into tercile based on the institutions' selling activity. Panel A of Table 5 shows the results for the period where the putback option was enforced. Panel B shows the results for the period after the putback option was abolished. In each panel, the long-run performance of IPO firms is measured from the ending date of the measurement of the institutions' selling activity. That is, in Panels A-1 and B-1, where the net selling activity is measured for three days after the IPO date, the long-run performance is measured as the abnormal buy-and-hold return from the closing price 3 trading days after the IPO until 12 months after the IPO. In Panels A-2 and B-2, where the net selling activity is measured for three trading days from one month after the IPO, the long-run performance is measured from the closing price 3 days after one month of IPO until 13 months after the IPO. We use the industry return as the benchmark return for calculating the abnormal return of the long-run performance.

[Table 5]

During the period when the putback option was enforced, we find in Panel A-1 that there is no significant difference in the long-run return of IPO firms between IPOs that institutions sold more and IPOs that institutions sold less during the first three days of the IPO date. Therefore, the selling activity of institutions for the first three days after the IPO do not show a significant predictive power for the one-year abnormal return of IPO firms. However, in Panel A-2, for three days after the expiration of the putback option, the net selling activity of institutions does show a significant predictive power for the one-year abnormal return of IPO firms. The difference in the abnormal return between a subsample of IPO firms with low net selling by institutions and a subsample of IPO firms with the high net selling by institutions is 19.79%.

During the period after the putback option was abolished, Panel B shows that the institutions' selling activity for three days after the IPO does have predictive power for future one-year abnormal return of IPO firms. This is consistent with previous studies such as Krigman et al. (1999) and Boehmer et al. (2006) who show that institutional flipping activities can predict future returns of IPO firms. Buying a portfolio of IPO firms with low net selling by institutions and selling a portfolio of IPO firms with the high net selling by institutions yields an abnormal return of 13.19%. On the other hand, in Panel B-2, for three days after one month of the IPO, the selling activity of institutions no longer have predictive power for the long-run performance on IPO firms. Therefore, results in Panels A and B collectively imply that the putback option had an effect of merely delaying the predictive power of institutions' trading activity, from the time right after the IPO to after the expiration of the putback option.

In order to control for other factors of the long-run performance, we run a regression of the buy-and-hold abnormal return. Result of the regression is shown in Table 6. The control variables used

in the regression are consistent with previous studies that examine IPO long-run performance (for example, Boehmer et al., 2006; Chemmanur et al., 2010) and include the natural logarithm of firm's age, the natural logarithm of offer size, market return, IPO offer revision, the reputation of the underwriter, and the existence of venture capital as one of the investors of the IPO.

[Table 6]

Results in Table 6 are consistent with our univariate analysis in Table 5. During the period of the putback option enforcement, the selling activity of institutional investors for three trading days after the IPO does not have a significant explanatory power for the one-year abnormal return of IPO. Once the putback option expires, the selling activity for three trading days after the expiration does have a significant explanatory power for the subsequent one-year abnormal return of IPO. On the other hand, during the period after the putback option enforcement is abolished, it is the selling ratio of institutions right after the IPO that has the predictive power of future one-year return of IPO. As for the control variables of the regression, we find that the IPO firms' long-run abnormal return is worse when the market is performing well leading up to the day of bookbuilding. Older IPOs and firms with larger offer size have better long-run performance after the termination of the putback option. These results are consistent with those of previous studies.

Collectively, our results show that artificially enforcing the price supporting role of the underwriter does not bring permanent changes in institutions' trading behavior. Previous findings in the literature regarding the behavior and the information content of the institutions' trading activity remains valid and is only delayed until the regulation expires.

## **6. Conclusion**

We use a period in Korea during which the regulation of the putback option made it mandatory for the underwriter to purchase shares of IPO firm at the strike price of the option (90% of the IPO offer price) from retail investors if the stock price falls below the strike price within one month of the IPO offer date. This putback option was a very straightforward mechanism that mandates a price supporting role of the underwriter. We examine how the such artificial enforcement of the price supporting role alters the pricing of IPO shares and the trading of institutional investors. When we compare between the period during the enforcement of the putback option and period after the abolishment of the putback option, we find that there is greater underpricing during the putback option enforcement period, which suggests that underwriters lower the issuing price so that there is less likelihood of the option being exercised. As for the institutional investors, during

the putback option era, they delay their selling of IPO shares until the putback option expires. Further, while the institutions' selling activity during few days after the IPO does not predict future returns, their selling volume during few days after the putback option expires does have a significant predictive power for future long-run returns of IPO firms. Collectively, results suggest that the effect of the regulation is only temporary and the previously documented findings in the IPO literature remains intact once the enforcement channel of option expires

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**Table 1. Number of IPOs**

This table shows the number of IPO firms in our sample. KSE is the Korean Stock Exchange and KOSDAQ is the Korea Securities Dealers Automated Quotations.

	Period of putback option enforcement (2003.9~2007.6)	Period after the abolishment of putback option (2007.7~2014.12)	Total IPOs
KSE	32	55	87
KOSDAQ	210	325	535
Total IPOs	242	380	622

**Table 2. Descriptive Statistics of IPO Sample**

This table shows the descriptive statistics of main variables used in the study. Initial\_Ret is the difference between the closing stock price on the third trading day after the IPO and the IPO offer price, divided by the IPO offer price. REVISION is the IPO offer price revision and is measured as the IPO offer price less the average price of the offer price range, divided by the average price of the offer price range. BHAR[D3,M12] is the buy-and-hold abnormal return starting from the closing price 3 days after the IPO until 12 months after the IPO. The benchmark return for calculating the abnormal return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices. BHAR[E3,M13] is the buy-and-hold abnormal return starting from the closing price 3 days after one month of the IPO (one month anniversary of IPO is the putback option expiration date during the putback option enforcement period) until 13 months after the IPO. The benchmark return for calculating the abnormal return is the industry return. InstNSTD3C is the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after the IPO date. InstNSTE3C is the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after one month of the IPO. AGE is the number of months between the founding date and the IPO date of the firm. OFFER is the IPO offer size in million Korean Won. ISTSUB is the competition rate of the institutions in the bookbuilding process. D\_VC is a dummy variable which takes the value of one if a venture capital as one of the investors of the IPO firm. D\_REPU is a dummy variable that takes the value of one if the underwriter's market share is greater than 4%. \*, \*\*, \*\*\* denotes statistical significance at 1%, 5%, 10%, respectively.

	Period of putback option enforcement		Period after the abolishment of putback option		Difference		
	Mean	Median	Mean	Median	Mean	Median	
Initial_Ret	0.5047	0.3618	0.3739	0.1554	-0.1309	**	-0.2064 ***
REVISION	-0.0427	-0.0294	0.0087	0.0625	0.0514	***	0.0919 ***
BHAR[D3,M12]	-0.1069	-0.2526	-0.0248	-0.0915	0.0821	*	0.1611 ***
BHAR[E3,M13]	0.0411	-0.1510	0.0346	-0.0608	-0.0065		0.0902 *
InstNSTD3C	0.0374	0.0180	0.1797	0.1626	0.1423	***	0.1446 ***
InstNSTE3C	0.0965	0.0329	0.0167	0.0024	-0.0799	***	-0.0305 ***
AGE	122	87	164	130	42	***	43 ***
OFFER	19,125	9,386	36,584	14,705	17,459	***	5,320 ***
ISTSUB	123.9	90.9	127.6	71.7	3.7		-19.1 ***
D_VC	0.4711	0.0000	0.3947	0.0000	-0.0763	*	0.0000
D_REPU	0.1942	0.0000	0.2500	0.0000	0.0558		0.0000



### Table 3. Institutional Investors' Sell Ratio

This table shows the average sell ratio of institutional investors. Sell ratio is calculated as the proportion of net sell volume (that is, sell volume - buy volume) of shares relative to the number of tradable shares. The first column measures sell activity for three trading days after the IPO, and the second column is measured for three trading days starting from one calendar month after the IPO. During the putback option enforcement years, the latter 3 trading day period corresponds to three trading immediately following the expiration of the putback option. Median numbers are in parentheses.

	Three days after IPO	Three days after one-month post-IPO	Difference
Period of putback option enforcement	0.0374 (0.0180)	0.0965 (0.0329)	-0.0591*** (-0.0149)***
Period after the abolishment of putback option	0.1797 (0.1626)	0.0167 (0.0024)	0.0799*** (0.0305)***
Difference	-0.1423*** (-0.1446)***	0.0832*** (0.1297)***	

**Table 4. Institutional Investors' Sell Ratio and Lockup Expiration**

This table shows the relationship between the institutions' selling activity of IPO firms and the proportion of lockups expiring within one month of the IPO. IPOs are grouped into tercile based on the proportion of lockups expiring within one month of the IPO relative to the total number of shares outstanding. Sell ratio is calculated as the proportion of net sell volume (that is, sell volume - buy volume) of shares relative to the number of tradable shares.

Panel A: Period of putback option enforcement

		Proportion of shares with lockup expiring within one month of the IPO	Sell ratio for three days after one-month post-IPO
High	Mean	0.1452	0.0515
	Median	0.1159	0.0220
Middle	Mean	0.0199	0.1905
	Median	0.0096	0.0657
Low	Mean	0.0000	0.0488
	Median	0.0000	0.0232
T-test	Mean	0.1452 ***	0.0027
(High-Low)	Median	0.1159 ***	-0.0012

Panel B: Period after the abolishment of putback option

		Proportion of shares with lockup expiring within one month of the IPO	Sell ratio for three days after one-month post-IPO
High	Mean	0.0867	0.0118
	Median	0.0891	0.0025
Middle	Mean	0.0029	0.0282
	Median	0.0000	0.0036
Low	Mean	0.0000	0.0101
	Median	0.0000	0.0010
T-test	Mean	0.0867 ***	0.0017
(High-Low)	Median	0.0891 ***	0.0015

## Table 5. Selling Activity of Institutions and the Long-run Performance of IPOs

This table shows the relationship between the institutions' selling activity of IPO firms and the subsequent long-run performance. Panel A shows the result during the enforcement of the putback option and Panel B shows the result after the abolishment of the putback option. IPO firms are categorized into tercile based on the institutions' selling ratio. Sell ratio is calculated as the proportion of net sell volume (that is, sell volume - buy volume) of shares relative to the number of tradable shares. In Panels A-1 and B-1, we measure the sell ratio for three trading days after the IPO. The subsequent long-run performance is BHAR[D3,M12], which is the buy-and-hold abnormal return starting from the closing price 3 days after the IPO until 12 months after the IPO. The benchmark return for calculating the abnormal return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices. In Panels A-2 and B-2, we measure the sell ratio for three trading days starting from one calendar month after the IPO (one calendar month after IPO is the putback option expiration date during the putback option enforcement period). The subsequent long-run performance is BHAR[E3,M13], which is the buy-and-hold abnormal return starting from the closing price 3 days after one month of the IPO until 13 months after the IPO. The benchmark return for calculating the abnormal return is the industry return. Numbers are mean numbers. \*, \*\*, \*\*\* denotes statistical significance at 1%, 5%, 10%, respectively.

Panel A: During the enforcement of the putback option

Panel A-1: Relationship between the sell ratio during three days after IPO and the IPO performance afterwards

	High	Middle	Low	High-Low
Sell ratio	0.1286	0.0215	-0.0380	0.1666***
BHAR[D3, M12]	-0.1319	-0.0835	-0.1049	-0.0270

Panel A-2: Relationship between the sell ratio during three days after the expiration of the putback option and the IPO performance afterwards

	High	Middle	Low	High-Low
Sell ratio	0.2652	0.0369	-0.0133	0.2785***
BHAR[E3, M13]	-0.2655	0.0140	-0.0676	-0.1979*

Panel B: After the abolishment of the putback option

Panel B-1: Relationship between the sell ratio during three days after IPO and the IPO performance afterwards

	High	Middle	Low	High-Low
Sell ratio	0.3541	0.1607	0.0243	-0.3298***
BHAR[D3, M12]	-0.1094	0.0130	0.0225	-0.1319**

Panel B-2: Relationship between the sell ratio during three days after one month of the IPO and the IPO performance afterwards

	High	Middle	Low	High-Low
Sell ratio	0.0555	0.0028	-0.0084	-0.0639***
BHAR[E3, M13]	0.0027	-0.0760	-0.0014	0.0041

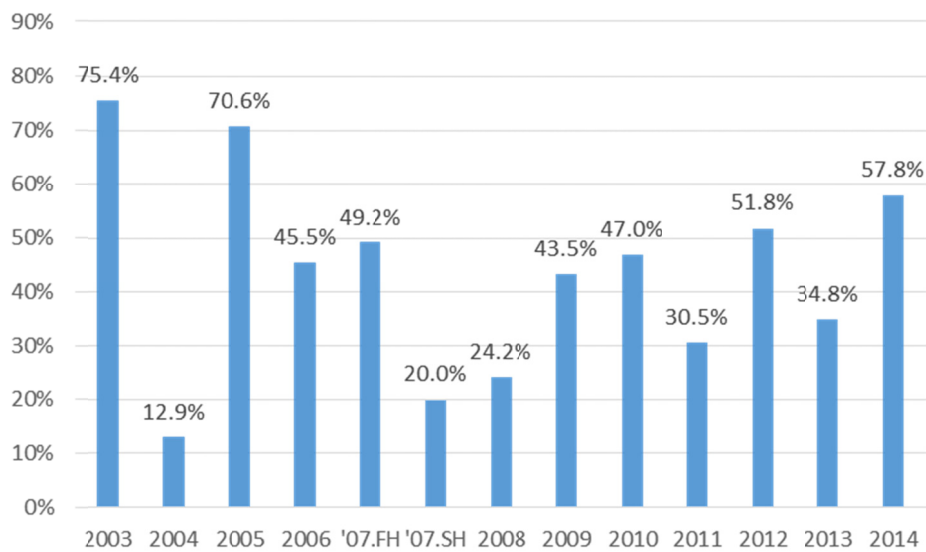
**Table 6. Regression of the Long-run Performance of IPOs**

This table shows the regression of the Long-run Performance of IPOs. The long-run performance is measured as BHAR[D3,M12] and BHAR[E3,M13]. BHAR[D3,M12] is the buy-and-hold abnormal return starting from the closing price 3 days after the IPO until 12 months after the IPO. BHAR[E3,M13] is the buy-and-hold abnormal return starting from the closing price 3 days after one month of the IPO until 13 months after the IPO. The benchmark return for calculating the abnormal return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices. InstNSTD3C is the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after the IPO date. InstNSTE3C is the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after one month of the IPO. AGE is the number of months between the founding date and the IPO date of the firm. OFFER is the IPO offer size in million Korean Won. MARKET is the buy-and-hold return of the industry during three months leading up to the day of the bookbuilding. REVISION is the IPO offer price revision and is measured as the IPO offer price less the average price of the offer price range, divided by the average price of the offer price range. D\_REPU is a dummy variable that takes the value of one if the underwriter's market share is greater than 4%. D\_VC is a dummy variable which takes the value of one if a venture capital as one of the investors of the IPO firm. \*, \*\*, \*\*\* denotes statistical significance at 1%, 5%, 10%, respectively.

Dep. Variable	During the enforcement of the putback option		After the abolishment of the putback option	
	BHAR[D3,M12]	BHAR[E3,M13]	BHAR[D3,M12]	BHAR[E3,M13]
Intercept	0.7526	0.9390	-0.9163 ***	-0.4927
InstNSTD3C	-0.4624		-0.3453 *	
InstNSTE3C		-0.4187 *		-0.2773
LOG(AGE)	-0.0657	-0.0284	0.1039 **	0.1128 **
LOG(OFFER)	-0.0465	-0.0662	0.0448 *	-0.0036
MARKET	-0.7538 **	-0.7728 **	-0.4119 **	-0.4455 **
REVISION	0.3386	0.4435	-0.2273	-0.1540
D_REPU	-0.0226	0.0059	0.0464	0.0480
D_VC	-0.1125	-0.1237	0.0061	0.0127
Adj. R <sup>2</sup>	0.0086	0.0176	0.0345	0.0152
F-stat.	1.3003	1.6168	2.9331	1.8369
No. of Obs.	242		380	

### Figure 1. Annual trend of initial return of IPOs

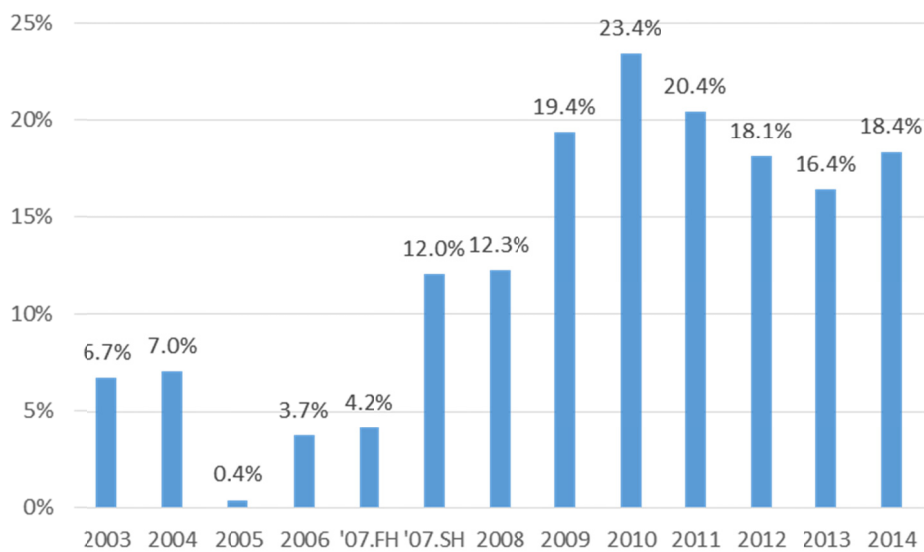
This figure shows the annual trend of the IPO initial return during the sample period. Initial return is measured as the difference between the closing stock price on the third trading day after the IPO and the IPO offer price, divided by the IPO offer price. Putback option was abolished in July, 2007. '07 FH refers to the first half of 2007 before the abolishment of the putback option. '07 SH refers to the second half of 2007 after the abolishment of the putback option.



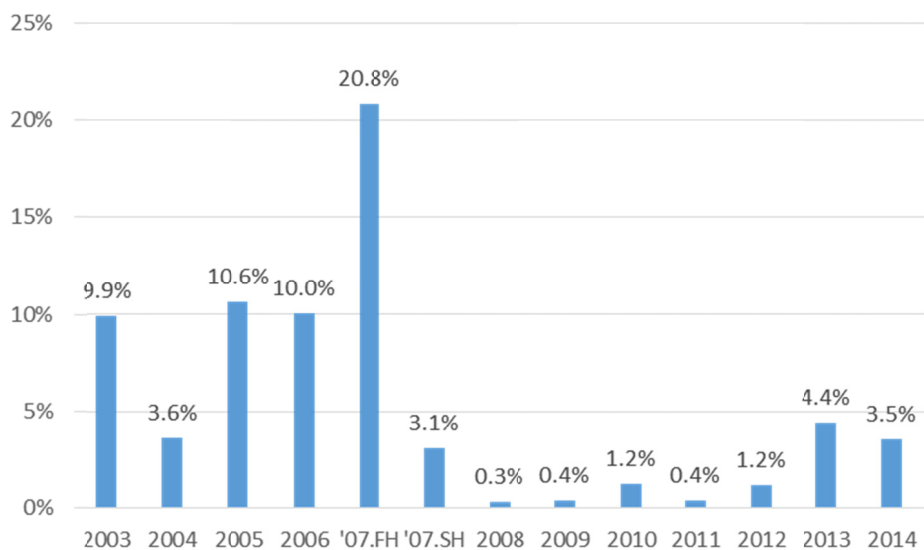
## Figure 2. Annual Trend of the Institutional Investors' Sell Ratio

This figure shows the annual trend of the institutional investors' sell ratio during the sample period. In Panel A, institutional investors' sell ratio is measured as the proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after the IPO date. In Panel B, institutional investors' sell ratio is measured as the institutional investors' proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares for three trading days after one month of the IPO. '07 FH refers to the first half of 2007 before the abolishment of the putback option. '07 SH refers to the second half of 2007 after the abolishment of the putback option.

Panel A: Three trading days after the IPO

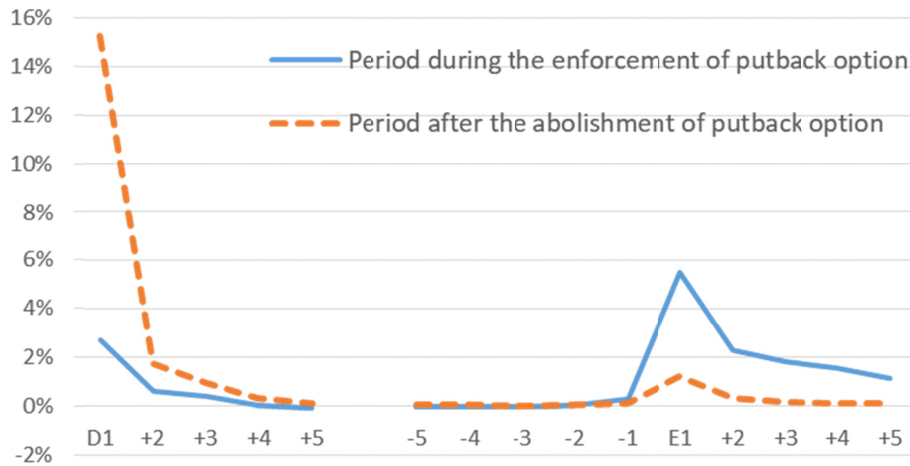


Panel B: Three trading days after one-month post-IPO



### Figure 3. Daily Trend of Institutional Investors' Sell Ratio

This figure shows the daily net selling proportion by institutional investors for all years in our sample period. D0 is the day of the IPO and E1 is the expiration date of the putback option (or one calendar month after the IPO for period after the abolishment of the putback option). Institutional investors' sell ratio is measured as the proportion of net sell volume of shares (sell volume - buy volume) relative to the number of tradable shares





#### Figure 4. Annual Trend of Long-run Performance of IPO Firms

This figure shows the annual trend of the buy-and-hold abnormal return during the sample period. Buy-and-hold return is measured from the closing price 3 trading days after the IPO until 12 calendar months after the IPO. The benchmark return for calculating the abnormal return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices. '07 FH refers to the first half of 2007 before the abolishment of the putback option. '07 SH refers to the second half of 2007 after the abolishment of the putback option.

