

Mandatory Price Stabilization of the Underwriter: Evidence from the putback option

Joon Ho Hwang^a

Joohwan Kim^b

Jinwoo Park^c

^a Korea University Business School
Anam-dong, Seongbuk-gu
Seoul, KOREA
Tel: 82-2-3290-2830
Email: joonhwang@korea.ac.kr

^b KB Financial Group
Yeouido-dong, Yeongdeungpo-gu
Seoul, KOREA
Tel: 82-2-2073-5734
Email: joohwan.kim@kbfkg.com

^c Hankuk University of Foreign Studies
Imun-ro, Dongdaemun-gu
Seoul, KOREA
Tel: 82-2-2173-3175
Email: jwp@hufs.ac.kr

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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 period of time in Korea during which a mandatory price stabilization role was imposed on the underwriter. Under the regulation, individual investors of the IPO were given put options 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. To address the effect of the regulation, we compare between the period during which the putback option was enforced and the period after the putback option was abolished. We find that during the putback option period, the higher risk faced by the underwriter resulted in more underpricing of IPOs. Also, institutional investors' flipping activity and its predictive power for future performance is evident not on days immediately following the IPO but on days following the expiration of the putback option. Our study suggests that the regulation of imposing mandatory price supporting role of the underwriter results in delaying the institutional investors' documented behavior until the option expires and does not benefit the long-term investors of IPO.

Keywords: IPO; underwriter; regulation; institutional investors

JEL Classification: G15, G18, G23, G24

1. INTRODUCTION

The lead underwriter of IPO plays an important role not only in pricing and distributing IPO shares but also in the price stabilization in the IPO aftermarket. (e.g., Hanley, et al., 1993; Aggarwal, 2000; Ellis et al., 2000) Studies of IPO also document 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) Therefore, a regulatory change that alters the aftermarket payoff of the underwriter will affect not only the underwriter's pricing of the IPO, but also the dynamics between the underwriter and institutions that invest in IPO firms. In this study, we identify a regulatory enforcement which imposed a mandatory price stabilization role of the underwriter and examine how this regulation affected the behavior of the underwriters and the institutional investors; specifically, the underpricing of IPO firms, the flipping behavior of institutions, and the predictive power of institutions' trading.

Korea stock market implemented a regulation called the putback option in September, 2003. The putback option is an option given to all the individual investors of the IPO. If the market price of the IPO firm falls below 90% of the IPO offer price at any time 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.¹ As for the underwriters, they are exposed to the risk of having to purchase shares at a price greater than the market price. When the putback option is in-the-money, it results in a mandatory price stabilization by the underwriter. While the price stabilization 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. This 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 price supporting activities. In this study, we compare the period during which the putback option was enforced (hereafter referred to as the "putback option era") versus the period after the abolishment of the putback option (hereafter referred to as the "post putback option era").² Specifically, we examine how the mandatory price supporting role alters the

¹ Throughout our sample period (during the period of putback option enforcement 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.

² Before the putback option was introduced, there was another form of market stabilization role of the underwriter. Before the implementation of the putback option, underwriters were required

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

We find that during the putback option era, 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 during the putback option era, institutional investors' trading is aligned with the incentive of the underwriter as the institutional investors 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. The policy implication of our study is that while the regulation of imposing mandatory price stabilization to the underwriter in the form of putback option protects short-term individual investors, it does not benefit the long-term investors and can especially hurt investors who buy shares of IPO firms in the secondary market before the putback option expires.

We contribute to the literature by examining how regulation of the underwriter can alter the behaviors of the underwriter and institutional investors. We show that the regulation of imposing a mandatory price supporting role had an effect of delaying the institutions' selling of IPO shares and the predictive power of their selling activity until the regulation, in the form of putback option, expires. Another contribution of our study is that on the identification of institutional trades. Whereas previous studies on examining institutional trades in IPOs were limited in precisely classifying the identity of the investor 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.

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 era and post putback option era. We analyze institutions' selling or flipping behavior in Section 4. The predictive power of institutions' trading on IPO firms' future performance is shown in Section 5. We conclude the study in Section 6.

to maintain the market price of the IPO firm's share above 90% of the IPO offer price until one month of the IPO. 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. We therefore compare the period during which the putback option was enforced (period of mandatory price support) and the period after it was abolished (period of no mandatory price support).

2. Data on IPOs in Korea

In 1999, the Korea Securities Dealer's Association adopted the bookbuilding system as the official flotation method for IPOs in Korea. According to the regulation set by the Korean Financial Supervisory Service, 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. With regard to IPO allocation, the Korea Financial Investment Association sets the rule. 20% of IPO shares need to be allocated to the employees of the IPO firm under the Direct Share Participation (DSP) program, and at least 20% should be allocated to retail investors. Any unsubscribed shares of the IPO are conventionally allocated to institutional investors. Shin (2010) finds that the allocation to institutional investors in Korea is about 65% during the period of 2001-2007.

We collect data on IPOs in Korea from the Korea Exchange (www.krx.co.kr) from September, 2003 to December, 2014, which spans the putback option era and the post putback option era. September, 2003 is the start date of the enforcement of the putback option. The putback option was abolished in July, 2007. We collect IPO offering 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, which is a database of the Korean financial market, to retrieve the firms' financial and stock price data, and the institutional investors' trading data. A nice feature of the FnGuide database in extracting institutional trades is that the database identifies investor type between individual investor and institutional investor. Previous studies of testing the effect of institutional trading activity have limitations in accurately identifying institutional trades. 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. (Campbell et al., 2009) Boehmer et al. (2006) use a proprietary data on flipping and allocation, but covers only a subsample of IPO firms that spans three discontinuous time periods. Chemmanur et al. (2010) also 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. In our study, we have data on all trading activities based on the identification of trader types and can identify all institutional trades for all IPOs in Korea during our sample period.

Table 1 shows the number of firms in our sample during the putback option era versus the post putback option era. During the putback option era, 32 firms (13.0% of IPO firms) are listed in the Korean Stock Exchange (KSE) and 215 firms (87.0% of IPO firms) in the Korea Securities Dealers

Automated Quotations (KOSDAQ).³ In the post putback option era, 55 firms (14.7% of IPO firms) are listed in the KSE and 320 firms (85.3% of IPO firms) in the KOSDAQ. Therefore, the proportion of firms listed in the KSE and the KOSDAQ are similar between the two periods.

[Table 1]

3. Putback Option and Underpricing

Schultz and Zaman (1994) and Aggarwal (2000) show that the underwriter's price stabilization such as covering their short position in IPO shares and imposing penalty bids for flipping by institutions functions as a complement to underpricing since investors are more likely to buy IPO firms' shares if they expect aftermarket price stabilization by the underwriter. The putback option is different from a voluntary price stabilization because the putback option forces the underwriters to purchase shares at a below-market price from retail investors. Since the obligatory price support brought by the putback option is a source of risk to the underwriter, the underwriter can 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 we use three-day trading period instead of 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 within a day or two, we measure underpricing, or initial return, as the three-day return.

Table 2 shows the descriptive statistics of main variables used in the study. Consistent with previous studies that examine the underpricing of IPOs in Korea (see Choi, 2011 for a review), we find that there is significant amount of underpricing of IPOs in Korea. The average (median) three-day initial return is 47.82% (33.89%) during the period when the putback option was enforced. After the abolishment of the putback option, the mean (median) is reduced to 31.17% (10.01%). The difference in the initial return between the two periods is statistically significant at 1% level.

³ KOSDAQ was set up as an independent stock market from the KSE and benchmarked the U.S. NASDAQ. Currently KOSDAQ operates as SME Market Division of Korea Exchange (KRX).

Table 2 also shows that the IPO offer price revision (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 putback option era. The mean (median) price revision is -3.88% (-2.86%) during the putback option era and 0.68% (6.25%) after the abolishment of the putback option. The difference is statistically significant at 1% level. The result shows that when the putback option was enforced, underwriters were more likely to revise their share price downwards thereby underpricing the shares.

[Table 2]

In order to examine whether there were any monotonic time-series trend 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. Putback option era is the period until the first-half of 2007. We see that while the IPO initial returns are on average greater during the putback option era, there is no 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]

As for other firm-level characteristics in the study, Table 2 shows greater offer size of IPOs in the post putback option era compared to the putback option era. Also, the average age of firms going public is greater during the post putback option era compared to the putback option era. In order to control for these different firm-level characteristics that may affect the level of underpricing, we run a multivariate regression of initial return. Results are shown in Table 3.

[Table 3]

The dependent variable of the regression is the three-day initial return as the measure of underpricing. The variable of interest is the putback option era dummy which takes the value of 1 for IPO that occurred during the period of putback option enforcement and zero for period after the abolishment of the putback option. The control variables are adopted from Loughran and Ritter (2004, Table V), who choose variables based on the risk composition of the firm and the alignment of incentives. The logarithm of assets, the logarithm of age, underwriter reputation dummy (the variable takes the value of one if the underwriter's market share is greater than 4%), and the tech stock dummy measure the IPO firm's risk composition. Also, the issuing firm and venture capitals have greater incentive to offer shares at higher price if they own more shares or if they are selling their secondary shares at the IPO. To capture this incentive alignment effect, we

control for share overhang (the proportion of shares owned by the majority owner after the IPO relative to the number of shares offered in the IPO), the VC dummy (the variable takes the value of one if a venture capital is an investor of the IPO), the technology sector dummy, and the pure primary offering dummy (the variable takes the value of one if the IPO has only primary shares). We also control for the market return leading up to the date of the bookbuilding.

Results of Table 3 show that the coefficient of the putback option era dummy is positive and statistically significant. Therefore, even after controlling for other factors that may affect the degree of underpricing, there is significantly greater underpricing during the putback option era compared to the period after the putback option was abolished. The effects of control variables are mostly similar between the two periods. For both periods, we find that the initial return is greater when the market return leading up to the bookbuilding is greater and when the offer price is revised upwards. During the putback option era, initial return is greater also when the majority shareholder retains a greater proportion of shares, and for smaller firms. These statistically significant control variables, along with insignificant effects of pure primary offering dummy and the VC dummy, are consistent with the findings in the U.S. as shown in Loughran and Ritter (2004). Some different findings are that IPOs of tech firms and IPOs underwritten by underwriters with large market shares do not affect the level of underpricing in our sample, whereas they are found to be significant factors in the U.S. (Loughran and Ritter, 2004)

4. Putback Option and Flipping

Investors with IPO allocation have incentive to sell their shares in the post-IPO secondary market in order to avoid the long-run underperformance of IPO firms. Selling of allocated IPO shares by institutional investors during a few days after the IPO, or flipping, can put a downward pressure on the stock price. The relationship between the underwriter and institutional investors is an important factor in determining the flipping activity of institutional investors. One important channel on how the underwriter exerts influence is through its discretionary allocation of IPO shares. 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.⁴ While the discretionary allocation power of the underwriter is somewhat weaker in

⁴ Other studies also document the importance of underwriter's discretionary allocation.

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

Korea as underwriters do not change their scheduled allocation as much as in the U.S., an informal agreement between the underwriter and the institutions will affect the institutions' trading behavior. (Eom and Jun, 2013) As the putback option is an impactful regulation regarding the price supporting role of the underwriter, the existence of the putback option can affect the relationship between the underwriter and institutional investors, thus changing the flipping behavior of institutional investors. 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 putback option era compared to post putback option era. We further hypothesize that during the putback option era, institutions are likely to delay selling their shares until the putback option expires.

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 era, since the putback option expires one day before the one-month anniversary of the IPO, 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 the control period.

In the descriptive statistics reported in Table 2, we find that for three trading days after the IPO offer date (variable INST_SELL0), institutions sell more shares during the post putback option era compared to the putback option era. However, when we examine the institutions' selling activity for three trading days after one-month of the IPO (variable INST_SELL1), we find that there is greater selling during the putback option era compared to the post putback option era.

In Figure 2, we plot the annual trend in the average proportion of net selling of IPO shares by the institutional investors. Figure 2 shows that for every year, there is net selling by institutional investors during the three trading day window. In Panel A for the three-day period following the IPO, there is less selling by institutional investors during the put-back option era compared to the post putback option era. However, in Panel B for the three-day period following one-month anniversary of IPO, there is more selling by institutional investors during the putback option era. These patterns support our conjecture that during the putback option era, institutional investors delay selling their shares until the expiration of the putback option. We also find that there is not a significant monotonic trend in their trading activities within each of the two different eras.

relationship with. Boehmer et al. (2006) show that compared to retail investors, institutions receive more allocations in IPOs with better long-run performance.

Therefore, it is unlikely that a time-series trend is driving the differences in the institutions' selling activity.

[Figure 2]

Figure 3 shows the daily figures for the net selling proportion by institutional investors for all years in our sample period. D1 is the day of the IPO and E1 is the one-month anniversary of IPO. During the putback option period, E1 corresponds to the day after the putback option expires. The solid line represents the pattern during the putback option era while the dotted line represents the pattern during the post putback option era.⁵ In Figure 3, we find that in the post putback option era, there is a large amount of selling by the institutional investors on the day of the IPO. On the other hand, during the putback option era, there is significant increase in institutions' selling activity right after the putback option expires.

[Figure 3]

Table 4 shows the result of the statistical test of the institutional investors' flipping behavior as measured by their net selling activity. Consistent with the 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 era compared to the post putback option era. During the putback option era, the average (median) sell ratio for the three-day period after the IPO is 3.66% (1.77%). After the abolishment of the putback option, the average (median) increases to 18.21% (16.27%), which corresponds to 5.0 (9.2) times the average (median) of the previous era. We also find that during the putback option era, there is a large net selling by institutions once the putback option expires in one month of the IPO. The difference in institutions' average (median) sell ratio between three days after IPO and three days after the expiration of the putback option is 5.71% (1.27%). The sell ratio for three-days after the expiration of the putback option is 2.6 (1.7) times the average (median) sell ratio during three days after the IPO. 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 delaying the flipping of the institutional investors until the putback option expires.

[Table 4]

⁵ The graph cannot be drawn without a break because the putback option expires a day before the one-month anniversary of 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.

An additional observation in Figure 3 and Table 4 is that even in the post putback option era, 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 existence of lockup expiration can be an additional factor that affects the institutions' selling activity. According to the listing requirement of the Korean stock market, venture capitals and other institutional investors whose investment period is less than 2 years are subject to a lockup period of one month for IPOs listed in KOSDAQ.⁶ To test for the effect of lockup expiration on institutions' selling activity, 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 5 shows the proportion of net selling activity of institutional investors for each tercile of IPOs. Result in Table 5 shows that for both periods of putback option era (Panel A) and post putback option era (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 lessens the concern of the potentially complicating effect of the lockup expiration on the institutional investors' selling activity.

[Table 5]

5. Putback Option, Flipping, and IPO Performance

Studies document that institutional investors have better stock investment performance than retail investors. (e.g., Nagel, 2005; Griffin et al., 2003; Cohen et al., 2002; Badrinath et al. 1995) The superior performance of institutional investors can be magnified in the IPO market which is characterized by greater information asymmetry. Field and Lowry (2009) empirically show that IPOs with the highest levels of institutional investment outperform those with the lowest levels. Also, Krigman et al. (1999), Boehmer et al. (2006), and Chemmanur et al. (2010) show that institutional investors' trading of IPO firms has a predictive power of the IPO firms' long-run performance. In this section, we test how the regulation of mandatory price support affects the predictive power of institutional investors' trading activity. We hypothesize that under the mandatory price support, since institutional investors delay their selling until the mandatory price support role expires, selling activity right after the IPO is likely to be due to liquidity reason and not have much predictive power of future performance. The predictive power of institutions'

⁶ As for IPOs listed in KOSPI, there is no lockup period for venture capitals and institutional investors. The lockup period for the majority shareholders and their related parties are 6 months for IPOs in both KOSPI and KOSDAQ. (Kim and Jun, 2016, Table 1)

trading will be found only for the trades that occur after the mandatory price support role expires.

Figure 4 shows the annual trend in the long-run performance of IPO firms. Long-run performance of the IPO firm is measured as the one-year 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 industry return based on the KOSPI or KOSDAQ industry group indices.⁷ We see in Figure 4 that IPO firms in Korea underperform on average during a one-year window as documented in Kim and Jung (2010). We also observe that there is some improvement in the performance of IPO firms over our sample period.

[Figure 4]

Next, we examine if the institutional investors' trading can predict the IPO firms' future performance. We compare such predictive power of institutional investors' trading between the putback option enforcement era and the post putback option era. For each era, 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. During the putback option enforcement period, the latter three trading days are the days immediately following the expiration of the putback option. As in the previous section, we measure institutions' net selling activity as the ratio of net selling of stocks to the number of tradable shares.

Table 6 reports the long-run performance of IPO firms based on the level of institutions' selling activity. We categorize IPO firms into tercile based on the institutions' selling activity. Panel A of Table 6 shows the results for the putback option era and Panel B shows the results for the post putback option era. In each panel, the measurement of long-run performance starts from the end date of the institutions' selling activity measurement. 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 starting 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. As before, we use the KOSPI or KOSDAQ industry indices return as the benchmark return in calculating the abnormal return of the long-run performance.

⁷ 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 specific classification of industries can be found at <http://eindex.krx.co.kr/main/main.jsp>.

[Table 6]

Results in Panel A-1 show that during the putback option era, there is no significant difference in the one-year buy-and-hold abnormal return of IPO firms between IPOs that are in the highest tercile of institutions' sell ratio during three days after IPO and IPOs that are in the lowest tercile of institutions' sell ratio. Therefore, the selling activity of institutions for the first three days after the IPO does not have 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 exhibits predictability for the one-year abnormal return of IPO firms. The mean (median) abnormal returns of IPO firms with low net selling by institutions is 6.32% (-17.80%), whereas the mean abnormal return of IPO firms with high net selling by institutions is -16.54% (-21.99%). The difference in the mean (median) abnormal return is 22.86% (4.19%). The difference in the mean return is statistically significant at 95% level.

After the putback option is abolished, Panel B shows that the institutions' selling activity for three days after the IPO has predictive power for future one-year abnormal return of IPO firms. Buying a portfolio of IPO firms in the lowest tercile of institution selling and selling a portfolio of IPO firms with the highest tercile of institution selling yields an abnormal return of 11.50%. This result 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. 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 immediately after the IPO to after the expiration of the putback option.

Since there can be other factors that can affect the IPO firm's long-run performance, we run a regression of the buy-and-hold abnormal return. Result of the regression is shown in Table 7. 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 logarithm of firm's age, the logarithm of asset size, market return, the reputation of the underwriter, the existence of venture capital as one of the investors of the IPO, and the tech stock dummy. We also include the institutional investors' competition rate in the bookbuilding. This number is published by the underwriter and controls for the hotness of the IPO.

[Table 7]

Results in Table 7 are consistent with our univariate analysis in Table 6. During the putback option

era, the selling activity of institutional investors for three trading days after the IPO (variable INST_SELL0) does not have a significant explanatory power for the one-year abnormal return of IPO. Once the putback option expires one month after the IPO date, the selling activity for three trading days after the expiration (variable INST_SELL1) does have a significant explanatory power for the subsequent one-year abnormal return of IPO firm. On the other hand, during the post putback option era, it is the selling ratio of institutions immediately after the IPO (variable INST_SELL0) that has the predictive power of future one-year abnormal return of IPO firm. 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. During the post putback option era, older firms have better long-run performance. These results are consistent with those of previous studies such as Boehmer et al. (2006) and Chemmanur et al. (2010).

Collectively, we find that under the regulation of the putback option, underwriters and institutions act in a way so that the price of the stock stays above the putback option strike price (which may be above the fair value of stock) until the putback option expires. Once the putback option expires, many institutions start to sell their shares and the stock returns of these shares deteriorate. Our results thus imply that the regulation in the form of putback option that enforces mandatory price support of the underwriter does not bring permanent changes in institutions' trading behavior. Previous findings in the literature regarding the selling behavior of institutions becomes evident after the putback option expires. Also, the information content of institutions' selling activity remains valid and is merely delayed until the putback option expires in a month.

6. Conclusion

Typical aftermarket price support activities of the underwriters are posting a stabilizing bid, covering a short position, and imposing penalty bids to control flipping. While these actions of the underwriters are voluntary, 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 is a mechanism that mandates a price supporting role of the underwriter. We examine how such 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 putback 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 the putback option expires within a month of the IPO offer date. The regulatory implication is that while the mandatory price stabilization role imposed by the putback option protects the wealth of investors with short-term investment horizon until the option expires, it does not benefit the long-term investors of IPO and especially hurt investors who purchase shares at inflated market price in the secondary market before the putback option expires.

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Table 1. Number of IPOs

This table shows the number and the proportion of IPO firms' listing exchange in our sample. KSE is the Korean Stock Exchange and KOSDAQ is the Korea Securities Dealers Automated Quotations. Putback option era is the period during which the putback option was enforced, post putback option era is the period after the abolishment on the putback option.

	Putback option era (2003.9~2007.6)	Post putback option era (2007.8~2014.12)	Total IPOs
KSE	32 (13.0%)	55 (14.7%)	87 (14.0%)
KOSDAQ	215 (87.0%)	320 (85.3%)	535 (86.0%)
Total IPOs	247 (100.0%)	375 (100.0%)	622 (100.0%)

Table 2. Descriptive Statistics of IPO Sample

This table shows the descriptive statistics of variables used in the study. Putback option era is the period during which the putback option was enforced, post putback option era is the period after the abolishment on the putback option. 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. OFFER is the IPO offer size in billion Korean Won. AGE is the number of months between the founding date and the IPO date of the firm. ASSETS are in billion Korean Won and are measured on the year before the IPO date. MARKET is the buy-and-hold return of the industry during three months leading up to the day of the bookbuilding. COMP is the published competition rate of the institutions in the bookbuilding process. OVERHANG is the proportion of shares owned by the majority owner after the IPO relative to the number of outstanding shares after the IPO. LOCKUP is the proportion of shares with lockups expiring within one month of the IPO relative to the total number of shares outstanding. D-VC is a dummy variable which takes the value of one if a venture capital is 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%. D-TECH is a dummy variable which takes the value of one if the IPO firm is in the technology sector. D_PRIMARY is a dummy variable which takes the value of one if the offering is 100% primary and there are no secondary shares sold. INST_SELL0 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. INST_SELL1 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. 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 (one month anniversary of IPO is the putback option expiration date during the putback option era) until 13 months after the IPO. The benchmark return is the return of the industry based on the industry classification of KOSPI and KOSDAQ industry group indices. *, **, *** denotes statistical significance at 1%, 5%, 10%, respectively.

	Putback option era		Post putback option era		Difference	
	mean	median	mean	median	mean	median
INITIAL_RET	0.4782	0.3389	0.3117	0.1001	-0.1665 ***	-0.2387 ***
REVISION	-0.0388	-0.0286	0.0068	0.0625	0.0456 ***	0.0911 ***
OFFER	19.0	9.5	36.9	14.9	17.8 ***	5.4 ***
AGE	122.3	88.0	165.0	130.0	42.8 ***	42.0 ***
ASSETS	119.9	24.0	322.9	37.7	203.0	13.7 ***
MARKET	0.0568	0.0331	0.0025	-0.0099	-0.0543 ***	-0.0430 ***
COMP	125.4	91.4	126.6	71.2	1.2	-20.2 ***
OVERHANG	0.4293	0.4153	0.4650	0.4566	0.0357 ***	0.0413 ***
LOCKUP	0.1381	0.0726	0.1604	0.0483	0.0223	-0.0243
D_VC	0.4737		0.3920		-0.0817	
D_REPU	0.1943		0.2507		0.0563	
D_TECH	0.4453		0.2373		-0.2080	
D_PRIMARY	0.9717		0.8640		-0.1077	
INST_SELL0	0.0366	0.0177	0.1821	0.1627	0.1456 ***	0.1450 ***
INST_SELL1	0.0937	0.0304	0.0157	0.0024	-0.0780 ***	-0.0280 ***
BHAR[D3,M12]	-0.0827	-0.2371	-0.0217	-0.1078	0.0610	0.1293 ***
BHAR[E3,M13]	0.0443	-0.1346	0.0316	-0.0360	-0.0127	0.0986 *

Table 3. Regression of IPO Initial Returns

This table shows the regression of the IPO initial returns. IPO 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. D_Putback is a dummy variable which takes the value of 1 for IPO that occurred during the period of putback option enforcement and zero for period after the abolishment of the putback option. MARKET is the buy-and-hold return of the industry (based on the industry classification of KOSPI and KOSDAQ industry group indices) 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. OVERHANG is the proportion of shares held by the majority owner relative to the total number of shares offered in the IPO. Assets are measured on the year before the IPO date. AGE is the number of months between the founding date and the IPO date of the firm. 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. D-TECH is a dummy variable which takes the value of one if the IPO firm is in the technology sector. D_PRIMARY is a dummy variable which takes the value of one if the offering is 100% primary (i.e., no secondary shares are sold). Putback option era is the period during which the putback option was enforced, post putback option era is the period after the abolishment on the putback option. *, **, *** denotes statistical significance at 1%, 5%, 10%, respectively.

	Total Sample Period		Putback option era		Post putback option era
Variable	Coefficient		Coefficient		Coefficient
Constant	0.1981		0.5658 *		0.1261
D_PUTBACK	0.1569 ***				
MARKET	0.7453 ***		0.6537 ***		0.6827 ***
REVISION	0.6880 ***		1.0636 ***		0.5693 ***
OVERHANG	0.4193 ***		0.9375 ***		0.1337
LOG(ASSETS)	-0.0370 *		-0.0659 *		-0.0187
LOG(AGE)	0.0066		-0.0615		0.0351
D_REPU	-0.0070		-0.0514		0.0134
D_VC	0.0094		0.1175		-0.0666
D_TECH	0.0064		-0.0970		0.0787
D_PRIMARY	-0.0560		0.0957		-0.0898
Adjusted R ²	0.1344		0.1711		0.0887
F-statistic	10.6417		6.6413		5.0445
Prob(F-statistic)	0.0000		0.0000		0.0000
Observations	622		247		375

Table 4. 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 (floating) 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. Putback option era is the period during which the putback option was enforced, post putback option era is the period after the abolishment on the putback option. During the putback option era, the latter 3 trading day period corresponds to three trading days 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
Putback option era	3.66%	9.37%	-5.71% **
	(1.77%)	(3.04%)	(-1.27%) ***
Post putback option era	18.21%	1.57%	16.65% ***
	(16.27%)	(0.24%)	(16.03%) ***
Difference	-14.56% ***	7.80% ***	
	(-14.50%) ***	(2.80%) ***	

Table 5. 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: Putback option era				
		Proportion of shares with lockup expiring within 1 month of the IPO		Sell ratio for 3 days after one-month post-IPO
High	mean	0.3456		0.1075
	median	0.2466		0.0253
Middle	mean	0.0688		0.0555
	median	0.0726		0.0303
Low	mean	0.0008		0.1185
	median	0.0000		0.0438
T-test	mean	0.3448	***	-0.0109
(high-low)	median	0.2466	***	-0.0185
Panel B: Post putback option era				
		Proportion of shares with lockup expiring within 1 month of the IPO		Sell ratio for 3 days after one-month post-IPO
High	mean	0.4290		0.0187
	median	0.4710		0.0030
Middle	mean	0.0522		0.0091
	median	0.0483		0.0014
Low	mean	0.0000		0.0191
	median	0.0000		0.0023
T-test	mean	0.4290	***	-0.0004
(high-low)	median	0.4710	***	0.0007

Table 6. 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 based on the industry classification of KOSPI and KOSDAQ industry group indices. Numbers are mean numbers. *, **, *** denotes statistical significance at 1%, 5%, 10%, respectively.

Panel A: Putback option era

Panel A-1: Relationship between the sell ratio during 3 days after IPO and the IPO performance afterwards

		high	middle	low	high-low	
Sell ratio	mean	0.1302	0.0215	-0.0419	0.1720	***
	median	0.1049	0.0177	-0.0098	0.1147	***
BHAR[D3,M12]	mean	-0.0944	-0.0604	-0.0935	-0.0009	
	median	-0.3120	-0.2260	-0.1942	-0.1178	

Panel A-2: Relationship between the sell ratio during 3 days after the expiration of the putback option and the IPO performance afterwards

Sell ratio	mean	0.2604	0.0349	-0.0135	0.2740	***
	median	0.1475	0.0304	0.0022	0.1453	***
BHAR[E3,M13]	mean	-0.1654	0.2330	0.0632	-0.2286	**
	median	-0.2199	-0.0154	-0.1780	-0.0419	

Panel B: Post putback option era

Panel B-1: Relationship between the sell ratio during 3 days after IPO and the IPO performance afterwards

		high	middle	low	high-low	
Sell ratio	mean	0.3562	0.1620	0.0282	0.3280	***
	median	0.3262	0.1627	0.0400	0.2863	***
BHAR[D3,M12]	mean	-0.0992	0.0183	0.0158	-0.1150	**
	median	-0.1361	-0.0816	-0.1108	-0.0253	*

Panel B-2: Relationship between the sell ratio during 3 days after the expiration of the putback option and the IPO performance afterwards

Sell ratio	mean	0.0525	0.0027	-0.0082	0.0607	***
	median	0.0279	0.0024	-0.0021	0.0299	***
BHAR[E3,M13]	mean	-0.0016	-0.0067	0.1033	-0.1049	
	median	-0.0316	-0.1046	-0.0237	-0.0079	

Table 7. 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. INST_SELL0 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. INST_SELL1 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. ASSET is the asset size of IPO firm in the previous year in billion Korean Won. MARKET is the buy-and-hold return of the industry (based on the industry classification of KOSPI and KOSDAQ industry group indices) during three months leading up to the day of the bookbuilding. COMP is institutional investors' competition rate in the bookbuilding. 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. D_TECH is a dummy variable which takes the value of one if the IPO firm belongs to the technology industry. Putback option era is the period during which the putback option was enforced, post putback option era is the period after the abolishment on the putback option. We use Newey-West standard errors. *, **, *** denotes statistical significance at 1%, 5%, 10%, respectively.

Dep. Variable	Putback option era		Post putback option era	
	BHAR[D3,M12]	BHAR[E3,M13]	BHAR[D3,M12]	BHAR[E3,M13]
Intercept	0.0816	-0.4693	-0.5053 **	-0.3539
INST_SELL0	-0.6629		-0.3249 **	
INST_SELL1		-0.4191 **		-0.0640
LOG(AGE)	-0.0373	0.0513	0.1120 ***	0.0972 **
LOG(ASSET)	-0.0343	-0.0109	0.0265	0.0036
MARKET	-0.8007 **	-0.7142 *	-0.6249 ***	-0.5536 ***
LOG(COMP)	0.0497	0.0809	-0.0311	-0.0281
D_REPU	-0.0113	0.0351	0.0515	0.0560
D_VC	-0.1920 **	-0.1773 *	0.0262	0.0496
D_TECH	0.1490 *	0.2497 **	-0.0169	-0.0897
Adj. R ²	0.0316	0.0531	0.0484	0.0258
F-stat.	1.9941	2.7087	3.3524	2.2265
Prob	0.0480	0.0072	0.0010	0.0250
No. of Obs.	245	245	371	371

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.

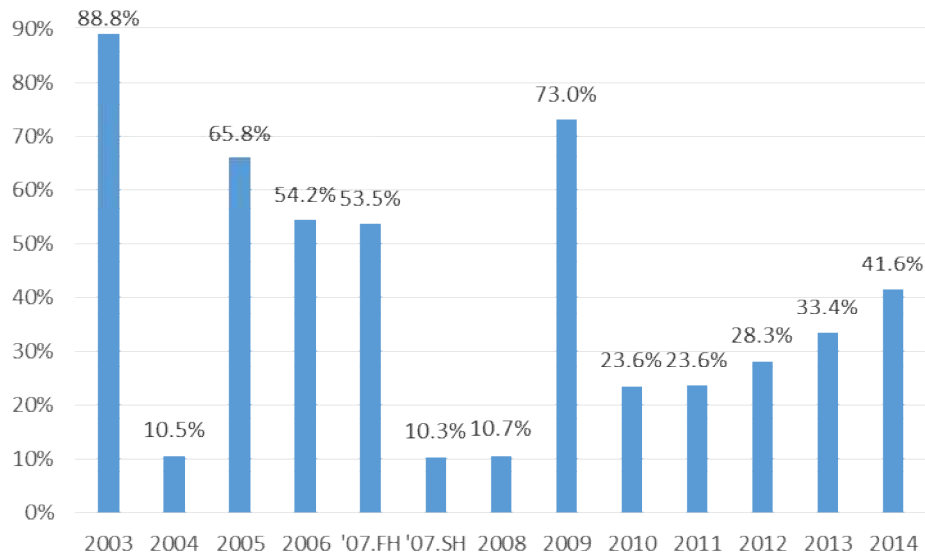
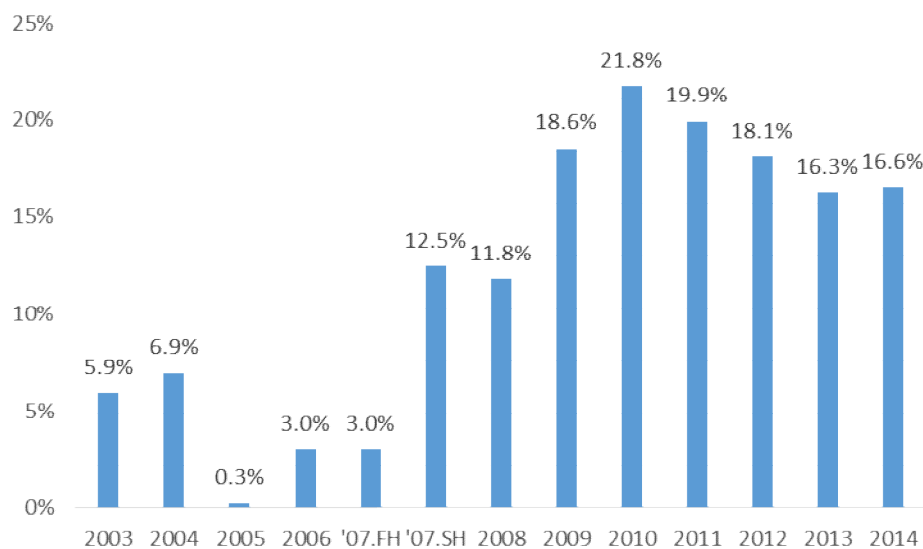


Figure 2. Annual Trend of the Institutional Investors' Sell Ratio

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

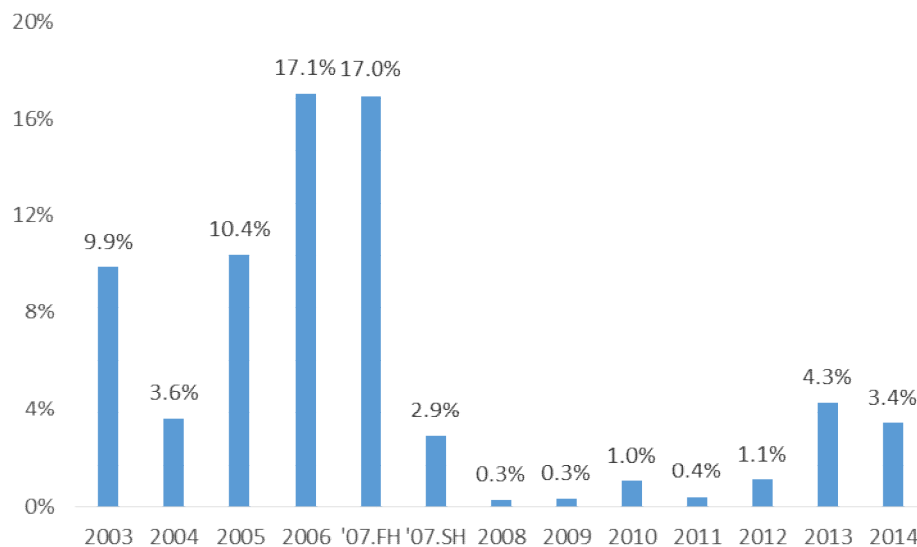


Figure 3. Daily Trend of Institutional Investors' Sell Ratio

This figure shows the daily net selling proportion by institutional investors for all years in our sample period. D1 is the day of the IPO and E1 is the day after 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

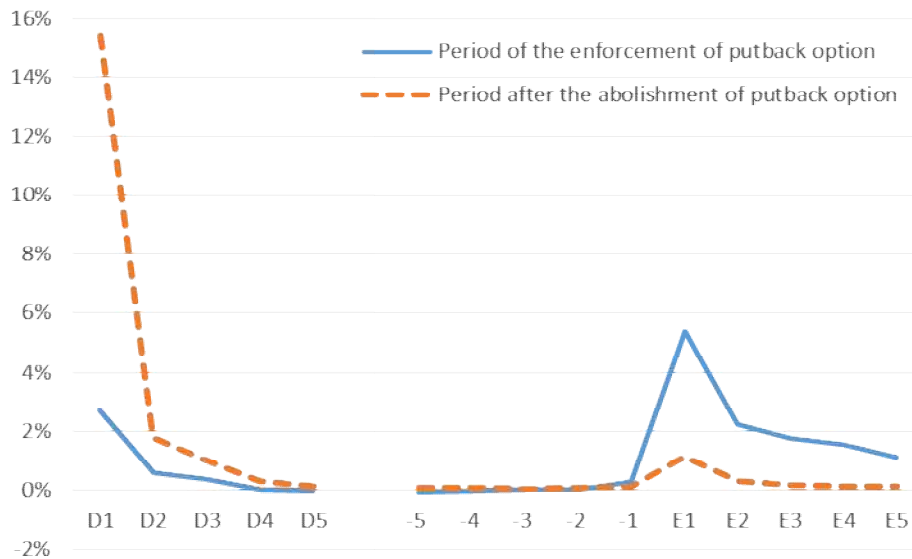


Figure 4. Annual Trend of Long-run Performance of IPO Firms

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. '07FH refers to the first half of 2007 before the abolishment of the putback option. '07SH refers to the second half of 2007 after the abolishment of the putback option.

