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IPO's Long-Run Performance: Hot Market versus Earnings Management

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Abstract: One of the IPO-related anomalies that have been well-discussed in the finance literature is the IPO's long-running underperformance. Two of the major explanations of that phenomenon are: "Hot market" and earnings management. This study investigates the relative importance of these two explanations to the IPO's long-run underperformance. Our results show that although both hot market and earnings management play a role in explaining IPO's long-run performance in their own rights, earnings management no longer exhibits significant explanatory power when the IPOs are issued in the cold market. While the IPOs that are issued in the hot market still tend to underperform in the long run even if the firms do not engage in earnings management. Our findings are consistent with the literature related to the information asymmetry in IPO market. And, because the information asymmetry is more severe in hot market condition, IPOs issued in hot market tend to exhibit poorer returns than those issued in cold market.

Keywords: IPO; information asymmetry; hot market; cold market; earnings management; IPO's long-run underperformance

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1. Introduction

Numerous studies have documented the long-run underperformance of the issuers of initial public offerings (IPOs). For example, Ritter (1991) documents that the IPO firms have significantly underperformed the non-IPO firms with similar size and industry over a three-year period following the initial offering. Other studies also find the similar phenomenon (Levis 1993; Loughran et al. 1994; Firth 1997). Many researchers have attempted to explain this IPO's long-run underperformance phenomenon. Some point out that investors' heterogeneous expectations, in particular investors' over-confidence and over-optimistic beliefs, can lead to the clustering of IPOs in a certain period. People tend to call it the "hot market" phenomenon e.g., Ibbotson (1975), Ritter (1984) and Ibbotson et al. (1988, 1994). Under the hot market condition, investors cannot distinguish between IPO firms with high versus low qualities. Therefore, in the short, run both firms enjoy high returns initially. However, eventually the quality of the firms will be revealed in the long run, thus, and low-quality firms inevitably face a much lower return, which leads to underperformance in the long run Wang and Yung (2018).

Another school of thought finds that earnings management provides an explanation to both the short-run underpricing and the long-run underperformance of IPO firms e.g., Teoh et al. (1998), Boulton et al. (2011), Sletten et al. (2018). In particular, Teoh et al. (1998) find that IPO firms engage in earnings management in the IPO year experience poorer stock return performance in the three years thereafter.

Other explanations, proposed in the literature, have been related to either or both investor's and firm manager's over-optimistic or over-confident sentiments at the time of

the IPO e.g., Heaton (2002), Bernardo and Welch (2001), Purnanandam and Swaminathan (2004). Those studies find that the over-confidence or over-optimism by the firm managers or investors can lead to firm's share being overpriced at the time of the IPO, and poorer performance in the long run, compared to their non-IPO peers. Since this line of research regarding either managers' or investors' over-optimistic or over-confident sentiment can also lead to hot market, where IPO clustering occurs. Therefore, they can be categorized as related to the hot market phenomenon.

To sum up, the existing explanations to the IPO's long-run underperformance are two-fold: (1) Hot market phenomenon, and (2) earnings management. The purpose of this paper is to investigate the relative importance of each of these two factors in explaining the long-run underperformance of IPOs, by instilling the effect of one while controlling for another. To our knowledge, this is the first study in the literature that looks at both factors in the same time and compares their relative importance in explaining the IPO's long-run underperformance.

Our empirical results show that although both market condition and earnings management may lead to IPO's long-run underperformance, market condition plays a more prominent role than earnings management in explaining why IPO firms underperform in the long run. That is, IPOs issued in the hot market condition still tend to underperform their peers in the long run even if the managers do not engage in earnings management. However, IPOs that are issued in the cold market condition no longer underperform in the long run even when the managers engage in earnings management. Our findings are consistent with the existent studies focusing on IPOs and market conditions, and suggest that the main reason why IPO firms exhibit long-run underperformance is that the heterogeneity problem becomes more severe in the hot market. This involves more low-quality firms are pooled with high-quality ones such that eventually the quality will inevitably be revealed in the market and thus low-quality IPOs suffer poorer performance in the long run.

Our findings also suggest that it is important to identify the market conditions when analyzing issues related to IPO's long-run underperformance. In particular, one may not isolate the effect of earnings management on IPO's performance without explicitly taking into account the market conditions.

The rest of the paper is organized as follows. Section 2 presents the literature review. In Section 3 we describe the data and the empirical model. Section 4 provides the empirical findings and documents the relative importance of the above two explanations to the IPO long-run underperformance, and Section 5 summarizes our results and provides a brief discussion.

2. Literature Review

2.1. Market Conditions and IPO's Long-Run Underperformance

Miller (1977) proposes an explanation that is related to the investors' heterogeneous expectations regarding the valuation of the IPO firms. It states that when the IPOs are issued the most optimistic investors buy them. And, over time the prices of the IPOs fall when marginal investor's valuation of the firm converges towards the mean valuation Ritter and Welch (2002). Following the same line of logic, Wang and Yung (2018) point out that " . . . If there exists heterogeneity—and if investors cannot distinguish between firms—then low-quality firms enjoy a mispricing benefit when pooling with their higher quality peers".

Furthermore, Yung et al. (2008) argue that the severity of the heterogeneity problem among investors depends upon the market conditions. That is, in a hot market, low-quality IPO firms will be more incentivized to pool among the high-quality ones, given that in the hot market condition, more promising new opportunities can be promoted and thus high IPO prices may be justified. However, eventually the quality of the IPO firms will become evident to the investors and thus the low-quality firms will perform much poorer in the long run.

Similar argument to Yung et al. (2008) is offered by Schultz (2003) and is restated by Ritter and Welch (2002): " ... that more IPOs follow successful IPOs. Thus, the last large group of IPOs would underperform and be a relatively large fraction of the sample. If underperformance is being measured weighting each IPO equally, the high-volume periods (i.e., hot market condition) carry a larger weight, resulting in underperformance, on average". Ljungqvist et al. (2006) also evidence that hot market contributes to IPO's long-run underperformance. Furthermore, Derrien (2005) find that individual investors' demand is positively related to market conditions. In particular, large individual investors' demand leads to both higher initial returns, and poor long-run performance of IPOs. In a separate study, Dorn (2009) also find that retail investors' sentiment drives up initial IPO prices and leads to poorer aftermarket IPO returns.

All of the above explanations are related to the "hot market" phenomenon documented by Ibbotson (1975), Ritter (1984) and Ibbotson et al. (1988, 1994), and are directly related to the clustering of the IPO firms during the "hot market" period. In a recent study, Tsukioka et al. (2018) use investor's sentiment data extracted from Yahoo! Japan Finance message boards to investigate the high initial return and long-run underperformance of IPOs and find that high investor attention and bullish investor sentiment induce higher IPO offer prices and subsequently lead to lower long-run returns. The investor attention or sentiment can also be part of the hot market phenomenon because there tends to be a hype in investor sentiment when IPO becomes more popular and more firms are pursuing IPOs. Furthermore, Neupane et al. (2014) find that retail investors may be more influenced by the market sentiment and conditions than the institutional investors. The implication from their finding is that retail investors may play a significant role in the linkage between market condition and IPO's long-run underperformance.

2.2. Earnings Management and IPO's Long-Run Underperformance

Another direction of explanations to the IPO's long-run underperformance is earnings management by the IPO firms. Teoh et al. (1998) first offer this explanation and find that "issuers with unusually high accruals in the IPO year experience poor stock return performance in the three years thereafter". Thus, they claim that firm's earnings management plays a significant role in explaining IPO's long-run underperformance.

Boulton et al. (2011) examine IPOs from 37 countries and find that IPOs are underpriced less in countries where public firms produce higher quality earnings information. Chiraz and Anis (2013) study IPOs in the French market and find that firms engaged with aggressive earnings management in the IPO process tend to exhibit poor returns subsequently and to be delisted for performance failure after IPO.

A recent study by Sletten et al. (2018) also show that IPO firms engaged with earnings management with high accruals at the time of the IPO tend to experience a reverse in accruals and such reversals contribute to the IPO's long-run underperformance.

3. Data and Empirical Model

3.1. The Data

The IPO data used in this study is obtained from the SDC database, which includes all of the IPO firms listed in the NYSE, AMEX and NASDAQ. The stock returns of both the IPO and the matched non-IPO firms are retrieved from the CRSP database, while all of the companies' financial variables including those used to measure the company's discretional accruals are obtained from the COMPUSTAT database. The sample period of all of the data is from 1 January 1970 to the end of 2008, which is the maximum time span that we are able to obtain. We further filter our firm data as follows. First, we delete those firms with share prices below $1. Secondly, we avoid firms that are lack of complete financial data that we need in our empirical models. Thirdly, we delete firms in the financial and banking industries. There are a total of 6821 IPO firms remaining in our sample after screening the data according to the above three main criteria. The detailed numbers are presented in Table 1.

Table 1. Selection process for sample IPO firms, 1970–2008.

U.S. common stock IPOs (with share price > $1), from SDC database, 1970–2008	29,406
Less	
Firm data unavailable in CRSP Database	11,438
The first trading date recorded in CRSP was earlier than the IPO date	7639
Firm data unavailable in Compustat Database	2511
Financial companies (SIC codes 6000–6999)	966
Miscellaneous exclusions	31

3.2. IPO Long-Run Performance Measurement

We adopt similar buy-and-hold return measurement as used by Ritter (1991) and Ritter and Welch (2002), and is described as follows.

First of all, we calculate the buy-and-hold return, R_i, for each of the IPO stocks after the initial IPO month:

$$R_i = \left[\prod_{t=T_1}^{T_2}(1+R_{i,t})\right], \tag{1}$$

where R_{it} is the raw return for stock i at month t, while T_1 and T_2 represent the first month after the IPO month and the end month of the buy-and-hold period, respectively.

Next, we form the benchmark adjusted stock return by using the above return minus the benchmark return, which results in the following buy-and-hold risk-adjusted return for stock i, $BHAR_{(T_1,T_2)}$:

$$BHAR_{(T_1,T_2)} = \left[\prod_{t=T_1}^{T_2}(1+R_{it})\right] - \left[\prod_{t=T_1}^{T_2}(1+R_{mt})\right], \tag{2}$$

where $\left[\prod_{t=T_1}^{T_2}(1+R_{mt})\right]$ is the benchmark's buy-and-hold return, with the same buy-and-hold period from T_1 and T_2 as that of the stock i.

We, then, form the IPO return portfolio for each month after the IPO's initial month by taking an equal-weighted average of the IPO firms' adjusted returns. For the benchmarks, we use three different benchmarks to adjust for the stock return: (1) the CRSP value-weighted NYSE-AMEX and NASDAQ index, (2) the CRSP equal-weighted NYSE-AMEX and NASDAQ index, and (3) the matching firms with similar industry and size as that of the IPO firms.

3.3. Measurement for Discretionary Accruals

We follow Teoh et al. (1998) in calculating firm's discretionary accruals, with the performance matching adjustment proposed by Kothari et al. (2005). The calculation is described in the following steps:

$$\begin{aligned} CA \equiv \Delta[&accounts\ receivables + inventory + other\ current\ assets] \\ -\Delta[&accounts\ payable + tax\ payable + other\ current\ liabilities] \end{aligned} \tag{3}$$

$$\frac{CA_{it}}{A_{it-1}} = \beta_0 + \beta_1\left(\frac{1}{A_{it-1}}\right) + \beta_2\left(\frac{\Delta REV_{it}}{A_{it-1}}\right) + \beta_3\left(\frac{\Delta PPE_{it}}{A_{it-1}}\right) + \beta_4 ROA_{it-1} + \varepsilon_{it} \tag{4}$$

$$NDCA_{it} = \hat{\beta}_0 + \hat{\beta}_1\left(\tfrac{1}{A_{it-1}}\right) + \hat{\beta}_2\left(\tfrac{\Delta REV_{it}-\Delta REC_{it}}{A_{it-1}}\right) + \hat{\beta}_3\left(\tfrac{\Delta PPE_{it}}{A_{it-1}}\right) + \hat{\beta}_4 ROA_{it-1} \tag{5}$$

$$DCA_{it} = \frac{CA_{it}}{A_{it-1}} - NDCA_{it} \tag{6}$$

where the definitions of the variables are listed as follows.

CA_{it}: current accruals;
$NDCA_{it}$: nondiscretionary current accruals;
DCA_{it}: discretionary current accruals;
A_{it-1}: total assets;
ΔREV_{it}: change in revenues;
ΔPPE_{it}: net property, plant and equipment;
ΔREC_{it}: change in receivables;
ROA_{it-1}: return on assets.

3.4. Definitions of Hot and Cold Markets

Following Alti (2006), we define hot and cold markets based on the monthly IPO volume in the following way. First, we take a three-month centered moving average of the number of IPOs for each month in order to smooth out the possible seasonal variation. We then sort these monthly moving average IPO volumes into three groups: High, Medium and Low. And the hot and cold months are defined as those in the High and Low groups, respectively. Our definition of hot and cold markets is slightly different from that by Alti (2006) in that we segregate the moving average IPO volumes into three groups, while Alti (2006) defines hot and cold months as those that are above and below the median in the moving average distribution, respectively. That is, Alti divides the IPO volumes into high and low groups only, without taking into account the medium group where IPO volumes are neither high nor low. Therefore, in order to avoid such a problem, we explicitly separate out the high and low IPO volume groups from the medium IPO volume group.

4. Empirical Results

First, we present in Table 2, the number of our sample IPO firms in each of the market conditions, with various degrees of earnings management. We identify each of the sample firms as issued in the "hot", "neutral" and "cold" market conditions according to the criteria described in Section 3.4 above. As a result, in total there are 4807, 1779 and 235 IPO firms issued in the "hot", "neutral" and "cold" markets, respectively. As we can see, by nature there are more firms issued in the hot market than those in the cold market. And, we equally divide the sample firms into three earnings management groups, "conservative", "neutral" and "aggressive", respectively, based on the discretionary accruals numbers calculated by using the model depicted in Section 3.3 above.

Table 2. Numbers of Firms with Various Degrees of Earnings Management, and in Different Market Conditions.

Earnings Management	Market Conditions			
	All	**Cold**	**Neutral**	**Hot**
Conservative	2273	63	546	1664
Neutral	2274	109	644	1521
Aggressive	2274	63	589	1622
All	6821	235	1779	4807

Notes: 1. The definitions of "hot", "cold" and "neutral" market conditions are described in Section 3.4 in the text. 2. We divide the total sample firms into three earnings management groups according to the degrees of earnings management measured in Section 3.3 in the text.

4.1. Full Sample Results

Next, we present our empirical results for the relative roles that hot market and earnings management play in explaining the IPO's long-run underperformance in various durations from 6-months to 3-years. We first present the full-sample results in Tables 3 and 4, by adjusting the IPO returns with the market return and firm size, and with the Fama-French Four-Factor Model, respectively.

Table 3. Full Sample Results of IPO's Abnormal Returns, Adjusted for Market Return and Firm Size.

Abnormal Return Adjusted for Market Return and Firm Size				
	Raw	**Market-Adjusted, Value-Weighted**	**Market-Adjusted, Equal-Weighted**	**Market & Size-Adjusted**
6-month	0.0002	−0.0530 ***	−0.0460 ***	−0.0450 ***
	(0.03)	(−9.04)	(−7.98)	(−6.01)
1-year	0.0404 ***	−0.0810 ***	−0.0780 ***	−0.0690 ***
	(4.10)	(−8.70)	(−8.50)	(−5.79)
1.5-year	0.0835 ***	−0.0890 ***	−0.0790 ***	−0.0740 ***
	(5.44)	(−5.97)	(−5.30)	(−3.94)
2-year	0.1190 ***	−0.1350 ***	−0.1130 ***	−0.1050 ***
	(6.86)	(−7.89)	(−6.64)	(−4.57)
2.5-year	0.1881 ***	−0.1210 ***	−0.0960 ***	−0.0820 ***
	(9.63)	(−6.27)	(−5.03)	(−3.14)
3-year	0.2536 ***	−0.1310 ***	−0.1090 ***	−0.0780 **
	(10.24)	(−5.40)	(−4.49)	(−2.47)

This table reports the full-sample results of abnormal returns of the IPOs. The numbers in the "Raw" column represents the returns without any adjustment. The numbers in other columns represent the abnormal returns adjusted for the market return, both value-weighted and equal-weighted, and firm size, respectively. All of the test results are based on the standard *t*-test. *** and ** denote the significance at the 1% and 5% levels, respectively.

Table 4. Full Sample Results of IPO's Abnormal Returns, Adjusted for Fama-French Four-Factor Model.

All Sample Results Adjusted for Fama-French Four-Factor Model					
	AR	**RMRF**	**SMB**	**HML**	**Momentum**
6-month	−0.0451 ***	1.2517 ***	0.9231 ***	−0.5049 ***	0.0508
	(−5.56)	(20.54)	(11.25)	(−5.76)	(0.79)
1-year	−0.0696 ***	1.1873 ***	1.3292 ***	−0.3555 ***	0.0056
	(−5.20)	(22.92)	(16.11)	(−5.80)	(0.07)
1.5-year	−0.0740 ***	1.2236 ***	1.3697 ***	−0.4263 ***	0.0530
	(−3.31)	(15.13)	(11.01)	(−4.83)	(0.68)
2-year	−0.0734 ***	1.1429 ***	1.4355 ***	−0.5322 ***	−0.0841
	(−2.70)	(14.94)	(10.12)	(−6.13)	(−1.03)
2.5-year	−0.0966 ***	1.1273 ***	1.5257 ***	−0.4297 ***	0.1002
	(−3.17)	(13.76)	(10.86)	(−4.63)	(1.30)
3-year	−0.1258 ***	1.1344 ***	1.8173 ***	−0.7561 ***	0.2860 ***
	(−3.26)	(13.59)	(12.23)	(−6.41)	(3.14)

This table reports the full-sample results of abnormal returns of the IPOs. The abnormal returns "AR" are adjusted for the four-factor model, where the four factors are Market-adjusted return (RMRF), Size-based return (SMB), Market/Book-based return (HML) and Momentum-based return (MOM), respectively. All of the test results are based on the standard *t*-test. *** denotes the significance at the 1%, 5% and 10% levels, respectively.

Firstly, in Table 3, we can see that without any adjustment the IPO's raw returns are quite significantly positive in all periods over one year. However, after either adjusted for the market return or for firm size, IPO's abnormal returns become significantly negative over all of the time horizons. Secondly, we also see the similar pattern in the abnormal returns when we adjust the IPO returns by the Fama-French Four-Factor Model, which is presented in Table 4. The results shown in both Tables 3 and 4 are consistent with the existent literature regarding IPO's long-run performance, where IPOs in general exhibit poorer returns in the long run.

4.2. Specific Results of the Market Conditions and Earnings Management

In this section, we present the specific results of IPO's long-run return performance for different market conditions in Table 5, and those for firms with different degrees of earnings management in Table 5. And, Tables 6 and 7 report those results of the earnings management by controlling for the market conditions, by adjusting for the market model and for the four-factor model, respectively.

Table 5. Abnormal Returns of the IPOs: Cold vs. Hot Markets.

	Cold Market		Hot Market	
	Market-Adjusted	**Market and Size-Adjusted**	**Market-Adjusted**	**Market and Size-Adjusted**
6-month	−0.031	−0.005	−0.054 ***	−0.047 ***
	(−1.10)	(−0.14)	(−7.62)	(−5.27)
1-year	−0.067	0.012	−0.082 ***	−0.072 ***
	(−1.49)	(0.22)	(−7.03)	(−4.92)
1.5-year	−0.016	0.046	−0.075 ***	−0.072 ***
	(−0.22)	(0.49)	(−3.82)	(−2.98)
2-year	−0.013	0.011	−0.104 ***	−0.093 ***
	(−0.15)	(0.09)	(−4.63)	(−3.19)
2.5-year	−0.005	0.044	−0.08 ***	−0.064 *
	(−0.05)	(0.34)	(−3.18)	(−1.92)
3-year	0.020	0.104	−0.086 ***	−0.046
	(0.13)	(0.67)	(−2.70)	(−1.13)

This table reports the abnormal returns of the IPOs that are issued in the cold versus hot market conditions. Two abnormal returns are presented here: One adjusted for the market factor only, and another adjusted for both the market and the firm size. And the cold (hot) market is defined as the months in the lower (higher) IPO volume group after we sort the IPO volume into three groups. All of the test results are based on the standard *t*-test. *** and * denote the significance at the 1% and 10% levels, respectively.

Table 6. Abnormal Returns of the IPOs: With versus Without Earnings Management.

	Without Earnings Management		With Earnings Management	
	Market-Adjusted	**Market and Size-Adjusted**	**Market-Adjusted**	**Market and Size-Adjusted**
6-month	−0.0390 ***	−0.0410 ***	−0.0520 ***	−0.0510 ***
	(−5.75)	(−4.26)	(−4.66)	(−3.56)
1-year	−0.0620 ***	−0.0490 ***	−0.0950 ***	−0.0890 ***
	(−5.71)	(−4.43)	(−5.48)	(−3.94)
1.5-year	−0.0560 ***	−0.0650 ***	−0.1130 ***	−0.0860 ***
	(−4.03)	(−3.46)	(−4.60)	(−2.81)
2-year	−0.0820 ***	−0.0990 ***	−0.1670 ***	−0.1360 ***
	(−3.77)	(−2.91)	(−5.73)	(−3.66)
2.5-year	−0.0500 **	−0.0800 *	−0.1740 ***	−0.1190 ***
	(−2.21)	(−1.80)	(−5.45)	(−2.92)
3-year	−0.068	−0.092	−0.1910 ***	−0.0890 **
	(−1.53)	(−0.69)	(−5.07)	(−1.97)

This table reports the abnormal returns of the IPO of the firms that are with vs. without earnings management. Two abnormal returns are presented here: one adjusted for the market factor only, and another adjusted for both the market and the firm size. All of the test results are based on the standard *t*-test. ***, ** and * denote the significance at the 1%, 5%, and 10% levels, respectively.

First, the results for the hot market vs. cold market are presented in Table 5. In each of the two market conditions, the first column shows the market-adjusted return, while the second column shows the market and size-adjusted return. From the results for each of the adjusted returns, we can see that there is not much difference between the results of these two adjusted returns, in each of the market conditions. However, the results in the cold market condition are completely different from those in the hot market condition. For example, in the cold market, none of the returns for either the market-adjusted or the market and size-adjusted are significant among all of the return horizons from 6-month to 3-year. On the contrary, in the hot market, all of the returns are significantly negative except for the one for the market and size-adjusted in the 3-year horizon. In another study, Phadke and Kamat (2017) also confirm that the IPOs issued in the cold market exhibit better return in the long run than those issued in the hot market.

Table 7. Abnormal Returns of the IPOs: Market Conditions versus Earnings Management.

	Cold Market				Hot Market			
	Without Earnings Management		With Earnings Management		Without Earnings Management		With Earnings Management	
	Market-Adjusted	Market and Size-Adjusted	Market-Adjusted	Market and Size-Adjusted	Market-Adjusted	Market and Size-Adjusted	Market-Adjusted	Market and Size-Adjusted
6-month	−0.072	−0.078	0.043	0.034	−0.046 ***	−0.032 **	−0.061 ***	−0.061 ***
	(−1.46)	(−1.30)	(0.75)	(0.48)	(−3.96)	(−2.18)	(−4.31)	(−3.42)
1-year	−0.103	−0.035	0.084	0.199 *	−0.057 ***	−0.033	−0.099 ***	−0.100 ***
	(−0.99)	(−0.32)	(0.84)	(1.74)	(−2.75)	(−1.31)	(−4.54)	(−3.60)
1.5-year	0.0366	0.0264	0.148	0.256	−0.046	−0.042	−0.103 ***	−0.087 **
	(0.18)	(0.13)	(1.01)	(1.43)	(−1.56)	(−1.07)	(−3.27)	(−2.27)
2-year	−0.052	−0.139	0.276	0.312	−0.057	−0.057	−0.165 ***	−0.140 ***
	(−0.26)	(−0.69)	(1.34)	(1.13)	(−1.52)	(−1.07)	(−4.41)	(−3.04)
2.5-year	0.0165	−0.047	0.315	0.200	−0.019	−0.036	−0.169 ***	−0.115 **
	(0.07)	(−0.20)	(1.40)	(0.57)	(−0.45)	(−0.57)	(−4.16)	(−2.28)
3-year	0.1487	0.033	0.313	0.259	−0.033	−0.048	−0.185 ***	−0.075
	(0.35)	(0.10)	(0.93)	(0.66)	(−0.57)	(−0.60)	(−3.94)	(−1.36)

This table reports the abnormal returns of the IPOs by comparing the significance of the market conditions versus earnings management. Two abnormal returns are presented here: one adjusted for the market factor only, and another adjusted for both the market and the firm size. The cold (hot) market is defined as the months in the lower (higher) IPO volume group after we sort the IPO volume into three groups. All of the test results are based on the standard *t*-test. ***, ** and * denote the significance at the 1%, 5%, and 10% levels, respectively.

The above contrast results between cold and hot market conditions suggest that market conditions play an important role in explaining IPO's long-run underperformance. That is, IPOs that are issued in a hot market condition tend to underperform, i.e., perform worse than their peers, in the long run. However, IPOs that are issued in a cold market condition will have no difference, in terms of their long-run performance from their peers. This result is consistent with the findings by Ibbotson (1975), Ritter (1984) and Ibbotson et al. (1988, 1994).

Next, in order to examine the effect of earnings management on IPO's long-run underperformance, we conduct the similar analysis to that in Table 5 for earnings management and present it in Table 6.

Basically, in Table 6, we compare the return results of IPO firms that are engaged in earnings management with those that are not engaged in earnings management. Again, we report in Table 6 the IPO returns for both the market-adjusted and the market and size-adjusted, over various return horizons from six-month to three-year. From Table 6, it is clear that almost all of the abnormal returns in various return horizons are significantly negative, except for the ones in the three-year horizon for the IPO firms without earnings management. That is, basically the result of the IPO firms with earnings management, indeed, shows no difference from that of the IPO firms without earnings management. In other words, IPO firms with or without earnings management basically exhibit the same return performance in the long run. Therefore, this suggests that earnings management alone cannot explain why IPO firms underperform in the long run. That is, earnings management per se is not a factor leading to the IPO's long-run underperformance. Instead, it is in the hot market where IPO firms with earnings management exhibit return underperformance in the long run.

In order to further verify the above results, we also perform a similar analysis to that in both Tables 5 and 6, by combining both market condition and earnings management, to see the relative role each of these two factors plays in the IPO's long-run underperformance. The results are reported in Table 7.

In Table 7, first we compare the returns for the IPO firms with and without earnings management in the cold market condition, then, we compare those in the hot market condition. Again, both the market-adjusted and the market and size-adjusted returns are presented in each of the scenarios.

First of all, the first four columns report the returns for IPOs that are issued in the cold market condition, for firms either with or without earnings management. And, it is obvious from the results shown in these four columns that there exists no significant pattern except for the one-year market and size-adjusted return, which actually exhibits a positive, instead of negative, return. In other words, the results show that none of the IPOs that are issued in the cold market experiences long-run underperformance, no matter the firms are engaged in earnings management or not.

Secondly, the last four columns present the returns for IPOs that are issued in the hot market condition, for both firms with and without earnings management. Within those four columns, the first two report the returns of the firms without engaging in earnings management, while the very last two columns report those of the firms with earnings management. In these four columns we observe a slightly different pattern in terms of the significance in returns between the first two and the last two columns. In specific, we observe that returns in both cases exhibit negatively significant patterns although there are more returns exhibiting significance in the last two columns than those in the first two columns. For example, there are three returns, which are in the 6-month and 1-year horizons, showing negative significance in returns in the first two columns, while many more in the last two columns showing significant returns.

In sum, the results from the first four columns of Table 7 imply that IPOs that are issued in the cold market do not underperform in the long run. However, the results from the last four columns of Table 7 indicate that IPOs tend to underperform in the long run when they are issued in the hot market, whether the firms are engaged in earnings management or not, albeit firms with earnings management tend to exhibit more pronounced underperformance result. Therefore, the overall results in Table 7 suggest that it is the market condition, instead of the earnings management, that plays a major role in explaining the IPO's long-run underperformance.

Furthermore, it is interesting to compare the results in Table 6 with those in Table 7 to see more clearly the role of earnings management in the IPO's long-run underperformance. In particular, by comparing results in Tables 6 and 7, we are able to see why Teoh et al. (1998), among others, come up with the conclusion that earnings management may play a major role in explaining IPO's long-run underperformance. Based on our findings, we argue that the main reason why Teoh et al. (1998) come up with that conclusion is because they do not take into account the market conditions by simply blending both hot and cold market conditions into one scenario. That is, from Table 6, we can see that the IPO long-run returns are all negatively significant for both firms with and without earnings management. However, the results from Table 7 show that firms with earnings management exhibit significant long-run underperformance only in the hot market but not in the cold market condition. Thus, it means that it is essential to take into account market conditions in examining the effect of earnings management on the IPO's long-run underperformance. Otherwise, the result may be biased toward favoring the earnings management being a major contributor to the IPO underperformance phenomenon. In a recent study, Gao et al. (2017) also point out that the long-run IPO performance is mostly unrelated to earnings management.

Finally, in Table 8, we verify the results from Table 7 by adjusting IPO returns for the four-factor model rather than the market model. Panels A and B in Table 8 report the results for the cold and hot market periods, respectively. The abnormal return "AR" column is the one that our analysis will focus on. The rest of the columns in the table simply report the coefficients for each of the four factors in the four-factor model.

Table 8. Abnormal Returns of the IPOs: Market Conditions vs. Earnings Management, Adjusted for Fama-French Four-Factor Model.

Panel A: Cold Market										
	Without Earnings Management					**With Earnings Management**				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.0799 (−0.96)	1.2814 ** (2.43)	1.2030 * (1.81)	−0.2229 (−0.26)	−0.2890 (−0.61)	0.0555 (0.52)	1.4608 ** (2.04)	1.4914 (1.61)	−1.3807 (−1.16)	−0.1169 (−0.15)
1-year	−0.3549 (−1.41)	1.6564 * (1.68)	2.8214 *** (3.08)	1.1117 (0.85)	0.2803 (0.36)	0.0935 (0.30)	0.9234 (0.74)	2.2907 ** (2.31)	−1.0341 (−0.57)	−0.3632 (−0.30)
1.5-year	−0.4609 (−0.92)	2.8095 (1.51)	4.0901 *** (2.86)	0.8725 (0.44)	1.0089 (0.77)	0.3015 (0.74)	0.5804 (0.43)	2.3184 ** (2.33)	−1.9191 (−1.27)	−0.4516 (−0.43)
2-year	−0.1934 (−0.39)	2.1090 (1.31)	3.4970 *** (2.72)	−1.1260 (−0.78)	0.3584 (0.32)	0.2127 (0.42)	2.5128 * (1.82)	2.0743 * (1.78)	−3.1564 ** (−2.28)	1.0948 (1.11)
2.5-year	0.1850 (0.31)	0.8838 (0.48)	3.2947 ** (2.33)	−2.4317 * (−1.72)	0.5161 (0.42)	1.0532 * (1.74)	0.4342 (0.28)	1.6554 (1.41)	−4.3895 *** (−3.04)	0.1369 (0.13)
3-year	−0.0618 (−0.06)	2.3638 (0.95)	4.2646 * (1.93)	−3.3670 (−1.55)	1.4458 (0.83)	0.3363 (0.32)	1.6150 (0.76)	1.9018 (1.12)	−2.8006 (−1.36)	1.0812 (0.72)
Panel B: Hot Market										
	Without Earnings Management					**With Earnings Management**				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.0354 ** (−2.09)	1.2378 *** (9.80)	0.5905 *** (3.64)	−0.8625 *** (−4.84)	−0.0267 (−0.16)	−0.0844 *** (−4.33)	1.2887 *** (8.24)	1.2569 *** (6.11)	−0.5212 ** (−2.31)	0.3979 ** (1.99)
1-year	−0.0744 ** (−2.32)	1.2313 *** (9.92)	1.1690 *** (6.26)	−0.4309 *** (−3.46)	0.2895 (1.41)	−0.1024 *** (−2.99)	1.2863 *** (8.92)	1.6500 *** (8.11)	−0.4349 *** (−3.08)	0.0910 (0.42)
1.5-year	−0.0563 (−1.25)	1.1807 *** (6.42)	1.3157 *** (4.81)	−0.4785 *** (−2.88)	0.1687 (1.02)	−0.1404 *** (−2.67)	1.1316 *** (5.60)	1.7490 *** (5.86)	−0.5880 *** (−3.12)	0.3790 * (1.93)
2-year	−0.0688 (−1.09)	1.1651 *** (5.58)	1.1973 *** (3.14)	−0.5210 *** (−2.89)	0.0480 (0.26)	−0.1075 (−1.53)	0.9821 *** (4.70)	1.3447 *** (3.35)	−0.6843 *** (−3.47)	−0.0862 (−0.41)
2.5-year	−0.0711 (−0.96)	1.1998 *** (5.90)	1.4412 *** (4.00)	−0.4773 ** (−2.39)	0.1739 (1.00)	−0.1489 * (−1.95)	0.8343 *** (4.40)	1.1394 *** (3.33)	−0.5980 *** (−2.97)	0.1421 (0.80)
3-year	−0.1379 (−1.37)	1.1945 *** (5.57)	1.9304 *** (4.97)	−0.8793 *** (−3.09)	0.4731 ** (2.07)	−0.0833 (−0.95)	0.8589 *** (5.06)	1.3083 *** (4.05)	−0.8282 *** (−3.43)	−0.0444 (−0.23)

This table reports the abnormal returns of the IPOs by comparing the significance of the market conditions vs. earnings management. The abnormal returns presented here are adjusted for the four-factor model, where the four factors are Market-adjusted return (RMRF), Size-based return (SMB), Market/Book-based return (HML) and Momentum-based return (MOM), respectively. The cold (hot) market is defined as the months in the lower (higher) IPO volume group after we sort the IPO volume into three groups. All of the test results are based on the standard *t*-test. ***, ** and * denote the significance at the 1%, 5% and 10% levels, respectively.

Basically, the results in the "AR" columns in Table 8 exhibit quite similar pattern to those in Table 7, where all of the returns in the cold market, for firms either with, or without, earnings management are not significant, while returns in the hot market showing significantly negative pattern in both firms with, and without, earnings management. In other words, the results in Table 8 reinforce what we find in Table 7 in terms of the relative roles of the market condition and earnings management in explaining the IPO's long-run underperformance. That is, earnings management plays a role only in the case where the IPOs are issued in the hot market, while there is no effect from earnings management when IPOs are issued in the cold market. However, in contrast, IPOs that are issued in the hot market condition still exhibit long-run underperformance even when the firms are not engaged in earnings management.

4.3. Further Robustness Analysis

In this section, we perform further analyses by using two alternative earnings management measurements, employing different methods to classify market conditions, and conducting analysis for the dotcom bubble sub-sample period, respectively, to ensure the robustness of our empirical findings. In each of the analyses below the IPO returns are

adjusted for Fama-French four-factor model. And, to save space in the main text, we present these test results in the Appendices A–C.

Firstly, the two alternative earnings management measurements are based on the "cash flow approach" and the "forecast error model" by DuCharme et al. (2001), with the results reported in Appendices A.1 and A.2, respectively. Both Appendices A.1 and A.2. exhibit a similar pattern of the abnormal returns as shown in the above sections where firms engaged in earnings management exhibit more significant negative long-run performance in hot market than in cold market. These results re-enforce what we find in the previous sections by using Teoh et al. (1998)'s measurement for earnings management.

Secondly, we re-do the analysis by using Alti (2006)'s method to classify market conditions into two groups. In specific, we divide IPO issues into "above medium" vs. "below medium" groups which represent, respectively, IPOs in the "hot market" vs. those in the "cold market". The results are presented in Appendix B, where Panel A and Panel B showing the figures in the cold and hot markets, respectively.

From Panel A in Appendix B, we can see that except a slight significance showing in the abnormal return at the 1.5-year horizon, no other abnormal returns exhibit any significance regardless the degree of firm's engagement in earnings management. On contrary, the results for the hot market condition in Panel B presents a completely different outcome, where almost all of the abnormal returns are significantly negative, representing long-run underperformance, for both earnings management and non-earnings management IPO firms. These results are consistent with what we find in the above section by classifying market conditions into three categories and keep the highest and lowest ones to represent the hot and the cold markets, respectively.

Finally, we conduct the analysis around the dotcom bubble period which occurred in the 2000s, to see if the pattern of IPO's long-run underperformance in the hot versus cold markets would be altered during a financial crisis such as dotcom bubble. Our data sample to represent the dotcom bubble period is from 1995 to 2001.

The results are reported in Appendix C, with Panels A and B showing those in the cold and the hot market conditions, respectively. Firstly, we observe that during the dotcom bubble period the pattern between hot and cold markets are not as obvious as those in other periods. This could be due to the fact that a shorter data sample period is being used such that the IPO firm's long-run underperformance cannot be detected as easy as in the longer time periods. Secondly, even the pattern of IPO's long-run underperformance is not as significant as that in the longer sample period that we use in the previous sections, we still observe that the IPO firms in the hot market in general exhibit a more significant negative abnormal return pattern, implying that IPOs issued in the hot market condition exhibit a more prominent long-run underperformance, which is consistent with our findings in the above sections.

5. Summary and Discussion

In this paper, we explore the relative roles of the two main explanations to the IPO's long-run underperformance: Hot market and earnings management. Our results show that although both may lead to IPO's long-run underperformance, hot market plays a more dominant role than earnings management in explaining why IPOs underperform in the long run. In specific, we find that IPOs issued in the hot market condition will still tend to underperform their peers in the long run even if the managers do not engage in earnings management. However, on the other hand, IPOs that are issued in the cold market condition will in general no longer underperform in the long run even when the managers engage in earnings management.

Our findings suggest that the reason why Teoh et al. (1998) find earnings management being an important factor leading to IPO's long-run underperformance is because they fail to take into account the market conditions. As mentioned above, our findings show that earnings management will no longer play a significant role if the IPOs are issued in the cold market. Therefore, it is crucial to identify the market conditions when examining the relationship between earnings management and IPO's long-run performance.

Our findings also suggest that the information asymmetry plays an important and dominant role in IPO's long-run underperformance. That is, due to the information asymmetry between IPO firm's management and investors, in general, regarding the value of the firm, investors cannot distinguish between IPO firms with high versus low qualities. Therefore, in the short run both firms may enjoy the same high returns initially, but the quality of the firms will eventually be revealed in the long run. Therefore, the low-quality firms will inevitably face a much lower return which leads to underperformance in the long run. And, according to Yung et al. (2008), the information asymmetry problem will be more severe in the hot market condition, where more low-quality IPO firms will be more incentivized to pool among the high-quality ones due to the fact that more promising new opportunities can be promoted and thus high IPO prices may be justified in the hot market. Therefore, IPOs issued in the hot market, on average, tend to perform poorer in the long run than those issued in the cold market. Moreover, the fact that this hot market effect still remains after controlling for the degree of firm's earnings management engagement suggests that market condition plays a dominant role in explaining IPO's long-run underperformance.

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Appendix A

Appendix A.1. Results by Using "Cash Flow Approach" for Earnings Management Measure

The results with alternative earnings management measurement by following DuCharme et al. (2001)'s "cash flow approach" in their Equation (A1), as follows:

$$\frac{AC_{it}}{A_{it-1}} = a_0\left(\frac{1}{A_{it-1}}\right) + a_1\left(\frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}}\right) + a_2\left(\frac{\Delta PPE_{it}}{A_{it-1}}\right) + a_3\left(\frac{\Delta CFO_{it}}{A_{it-1}}\right) + \varepsilon_{it} \quad \text{(A1)}$$

Table A1. Results by using "cash flow approach" for earnings management measure.

Panel A: Cold Market										
	Without Earnings Management					**With Earnings Management**				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.1647 (−1.19)	0.6232 (0.74)	1.7106 (1.62)	−0.0063 (0.00)	−0.7883 (−1.26)	−0.2184 *** (−2.67)	−0.5801 (−0.80)	−2.1122 *** (−2.99)	5.2730 *** (4.95)	−0.6802 (−1.26)
1-year	−0.4530 * (−1.78)	1.7010 (1.58)	2.6246 ** (2.15)	0.9969 (0.78)	−0.1113 (−0.15)	−0.6275 (−1.19)	3.4466 (1.63)	1.3445 (1.05)	2.4360 (1.00)	1.5625 (0.94)
1.5-year	−0.8415 *** (−2.90)	3.8637 *** (3.60)	3.2940 *** (2.89)	1.5997 (1.48)	1.1380 (1.67)	−0.6187 (−1.55)	1.6598 (1.33)	1.0255 (1.27)	2.4514 ** (2.47)	−0.0229 (−0.03)
2-year	−0.5971 * (−1.75)	2.5194 ** (2.33)	2.9679 ** (2.26)	0.3871 (0.37)	0.3205 (0.45)	−0.3897 (−0.85)	1.2892 (1.00)	1.2088 (1.41)	0.8175 (0.70)	−0.6564 (−1.05)
2.5-year	−0.5870 (−1.46)	2.7539 ** (2.27)	2.0893 (1.45)	0.1286 (0.10)	0.4581 (0.53)	−0.4520 (−0.91)	0.4601 (0.28)	1.6082 (1.71)	1.9632 (1.12)	−1.4307 (−1.42)
3-year	−0.5071 (−1.43)	2.4093 ** (2.57)	2.8336 ** (2.31)	−0.6142 (−0.57)	0.4372 (0.65)	−0.6708 (−1.02)	2.5996 (1.31)	1.7510 * (1.92)	−0.4228 (−0.21)	−0.4781 (−0.45)
Panel B: Hot Market										
	Without Earnings Management					**With Earnings Management**				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.0321 (−1.48)	1.3408 *** (8.80)	0.4935 *** (2.67)	−0.9661 *** (−4.84)	0.0097 (0.05)	−0.1187 *** (−4.82)	1.3465 *** (7.24)	1.2553 *** (5.49)	−0.5801 ** (−2.30)	0.5673 ** (2.43)
1-year	−0.0701 * (−1.67)	1.2762 *** (8.97)	1.2107 *** (5.73)	−0.4624 *** (−3.24)	0.2989 (1.18)	−0.1287 *** (−2.88)	1.2679 *** (7.83)	1.5987 *** (7.05)	−0.4350 *** (−2.74)	0.1905 (0.73)
1.5-year	−0.0471 (−0.86)	1.1716 *** (5.46)	1.2974 *** (4.20)	−0.5432 *** (−2.93)	0.1036 (0.54)	−0.1758 *** (−2.69)	1.1656 *** (4.88)	1.8344 *** (5.44)	−0.5723 *** (−2.68)	0.4882 ** (2.11)
2-year	−0.0523 (−0.67)	1.0887 *** (4.28)	1.0441 ** (2.29)	−0.5958 *** (−2.91)	0.0080 (0.04)	−0.148 * (−1.72)	1.0563 *** (4.18)	1.5285 *** (3.25)	−0.6699 *** (−3.02)	0.0204 (0.08)
2.5-year	−0.0643 (−0.69)	1.2576 *** (4.86)	1.4821 *** (3.31)	−0.5195 ** (−2.22)	0.1815 (0.89)	−0.1624 * (−1.75)	0.8205 *** (3.44)	1.1541 *** (2.78)	−0.6152 *** (−2.68)	0.1911 (0.93)
3-year	−0.1595 (−1.27)	1.2437 *** (4.58)	2.0742 *** (4.35)	−0.9604 *** (−2.87)	0.5720 ** (2.11)	−0.1066 (−1.02)	0.9002 *** (4.32)	1.3726 *** (3.62)	−0.7987 *** (−2.93)	−0.0065 (−0.03)

Note: ***, ** and * denote the significance levels at the 1%, 5% and 10%, respectively.

Appendix A.2. Results by Using "Forecast Error Model" for Earnings Management Measure

The results with alternative earnings management measurement by following DuCharme et al. (2001)'s "Forecast Error Model" in their Equation (A2), as follows.

$$TAEM_{it} = \frac{AC_{it}}{A_{it-1}} - \left(a_0 \left(\frac{1}{A_{it-1}} \right) + a_1 \left(\frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} \right) + a_2 \left(\frac{\Delta PPE_{it}}{A_{it-1}} \right) \right) \quad \text{(A2)}$$

Table A2. Results by using "forecast error model" for earnings management measure.

Panel A: Cold Market										
	Without Earnings Management					With Earnings Management				
	AR	RMRF	SMB	HML	MOM	AR	RMRF	SMB	HML	MOM
6-month	−0.1544 (−1.29)	1.4134 ** (1.99)	1.3473 (1.38)	−0.2354 (−0.19)	−0.5135 (−0.84)	−0.1900 (−1.21)	2.3006 ** (2.55)	0.1921 (0.17)	1.6350 (0.99)	0.8312 (0.89)
1-year	−0.3592 (−1.62)	1.9865 ** (2.16)	2.040 (1.99)	0.7243 (0.65)	0.0172 (0.03)	−0.1304 (−0.44)	1.6083 (1.39)	1.1612 (1.26)	0.1295 (0.08)	−0.1304 (−0.44)
1.5-year	−0.5567 ** (−2.25)	3.3633 *** (3.49)	2.7335 *** (2.86)	0.9033 (0.94)	0.9610 (1.55)	−0.4208 (−1.49)	1.8293 ** (2.04)	0.7031 (0.98)	0.7861 (0.78)	0.4181 (0.61)
2-year	−0.3732 (−1.24)	2.2045 ** (2.16)	2.4045 ** (2.25)	−0.2542 (−0.28)	0.1283 (0.20)	−0.2564 (−0.56)	3.0142 ** (2.28)	0.7572 (0.66)	−1.4567 (−1.17)	0.9887 (1.18)
2.5-year	−0.5267 (−1.41)	2.8198 ** (2.44)	1.9218 (1.56)	−0.1375 (−0.13)	0.5210 (0.70)	−0.3307 (−0.61)	4.0146 ** (2.41)	2.0771 * (1.92)	−2.1625 (−1.65)	0.8906 (0.86)
3-year	−0.5996 * (−1.84)	2.8835 *** (3.53)	3.3922 *** (3.45)	−1.0200 (−1.28)	0.6742 (1.25)	0.4260 (0.69)	0.0218 (0.01)	1.6775 (1.60)	−1.9409 (−1.67)	−0.9941 (−1.10)
Panel B: Hot Market										
	Without Earnings Management					With Earnings Management				
	AR	RMRF	SMB	HML	MOM	AR	RMRF	SMB	HML	MOM
6-month	−0.0283 (−1.55)	1.2591 *** (9.40)	0.5779 *** (3.37)	−0.9559 *** (−5.15)	−0.0258 (−0.15)	−0.0941 *** (−4.61)	1.2907 *** (8.00)	1.2215 *** (5.74)	−0.5982 *** (−2.55)	0.3989 ** (1.94)
1-year	−0.0653 * (−1.88)	1.2752 *** (9.64)	1.2335 *** (6.22)	−0.4636 *** (−3.53)	0.2801 (1.27)	−0.1072 *** (−2.98)	1.2710 *** (8.54)	1.6241 *** (7.62)	−0.4582 *** (−3.15)	0.0885 (0.39)
1.5-year	−0.0446 (−0.93)	1.1881 *** (6.10)	1.2988 *** (4.50)	−0.5217 *** (−3.01)	0.1484 (0.85)	−0.1356 ** (−2.44)	1.1225 *** (5.24)	1.8161 *** (5.76)	−0.6137 *** (−3.10)	0.3963 * (1.92)
2-year	−0.0579 (−0.85)	1.1832 *** (5.24)	1.1184 *** (2.71)	−0.5384 *** (−2.81)	0.0545 (0.27)	−0.1097 (−1.47)	1.0142 *** (4.53)	1.4462 *** (3.40)	−0.7008 *** (−3.39)	−0.0478 (−0.21)
2.5-year	−0.0623 (−0.78)	1.2678 *** (5.70)	1.4113 *** (3.61)	−0.4794 ** (−2.24)	0.1973 (1.06)	−0.1546 * (−1.92)	0.9072 *** (4.45)	1.2286 *** (3.38)	−0.5740 *** (−2.71)	0.1427 (0.76)
3-year	−0.1377 (−1.26)	1.2562 *** (5.35)	1.9696 *** (4.66)	−0.9255 *** (−3.04)	0.5503 ** (2.22)	−0.0887 (−0.97)	0.9040 *** (5.00)	1.3290 *** (3.91)	−0.7886 *** (−3.13)	−0.0384 (−0.19)

Note: ***, ** and * denote the significance levels at the 1%, 5% and 10%, respectively.

Appendix B. Results Based on Categorizing IPOs into "above Medium" and "below Medium" Market Condition Groups

Table A3. Results based on categorizing ipos into "above medium" and "below medium" market condition groups.

Panel A: Cold Market										
	Without Earnings Management					With Earnings Management				
	AR	RMRF	SMB	HML	MOM	AR	RMRF	SMB	HML	MOM
6-month	−0.0170 (−0.43)	1.5499 *** (5.44)	0.48260 (1.27)	−0.3178 (−0.74)	−0.1951 (−0.77)	−0.0315 (−0.78)	1.2895 *** (4.54)	1.6291 *** (4.08)	−0.3046 (−0.68)	0.2222 (0.83)
1-year	−0.0352 (−0.48)	1.1169 *** (3.72)	2.0811 *** (4.79)	−0.4076 (−1.11)	−0.3600 (−1.18)	−0.0965 (−1.36)	0.9769 *** (3.62)	2.0917 *** (5.33)	−0.5201 (−1.36)	0.3305 (1.05)
1.5-year	−0.2061 * (−1.77)	1.8390 *** (4.64)	2.7766 *** (5.45)	−0.1113 (−0.26)	0.3809 (1.04)	−0.0971 (−1.02)	0.6653 ** (2.20)	2.0463 *** (5.51)	−0.7306 *** (−1.96)	0.2847 (0.87)
2-year	−0.1774 (−1.13)	1.7458 *** (4.16)	2.5529 *** (5.01)	−0.6948 (−1.53)	−0.0851 (−0.22)	−0.0544 (−0.40)	0.8951 ** (2.48)	3.3201 *** (7.07)	−1.7680 *** (−4.13)	0.2210 (0.57)
2.5-year	−0.2363 (−1.26)	1.9182 *** (4.24)	2.8489 *** (4.96)	−0.6574 (−1.35)	0.2889 (0.68)	0.0293 (0.20)	0.5304 (1.37)	3.0916 *** (6.48)	−1.7714 *** (−4.16)	0.3237 (0.94)
3-year	−0.2431 (−0.95)	2.0801 *** (3.63)	3.6414 *** (5.29)	−1.5923 *** (−2.55)	0.5073 (1.03)	−0.1580 (−0.76)	0.9771 ** (1.94)	2.8020 *** (4.90)	−1.6930 *** (−3.14)	0.8415 ** (1.99)

Table A3. *Cont.*

Panel B: Hot Market										
	Without Earnings Management					With Earnings Management				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.0346 ** (−2.24)	1.3046 *** (11.04)	0.7080 *** (4.67)	−0.7476 *** (−4.48)	0.0114 (0.08)	−0.0718 *** (−4.22)	1.2965 *** (9.34)	1.1206 *** (6.21)	−0.5342 *** (−2.70)	0.2281 (1.40)
1-year	−0.0657 ** (−2.45)	1.3062 *** (12.56)	1.2565 *** (7.65)	−0.3887 *** (−3.54)	0.1365 (0.81)	−0.0902 *** (−3.12)	1.1834 *** (10.17)	1.4550 *** (8.20)	−0.4649 *** (−3.74)	0.0629 (0.36)
1.5-year	−0.0594 (−1.61)	1.2290 *** (8.54)	1.2705 *** (5.65)	−0.4140 *** (−2.94)	0.1027 (0.76)	−0.1079 *** (−2.58)	1.0554 *** (6.73)	1.6454 *** (6.72)	−0.6212 *** (−3.92)	0.2626 * (1.69)
2-year	−0.0831* (−1.68)	1.1973 *** (7.90)	1.1802 *** (3.98)	−0.4618 *** (−3.06)	0.0546 (0.36)	−0.0995 * (−1.90)	0.9527 *** (6.42)	1.2543 *** (4.07)	−0.6695 *** (−4.17)	−0.1169 (−0.71)
2.5-year	−0.0955 * (−1.68)	1.2454 *** (7.70)	1.4536 *** (4.82)	−0.4122 ** (−2.46)	0.2018 (1.39)	−0.1354 ** (−2.42)	0.8822 *** (5.80)	1.1975 *** (4.13)	−0.5387 *** (−3.19)	0.0806 (0.57)
3-year	−0.1392 * (−1.80)	1.2351 *** (7.10)	1.8887 *** (5.67)	−0.7704 *** (−3.29)	0.4342 ** (2.29)	−0.1075 * (−1.64)	0.9356 *** (6.73)	1.3563 *** (4.83)	−0.6498 *** (−3.27)	−0.0420 (−0.26)

Note: ***, ** and * denote the significance levels at the 1%, 5% and 10%, respectively.

Appendix C. Results for the Dotcom Bubble Period, 1995–2001

Table A4. Results for the dotcom bubble period, 1995–2001.

Panel A: Cold Market										
	Without Earnings Management					With Earnings Management				
	AR	**RMRF**	**SMB**	**HML**	**MOM**	**AR**	**RMRF**	**SMB**	**HML**	**MOM**
6-month	−0.1501 (−1.30)	0.0082 (0.01)	−0.7006 (−0.70)	−1.8694 ** (−2.05)	−0.3269 (−0.67)	−0.2709 (−1.65)	1.5747 (1.65)	0.3968 (0.27)	1.1793 (0.96)	0.6721 (1.17)
1-year	0.1759 (0.35)	1.9540 (0.95)	0.4578 (0.13)	−0.8953 (−0.87)	−0.4069 (−0.27)	−0.6149 * (−1.85)	−0.8856 (−0.73)	5.9016 ** (2.54)	−0.8881 (−1.15)	−0.4891 (−0.60)
1.5-year	1.2141 * (1.77)	3.0440 (1.62)	−6.3820 * (−1.76)	−1.6495 (−1.21)	0.5281 (0.68)	0.3255 (0.56)	−0.0265 (−0.03)	−2.0417 (−0.69)	−1.8740 * (−1.98)	−0.7362 (−1.38)
2-year	0.1731 (0.40)	2.9125 (1.55)	−1.3200 (−0.75)	0.3226 (0.34)	0.3116 (0.34)	−0.0124 (−0.01)	−0.6198 (−0.11)	3.6817 (0.54)	−2.0389 (−0.69)	−1.4864 (−0.45)
2.5-year	−0.2162 (−0.57)	2.5061 (1.49)	0.1002 (0.06)	0.7114 (0.86)	−0.0258 (−0.03)	0.4053 (0.28)	−2.5702 (−0.46)	2.3437 (0.34)	−1.9372 (−0.68)	−2.5723 (−0.73)
3-year	−0.1089 (−0.26)	1.7614 (1.33)	−0.0112 (−0.01)	0.3073 (0.33)	−0.2690 (−0.26)	0.2308 (0.28)	3.2476 (1.15)	−1.4239 (−0.43)	0.3103 (0.14)	1.3150 (0.59)
Panel B: Hot Market										
	Without Earnings Management					With Earnings Management				
6-month	−0.0083 (−0.25)	0.9856 *** (4.96)	0.2635 (1.11)	−1.5104 *** (−5.66)	−0.3919 (−1.31)	−0.0987 *** (−3.40)	1.0137 *** (5.54)	1.2251 *** (5.79)	−0.7784 *** (−3.14)	0.2278 (0.88)
1-year	−0.0540 (−0.56)	0.8817 *** (3.27)	1.1865 *** (4.51)	−0.6472 ** (−2.24)	0.3348 (0.75)	−0.0998 (−1.06)	1.1699 *** (4.62)	1.5965 *** (6.28)	−0.4616 * (−1.67)	0.0887 (0.21)
1.5-year	−0.0609 (−0.45)	0.6997 ** (2.21)	1.1067 *** (2.81)	−0.7628 *** (−2.63)	0.1536 (0.36)	−0.5132 *** (−3.18)	1.6355 *** (4.78)	1.5828 *** (3.67)	0.0406 (0.13)	1.4537 *** (2.88)
2-year	−0.0638 (−0.33)	0.5165 (1.23)	0.6177 (1.00)	−0.8197 ** (−2.11)	0.1028 (0.23)	−0.1008 (−0.50)	1.0464 *** (2.56)	1.5325 *** (2.46)	−0.7066 * (−1.82)	−0.1717 (−0.36)
2.5-year	0.0185 (0.10)	0.6445 (1.21)	1.1770 ** (1.98)	−0.8846 ** (−2.27)	0.0565 (0.17)	−0.2340 (−1.24)	0.9272 ** (1.93)	1.1567 *** (2.09)	−0.4501 (−1.28)	0.2159 (0.68)
3-year	−0.3418 (−1.20)	1.5209 *** (2.70)	2.2056 *** (3.68)	−0.6487 (−1.02)	0.6721 (1.45)	−0.3530 (−1.55)	1.3274 *** (3.17)	1.5735 *** (3.37)	−0.3615 (−0.74)	0.3141 (0.86)

Note: (1) ***, ** and * denote the significance levels at the 1%, 5% and 10%, respectively. (2) In order to maintain statistical consistency, firms are divided into two, instead of three, market condition groups during this shorter sub-sample period, due to the much smaller sample size.

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