# Do Lockups Constrain Earnings Management by IPO Issuers?

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*This draft: May 2013*

**Abstract**

Initial public offering (IPO) firms typically employ lockups to mitigate information asymmetry and agency problems that plague new equity issues. This paper examines association between lockup length and the level of earnings management in IPOs. We contend that with significant liquidity and portfolio non-diversification costs, longer lockups remove insiders' incentives for earnings management to avoid potential wealth losses at lockup expiry. Consistent with this argument, we document a significant inverse relationship between earnings management and lockup length for a sample of UK IPOs over 1995-2006. Longer lockups effectively reduce earnings management and this result is invariant to adjustments for potential endogeneity of lockups and alternative proxy for earnings management. Overall, our evidence suggests that lockup length acts as an important constraint to opportunistic earnings management around equity issues.

*JEL Classification: G24, M13, M41*

*Keywords: Initial Public Offerings, IPO lockups, Earnings Management, Venture Capital*

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## Introduction

Prior research has documented that earnings management is pervasive around initial public offerings (IPOs). IPO setting provides both "opportunity" and "incentive" to manage earnings and make the financial statements look as strong as possible. The opportunity exists in the form of high degree of information asymmetry between insiders and investors of newly public firm. Moreover, accrual accounting system under the Generally Accepted Accounting Principles (GAAP) provides managerial discretion to change accounting policies and reported financial statements prior to the IPO (Armstrong et al., 2009, Ball and Shivakumar, 2008, Teoh et al., 1998a). Insiders typically hold large fraction of equity in the firm before going public and IPO is the first opportunity for a company's insiders and initial investors to realize the value of their investment in the company. The incentives for issuing firms to manage earnings upwards include higher issuing prices and large post IPO equity valuations. Consistent with this argument, DuCharme et al. (2001) find that pre-IPO earnings management is related to the initial firm value.

Earnings management has also been shown to have negative implications for the post-issue long term operating and return performance of IPOs and seasoned equity offerings (SEOs) (Rangan, 1998, Teoh et al., 1998a, Teoh et al., 1998b). These studies find that IPOs and SEOs manage earnings upwards at the time of equity offerings. The reversal of managed earnings in the post-IPO periods results in declining earnings creating disappointment in the market and revising stock prices and valuations downwards. Recent evidence also shows that IPOs associated with higher earnings management are also more likely to delist due to performance failure (Li and Zhou, 2006, Alhadab et al., 2013). This evidence suggests that earnings management around public offerings has severe negative consequences for the wealth of firms' insiders depending on their ability to sell shares at IPO (secondary shares) or in periods immediately after IPO. Firms' insiders, however, retain large equity shares at IPO to signal firm quality (Leland and Pyle, 1977). IPO lockups, on the other hand, restrict insiders of issuing firms from selling their equity for a certain post-issue period. Prior research has documented an extensive use of compulsory and voluntary lockups in IPOs (Brav and Gompers, 2003, Espenlaub et al., 2001, Field and Hanka, 2001, Goergen et al., 2006, Hoque, 2011, Yung and Zender, 2010). Therefore, the incentives to manage earnings are likely to persist in the months following IPO due to lockup period(Teoh et al., 1998a, Wongsunwai, 2012).

While the motivations for the use of lockups in IPOs have been examined extensively, the linkage between a firm's choice of lockup length and earnings management remains unexplored. The main aim of this paper is to document the relation between earnings management and a firm's choice of lockup characteristics, particularly the length, in IPO settings. Prior literature (Arthurs et al., 2009, Brau et al., 2005, Brav and Gompers, 2003, Goergen et al., 2006, Yung and Zender, 2010) argues that lockups signal firm quality and also act as a commitment device to alleviate moral hazard in newly public firms. We extend the existing literature by testing to determine if the lockup period also decreases the extent of earnings management in IPO process. We argue that a longer lockup is a costly commitment by IPO insiders which has severe negative consequences for firm's insiders in case of poor post-IPO operating and stock return performance. We maintain that firms with longer lockups avoid aggressive accounting accruals (earnings management) because of potential wealth losses at lockup expiry in the form of lower stock prices caused by earnings reversals and poor performance in post-IPO periods. Specifically, we expect a negative relation between lockup length and the level of earnings management by IPO firms. In addition to testing for correlation between lockup length and earnings management, we also address the endogeneity problem as the choice of lockup length may not be exogenous.

Overall empirical results support our predictions. Based on a sample of UK IPOs from 1995 to 2006, we find a strong negative correlation between the lockup length and earnings management proxy of discretionary working capital accruals. This inverse relation remains robust after addressing the possible endogeneity problem between lockup period and earnings management. These findings are consistent with the literature that shows that lockups signal firm quality and act as a commitment device to reduce moral hazard in IPO firms(Brau et al., 2005, Brav and Gompers, 2003, Yung and Zender, 2010).

Our paper makes important contribution to both lockup and earnings management literature. Although, there has been some examination of earnings management around lockup expiry (Wongsunwai, 2012), the question of whether lockup period could restrain earnings management around IPOs has remained unanswered. We also add to the literature that finds positive impact of reputed third party certifiers (underwriters, auditors, attorneys) and venture capitalists in IPO/SEO process(Brau and Johnson, 2009, Chen et al., 2013, Jo et al., 2007, Lee and Masulis, 2011, Morsfield and Tan, 2006) by showing that lockup period could serve as alternative/complementary mechanism for reducing earnings management around IPOs.

The rest of this paper is organised as follows. Section I reviews the related literature and provides the hypothesis. Section II provides details of sample, data sources and descriptive statistics. In section III, we discuss model specifications and regression results. Section IV provides results of our robustness tests. Section V concludes the paper.

# I. Related literature and hypothesis development

## A. Earnings Management around IPOs

A growing body of literature has examined the use of accounting accruals to inflate earnings around public offerings. The IPO process is susceptible to upwards earnings management due to high information asymmetry and insiders' opportunistic incentives at the time of public offering. Lack of trading history, few publicly available information and lack of news media coverage create information asymmetry between the issuers and investors at the time of IPO. IPO prospectus provides much of the information to investors including the operating and earnings information for mostly three pre-IPO years. However, Accounting Principles Board Opinion 20 allows managers discretion over change in accounting policies and restatement of reported financial results retroactively before going public. This gives managers opportunity to manage accruals in order to strengthen earnings and to make their financial results look as strong as possible. The insiders of issuing firms have incentives to boost earnings through accruals in the IPO process to ensure that offerings are fully subscribed and priced higher to realise larger proceeds. Underwriters base their pricing of shares on reported earnings of prospective IPO firms and price-earnings multiples of listed firms in the same industry (Teoh et al., 1998c). Issuing price of the IPO firm has direct and immediate impact on the post-offering valuation of the firm and wealth of firms' insiders (including large cash proceeds in case of higher percentage of secondary shares sold). Consistent with this argument, a number of studies suggest that insiders of issuing firms manipulate earnings to get higher offer prices and valuations (DuCharme et al., 2001, Teoh et al., 1998a, Dechow and Skinner, 2000).

The prior literature has identified that earnings management prior to and during the offering year has severe negative consequences for the post-issue IPO and SEO stock returns and operating performance (Rangan, 1998, DuCharme et al., 2001, Teoh et al., 1998a, Teoh et al., 1998b, Teoh et al., 1998c). These studies have found that issuing firms exhibit unusually high levels of income increasing abnormal accruals in the period around equity offerings. Furthermore, abnormal accruals during the offer year predict post–issue long term stock and operating underperformance. Teoh et al. (1998a), for example, find that IPO firms in the most

aggressive quartile of earnings management experience 20 percent lower aftermarket stock returns than issuing firms in the most conservative quartile of earnings management. Examining the post-IPO earnings performance, Teoh et al. (1998c) report that high issue year unexpected current accruals predict future earnings underperformance. Similarly, Rangan (1998), Teoh et al. (1998b) and Cohen and Zarowin (2010) find evidence of abnormal accruals around equity offerings and show a negative relation between earnings management and long run post-issue operating and stock return performance for SEOs. The collective evidence from these studies suggests that investors are fooled by earnings inflation at the time of offerings and markets initially overvalue firms with higher level of accounting accruals (Sloan, 1996). The subsequent earnings reversal in post-IPO periods leads to earnings declines and poor operating performance. The disappointed investors revalue firms downwards causing poor long term stock returns. The poor long run stock and operating performance due to earnings management might result in failure and delisting of IPO firms. Li and Zhou (2006) and Alhadab et al. (2013) find evidence consistent with this argument and show that IPO firms with higher levels of earnings management are more likely to delist for performance failure and have lower survival rates.

Rangan (1998) conclude that pre-offering insiders of issuing firms benefit form overvaluation of share prices that is caused by the abnormal accruals (earnings management). This would benefit those pre-offering shareholders who are able to sell most of their shares at IPO or in the immediate periods after IPO. However, it is known that firms' insiders and initial investors (venture capital/private equity providers) do not sell large portions of their equity at the time of IPO mainly due to two reasons. First, inside managers might retain large equity stakes to signal firm's quality in order to reduce information asymmetry surrounding the issuing firm (Leland and Pyle, 1977). Moreover, venture capitalists (VCs) rarely complete a full exit by selling their shares at the time of IPO and continue to hold substantial equity stakes for many years after the IPO (Barry et al., 1990, Gompers and Lerner, 2002). Secondly, lockup agreements restrict the sale of shares by insiders and VCs for a certain post-IPO period[1]. Teoh et al. (1998a), therefore, suggest that the incentives for managing earnings are also present in the post-IPO periods.

[1] A standardised lockup period of 180 days is more common in US (Field and Hanka, 2001; Mohan and Chen, 2001; Baru et al., 2004). Evidence from UK, however, shows the use of more diverse and longer lockups (Espenlaub et al., 2001; Hoque, 2011).

### B. Lockup agreements and earnings management

Prior research in constraints of earnings management around equity offerings has largely focused on the role of third party certifiers (VCs, underwriters, auditors) in reducing earnings management around IPOs. Morsfield and Tan (2006), for example, find lower IPO year earnings management in US IPOs backed by VCs. Lee and Masulis (2011) report that reputed underwriters and VCs significantly reduce earnings management in IPOs. Brau and Johnson (2009) find a significant negative relation between earnings management and prestigious third party certifiers (auditors, underwriters, attorneys and VCs).Similarly, Wongsunwai (2012) find that companies backed by lower quality VCs report higher quarterly abnormal accruals in the periods leading up to the lockup expiration. However, none of these studies have focused on the role of lockup length in constraining earnings management by IPO firms. Extant literature on IPO lockups suggest that lockup reduce information asymmetry by signalling firm quality and also work as bonding mechanism in post-IPO periods to reduce moral hazard. Brau et al. (2005) find empirical support for their prediction that the insiders of better quality firms commit to longer lockup to signal their quality. Arthurs et al. (2009) report similar findings for US venture IPOs and find that lockups signal quality and reduce valuation uncertainty for ventures with negative information. Brav and Gompers (2003), on the other hand, find support for bonding role of lockups to alleviate moral hazard in aftermarket. Specifically, they show that firms associated with greater potential for moral hazard use longer lockups as a commitment device to assuage the concerns of investors. A lockup is a costly mechanism because it creates liquidity cost and non-diversification of the insider's portfolios (Arthurs et al., 2009). The longer the lockup period, the higher will be the liquidity and non-diversifications costs. Brav and Gompers (2003) argue that firm quality will be revealed in post-IPO period through regulatory filings, news stories and analyst coverage and any negative information would hurt insiders in the same way as outside investors. Taken together, this evidence suggests that lockup length could affect the insiders' incentives of managing earnings around IPOs. The predictions of both signalling and commitment hypotheses of lockups could explain association between lockup length and earnings management. Firstly, if firms signal their quality by accepting longer lockups, they will avoid aggressive accruals management and damage the quality signal by resorting to poor financial reporting. Secondly, if firms reduce moral hazard by committing to longer lockups, then lockup length will mitigate agency conflicts and restrict earrings management. Finally, empirical evidence shows that aggressive earnings management is related to poor earnings performance and negative stock returns in post-IPO periods (DuCharme et al., 2001, Rangan,

1998, Teoh et al., 1998a). The insiders of firms with longer lockups are subject to more wealth losses due to lower stock prices at the expiry of lockup. We predict that insiders of firms with longer lockups will not engage in aggressive earnings management to avoid substantial wealth losses at lockup expiry. As a result, firms selecting longer lockups are less likely to engage in earnings management. Hence, we expect a negative relation between lockup length and earnings management.

# II. Data and measurement

## A. Sample and Data sources

Our sample consists of UK IPOs that went public on the main market (Official List) of London Stock Exchange (LSE) between January 1995 and December 2006. We exclude all financial firms (SIC code 6xxx) including investment trusts and venture capital trusts (VCTs), utility firms (SIC code 49xx), re-admissions, non-UK firms and firms with missing prospectuses and necessary data for calculating discretionary accruals[2]. The IPO firms reporting no lockup provision in their IPO prospectus are also excluded from our sample[3]. Thus, our final sample consists of 268 IPOs with lockups reported in their prospectuses. The issuing firms are identified from new issues list available from LSE website for the period 1998-2006. For years 1995-1997, we identify IPOs from Thomson One Banker and Perfect Filings database. Information on issue price, market capitalisation, date of IPO etc. is collected from these sources. We use Perfect Filings database to get IPO prospectuses and hand collect variables such as lockup type and duration, insider ownership, VC backing, underwriter, company founding date etc. Relevant financial variables for IPO and control firms are from WorldScope database and from IPO prospectuses when information is missing in WorldScope. Finally, data on stock prices is collected from DataStream.

## B. Measure of Earnings Management

We use discretionary accruals from a cross sectional modified Jones model (Dechow et al., 1995) as our proxy of earnings management. Our focus is on working capital accruals because they are more likely to be manipulated by the managers of issuing firms (Teoh et al., 1998a). Consistent with prior US and UK studies (Peasnell et al., 2005, Teoh et al., 1998a),

[2] This is consistent with the prior literature. For example, Lee and Masulis (2011) and Jo et al. (2007) state that financial and utility firms have significantly different disclosure requirement due to regulated industries and nature of their accruals might be different from other industrial firms.

[3] After applying earlier filters, there were only 19 firms from 1995 to 2006 which reported no lockup provision in their IPO prospectus.

the normal (expected) working capital accruals of an IPO firm *i* in year *t* are estimated using the following cross sectional OLS regression:

$$\frac{WCA_{it}}{TA_{i,t-1}} = \alpha_0 \left(\frac{1}{TA_{i,t-1}}\right) + \alpha_1 \left(\frac{\Delta\, REV_{it}}{TA_{i,t-1}}\right) + \varepsilon_{it} \qquad (1)$$

Where $WCA$ is working capital accruals measured as change in non-cash current assets minus the change in current liabilities, $\Delta REV$ is change in revenue,$TA$ is total assets, $\alpha_0$ and $\alpha_1$ are regression coefficients and $\varepsilon_{it}$ is the regression residual. The model is estimated separately for each year and each two-digit SIC industry category for all available non-IPO firms.[4] The variables are scaled by lagged total assets to reduce the hetroskedasticity and the cross sectional approach controls for the industry-wide fluctuations in the economic conditions that impact accruals (Teoh et al., 1998c). We require at least ten industry-year observations in a two-digit SIC industry for estimation purposes[5]. Using the estimated coefficients from equation 1, the non-discretionary (expected) working capital accruals for sample IPO firms are as follows:

$$NDWCA_{i,t} = \hat{\alpha}_0 \left(\frac{1}{TA_{i,t-1}}\right) + \hat{\alpha}_1 \left(\frac{\Delta REV_{it} - \Delta REC_{it}}{TA_{i,t-1}}\right) \qquad (2)$$

$\Delta REC$ is change in receivables during the year and $\hat{\alpha}_0$ and $\hat{\alpha}_1$ are estimates of $\alpha_0$ and $\alpha_1$ respectively obtained from equation 1. $\Delta REC$ is included to control for the credit sales manipulation by the issuers (Dechow et al., 1995).

Discretionary working capital accruals (DWCA) are measured as:

$$DWCA_{i,t} = \frac{WCA_{it}}{TA_{i,t-1}} - NDWCA_{i,t} \qquad (3)$$

For robustness of our results, we also calculate total accruals using a cash flow statement approach following Hribar and Collins (2002).

### C. Descriptive statistics

Table 1 provides sample distribution across issue years (panel A) and industry groups (Panel B) along with the summary statistics for DWCA, our proxy for earnings management. Panel A reports the frequency distribution of IPOs for the sample period from 1995 to 2006. IPO

[4] We exclude all observations within five years of an IPO from each year and two-digit SIC industry combination following Armstrong et al. (2009).

[5] All variables are winsorized at 1% and 99% to prevent the influence of extreme values.

frequency ranges from a mere 1.87% in year 2003 to 20.15% in year 2000. The bubble period (1999-2000) accounts for about 27% of the sample IPOs and just over three quarters of the sample IPOs went public in years 1995-2000 which show the negative impact of bubble period on market listings after year 2000[6]. Panel A also shows the DWCA as a percentage of lagged total assets across issue years. DWCA for year 2006 have the lowest mean and median respectively at -6.5% and -6.2% indicating very conservative accruals management. However, IPOs issued in years 2003 and 2004 show aggressive accruals management with mean DWCA at 19.5% (median=11.9%).

Panel B (Table 1) reports IPO frequency based on industry sectors measured by two-digit SIC codes and shows that IPOs are more frequent in computer equipment and services sectors comprising of almost 28% of the sample .Other industry sectors having large number of IPOs include engineering and management services, retail, and chemical products. Together with computer equipment and services, these three industry sectors account for 49% of the sample. Among industry sectors, transportation has the lowest mean DWCA at -18% (median= -7.8%) and two other industry portfolios (durable goods and engineering and management services) have mean (median) negative DWCA indicating conservative earnings management. IPOs in high tech industries such as computer equipment and services and electronic equipment exhibit aggressive accruals management with mean (median) DWCA at 12% (9%) and 11.1% (9.7%) respectively consistent with the earlier findings of (Brau and Johnson, 2009).

Panel A of Table 2 presents the descriptive statistics of variables used in the regression analysis for full sample of 268 IPOs. The mean and median values of DWCA for full sample are 0.051 and 0.033 respectively. These statistics suggest that issuing firms, on average, boost their earnings by around 5% of beginning assets in the IPO year and are comparable to prior research on IPO earnings management(Brau and Johnson, 2009, Morsfield and Tan, 2006, Teoh et al., 1998a).[7] The IPO firms go public with an average (median) period of 15.205 (12.367) months, measured as number of month from IPO date until the lockup expiry date. There is high dispersion ($\sigma$ =6.02 months) and significant clustering at 12 and 24 months lockups. The median lockup length of over 12 months in our sample is strikingly different from median lockup of 6 months consistently reported in US studies (Brav and Gompers, 2003, Field and Hanka, 2001, Mohan and Chen, 2001, Yung and Zender, 2010). This is also

[6] This drop in IPO frequency is also partly due to the exclusion of a large number of financial IPOs from our sample for the period 1998-2006.

[7] For example Morsefield and Tan (2006) and Brau and Johnson (2009) report mean (median) discretionary current accruals of 5.13% (4.12%) and 7.6% (2.4%) respectively for US IPOs.

consistent with the heterogeneity and diversity of UK lockups reported by (Espenlaub et al., 2001, Hoque, 2011). The IPOs experience average initial returns (IR) of 12.017% during the sample period. The mean (median) market share of underwriter based on number of IPOs underwritten in preceding year is 2.36% (2.41%) with a maximum of 4.99% (not reported) for a single underwriter. More than half (56.3%) of the sample IPOs are backed by VCs/private equity providers, and insiders (directors and officers) retain an average 24.65% of the post IPO equity. The mean value of total assets (Assets) for issuers in their pre-IPO year is £ 195.451 million with a median value of assets is £22.637 million[8]. The median values of return on assets (ROA) and operating cash flows (OCF) deflated by lagged total assets are 0.07 and 0.09 respectively. IPO firms list with an average age of 15.727 years and have a mean long term debt to total assets ratio (Leverage) of 0.251.

In panel B of Table 2, we break down DWCA by different lockup periods; up to 12 months, 13-18 months and longer than 18 months. Consistent with our prediction, IPOs with longer lockups do not aggressively manage accruals. For example, the mean (median) values of DWCA for IPOs with shorter lockups (12 months or less) are 6.93% (4.69%) and statistically significant. IPOs with lockups longer than 18 months, on the other hand, have insignificant mean (median) DWCA of 1.16% (-0.32%). Comparing the three lockup period groups, we observe that DWCA are a decreasing function of lockup length. In addition, the mean and median differences in DWCA between the shortest (up to 12 months) and the longest (more than 18 months) lockups are statistically significant. These results suggest that the existence of heterogeneity in lockup length results in different levels of earnings management by the issuing firms.

We report bivariate correlations in Table 3 among the variables used in this study. The upper triangle shows Spearman correlations and the lower triangle presents Pearson correlations of the variables. These correlation coefficients are within normal range suggesting that our model is not affected by the multicollinearity problems.[9] Notably, there is a significant negative correlation between lockup period (Lu Months) and discretionary working capital accruals (DWCA) indicating that lockup length is inversely related to earnings management.

[8] Due to high skewness in this variable, we use log of total assets in all of our tests.

[9] We also check the variance inflation factors (VIFs) for our regression analysis to ensure that our model is not significantly affected by multicollinearity. In our tests, the VIFs of all the explanatory variables are less than 3.87.

# III. Model Specifications and Empirical Results

## A. OLS Regressions of Earnings Management

The univariate tests so far have shown an inverse relation between lockup length and earnings management. In this section, we empirically test this relationship using multivariate analysis. Our aim is to answer the question of whether longer lockups can effectively restrain earnings management in IPO firms. We employ the following OLS model specification:

$$\begin{aligned} DWCA_{i,t} = {} & \beta_0 + \beta_1 Lu\ Months + \beta_2 \mathrm{IR} + \beta_3 Insider\ Ownership + \beta_4 Ln(Total\ Assets) \\ & + \beta_5 Ln(Age) + \beta_6 ROA + \beta_7\ OCF + \beta_8\ Leverage + \beta_9 UW\ Reputation \\ & + \beta_{10} VC + Industry\ Dummies + Year\ Dummies + \varepsilon_{i,t} \end{aligned} \quad (4)$$

Where *DWCA* is our proxy for earnings management obtained from equation (3) and *Lu Months* is the length of lockup period in month. A negative coefficient for *Lu Months* is consistent with our hypothesis that longer lockups constrain aggressive earnings management. We also control for additional variables in the model, following prior literature.

Prior research suggests that aggressive earnings management is associated with higher underpricing (DuCharme et al., 2001, Teoh et al., 1998a). Francis et al. (2012), however, find that conservative accrual management tend to increase the underpricing for IPOs in general and for technology IPOs, in particular. Thus, to control for the effect of underpricing, we include initial returns (*IR*) calculated as percentage difference between offer price and first day closing price. A significant association between equity retention by insiders and earnings management has been documented in the literature (Fan, 2007, Larcker et al., 2007, Warfield et al., 1995). Accordingly, we include *Insider Ownership* measured as the percentage of post-IPO ownership retained by insiders. Large and old firms are less likely to be involved in aggressive accruals management due to close scrutiny by the stock analysts and established management and accounting systems (Lee and Masulis, 2011). We include natural logarithm of *Total Assets* and *Age* of firms in the model to control for the possible size and age effect, where Age is in years from initial founding date to IPO date. Further, we control for the influence of firm performance on earnings management by adding return on assets (*ROA*) to the model, following previous studies (Kothari et al., 2005, Lee and Masulis, 2011). Firms with strong operating cash flow performance have lower incentives to engage in accruals management (Dechow et al., 1995, Becker et al., 1998). Therefore, *OCF*, operating cash flow scaled by lagged total assets, is used to control for cash flow performance. Highly levered firms may resort to aggressive earnings management when they are close to violation of debt

covenants (DeFond and Jiambalvo, 1994). We control leverage by including long term debt to assets ratio (*Leverage*) as the proxy for leverage in our model. Morsfield and Tan (2006) and Hochberg (2012) find that VC backing significantly reduces earnings management in IPOs due to VC certification and monitoring. In addition, previous research also suggests that reputed underwriters effectively reduce earnings management in equity issuing firms (Chen et al., 2013, Jo et al., 2007, Lee and Masulis, 2011). Thus we control for the monitoring effect of VC and underwriter reputation in our model by adding a VC dummy (*VC*) and *UW Reputation* variable, where *UW Reputation* is measured as percentage of IPOs sponsored by an underwriter in the year prior to IPO. Finally, we also include year and industry dummies to control for the possible time and industry effects.

Table 4 presents OLS regression estimates where dependant variable is discretionary working capital accruals (*DWCA*) as percentage of lagged total assets based on modified Jones model. Columns (1) to (4) show different model specifications based on how we include third party financial intermediaries (VC and UW Reputation) and industry and year controls separately. In column (5), we include all control variables and both industry and year controls. In all of the regression models, the coefficient for *Lu Months* is significantly negative (coefficient= -0.028 to -0.041) with varying level of statistical significance depending on model specification. The results suggest that lockup length can effectively reduce earnings management by IPO issuers and are consistent with our earlier univariate analysis.

Next, we discuss results regarding our control variables in the regression models. The variables *IR, Insider ownership* and *Ln (Age)* are statistically insignificant in all the regressions. The significant negative association of firm size (measured by total assets) is consistent with the argument that earnings management is more likely to be detected in large firms due to close scrutiny by market participants (Lee and Masulis, 2011) and large firms being politically sensitive (Watts and Zimmerman, 1978). The variable *OCF* has a significant inverse relation with earnings management implying that firms with strong cash flow performance have lower incentives for managing accruals (Dechow et al., 1995) .The significant positive coefficient on *ROA* is in contrast to the hypothesis that firms with low profitability have higher incentives to manage accruals (Lee and Masulis, 2011). A possible explanation for this result is that an expected growth in sales and income would result in increased working capital accruals to support such growth, and is consistent with the findings of Kothari et al. (2005), that the discretionary accruals have positive correlation with firm performance. The coefficient of *Leverage* is significantly negative and inconsistent with the

avoidance of debt covenant violation argument (DeFond and Jiambalvo, 1994). However, high leverage may induce active monitoring by the creditors resulting in negative relation between leverage and earnings management (Lee and Masulis, 2011). Our results, thus, support the creditor monitoring argument.

Contrary to the monitoring effect of quality underwriters in restraining earnings management proposed by Lee and Masulis (2011), we find that reputed underwriters are associated with significant earnings management. However, our results are consistent with Agrawal and Cooper (2010), who find no evidence of financial reporting quality certification by reputed underwriters and suggest that underwriters' revenue generation concerns outweigh their concerns about reputation. Finally, regression results show a positive but insignificant sign on VC dummy predicting higher earnings management in VC backed IPOs. Our result is inconsistent with recent studies (Hochberg, 2012, Morsfield and Tan, 2006) in finding a negative relation between VC presence and earnings management. A potential explanation is the VC moral hazard problem, where VCs may ignore earnings quality and encourage earnings manipulation to improve short term performance and to achieve higher valuations. Similarly, VC may grandstand (Gompers, 1996) and bring younger companies with low quality financial reporting and higher earnings management to public market.

In summary, the results from Table 4 are consistent with our hypothesis that longer lockups significantly reduce earnings management in IPO firms.

### B. Endogeneity of Lockup Length and Earnings Management

#### 1. 2SLS-IV Regressions

Up to now, our results have shown that lockup length is negatively associated with earnings management and suggest that lockup length significantly reduces earnings management. In our tests, we have assumed that firms with longer lockups choose not to manage earnings aggressively (and firms with shorter lockups manage earnings aggressively). However, the association between lockup length and earnings management may suffer from endogeneity problem as the choice of lockup length may not be exogenous. Firms with conservative earnings management may decide to have longer lockups. To address the possible endogenous choice of lockup, we employ a two-stage least squares (2SLS) method. In the

first stage, we use following OLS model to regress lockup length on a set of variables which are likely to affect the choice of a longer lockup[10]

$$Lu\ Months = \theta_0 + \theta_1 Bubble\ Dummy + Controls \quad (5)$$

$Lu\ Months$ is length of lockup period in months, $Bubble\ Dummy$ is our instrumental variable (IV) coded one for IPOs in years 1999-2000 and zero otherwise, and $Controls$ are all variables previously used in regression model in equation (5). We argue that *Bubble Dummy* is a good IV for lockup duration due to mainly two reasons. First during hot market periods, the information asymmetry problems become less severe due to investors' optimism and general market sentiment. As lockups are used to reduce information asymmetry, there is less need for firms to commit to longer lockups. Secondly, prior studies (Brau et al., 2005, Brav and Gompers, 2003) on lockups suggest that better quality firms use longer lockups to distinguish themselves from poor quality firms. On the other hand, bubble period is associated with listing of lower quality firms taking advantage of market sentiment in bubble periods (Coakley et al., 2007, Ljungqvist et al., 2006). Taken together, this evidence suggests a strong correlation between bubble dummy and lockup length and supports our choice of bubble dummy as an IV for lockup period. We find that *Bubble Dummy* is correlated with *LU Months*, but not with *DWCA*.[11]

In second stage, predicted values from equation (6) are used as a proxy for *LU Months* in the following regression:

$$DWCA = \alpha_0 + \alpha_1 Lu\ Months_{\_hat} + Controls \quad (6)$$

Equation (7) is similar to OLS model (5) except that in equation (7), we use predicted value of *LU Months* from first sate regression model (6).

The results of 2SLS model are presented in Table 5. In the first stage regression, *Bubble Dummy* is significantly negatively related to *LU Months* indicating that issuers are less likely to accept longer lockups in bubble periods. Consistent with our hypothesis, results from second stage regression show a significant negative association between *DWAC* and *LU Months*.[12] Results regarding the control variables are also consistent with our earlier analysis.

[10] We use OLS specification in both stages because dependant variables in equations of both stages are continuous variables.

[11] The Pearson correlation coefficient between *Bubble Dummy* and *LU Months* is -0.239 and significant at 1% level, while the coefficient between *Bubble Dummy* and *DWCA* is -0.014 and statistically insignificant.

[12] The Hausman test rejects the null of exogeneity of LU Months at 5% level (p-value=0.033), indicating the possible endogeneity of lockup period.

To conclude, the results from Table 7 show that longer lockups effectively reduce earnings management even after addressing the possible endogeneity of lockup length. In next section, we use different model specification to test simultaneous determination of lockup length and earnings management.

## 2. The Simultaneous Determination of Lockup Length and Earnings Management

In this section, we address the possible simultaneous relationship between lockup length and the level of accruals management before IPO. Our previous tests, implicitly assumed that lockup length is decided first which in turn helps to reduce the level of earnings management. But the decision about length of lockup period and the level of earnings management may be taken concurrently and firms may employ a strategic mix of both. We use system of equations with *DWCA* and *LU Months* modelled as a function of each other, and a set of control variables. This approach also helps in testing the direction of causality between lockup length and earnings management. To test the simultaneous relationship, we follow Chahine and Goergen (2011)[13] and use a three-stage least squares (3SLS) approach. More specifically, the system of equations is as follows:

$$LU\ Months = \beta_0 + \beta_1 DWCA + \beta_2 IR + \beta_3 Insider\ Ownership + \beta_4 Ln(Total\ Assets) + \beta_5 Ln(Age) + \beta_6 UW\ Reputation + \beta_7 VC + \beta_8\ Leverage + \beta_9 Bubble\ Dummy + Industry\ Dummies + \varepsilon_1 \quad (7)$$

$$DWCA = \beta_0 + \beta_1 Lu\ Months + \beta_2 IR + \beta_3 Insider\ Ownership + \beta_4 Ln(Total\ Assets) + \beta_5 Ln(Age) + \beta_6 UW\ Reputation + \beta_7 VC + \beta_8\ Leverage + \beta_9 ROA + \beta_{10} OCF + Industry\ Dummies + \varepsilon_2 \quad (8)$$

All the variables are as defined earlier. *Bubble Dummy* appears only in lockup length regression and is instrument for *LU Months*, and *ROA* and *OCF* appear in earnings management regression as instruments for *DWCA.* Rest of the variables are common for both equations.

Table 6 presents the results of system of simultaneous equations. The results in model (1) show that *Lu Months* is negative and significant in earnings management regression whereas the coefficient of *DWCA* is insignificant in lockup length regression. The results lend support to our conjecture that lockup length causes reduction in earnings management and not vice-

[13] Chahine and Goergen (2011) use 3SLS to test the simultaneous relationship between IPO performance and VC board membership.

versa. In model (2), following Jo et al. (2007), we exclude insignificant variables from both equations to cure the weak instruments problem. Again, the results are qualitatively similar to model (1) and weak instruments problem does not affect our earlier findings.

The combined results from Table 5 and Table 6 show that our inferences relating to negative association between lockup length and earnings management continue to hold after addressing the possible endogeneity of lockup length and joint determination problem (simultaneity).

## IV. Robustness tests for alternative Measurement of Earnings Management

In this section, we check robustness of our findings by employing an alternative measure of earnings management. Hribar and Collins (2002) report that working capital accruals are biased when calculated using the balance sheet data, primarily due to events like mergers and acquisitions or discontinued operations . We use cash flow based modified Jones model suggested by Hribar and Collins (2002) to estimate total accruals[14].

We re-estimate all models specifications (OLS, 2SLS-IV and simultaneous equations) using discretionary total accruals (*DTAC*) as a proxy of earnings management. Results of robustness tests are presented in Table 7. In all models, the coefficient of *LU Months* is negative and significantly related with *DTAC*. The results from robustness tests confirm our earlier findings that lockups effectively and significantly reduce earnings management in IPO firms.

[14] We run following regression on all non-IPO two-digit SIC code firm and year combinations using total accruals:

$$\frac{TAC_{it}}{TA_{i,t-1}} = \alpha_0\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_1\left(\frac{\Delta\, REV_{it}}{TA_{i,t-1}}\right) + \alpha_2\left(\frac{PPE_{it}}{TA_{i,t-1}}\right) + \varepsilon_{it}$$

Where $TAC_{it} = Net\ Income - Cash\ Flow\ from\ Operations,\ PPE_{it}$ is gross property, plant and equipment

The coefficient estimates from above equation are used to estimate non-discretionary total accruals (*NDTAC*) for all IPO firms in each year and industry combination as follow:

$$NDTAC_{i,t} = \hat{\alpha}_0\left(\frac{1}{TA_{i,t-1}}\right) + \hat{\alpha}_1\left(\frac{\Delta REV_{it} - \Delta REC_{it}}{TA_{i,t-1}}\right) + \hat{\alpha}_2\left(\frac{PPE_{it}}{TA_{i,t-1}}\right)$$

Discretionary total accruals (*DTAC*) are measured as:

$$DTAC_{i,t} = \frac{TAC_{it}}{TA_{i,t-1}} - NDTAC_{i,t}$$

## V. Conclusion

Earnings management around equity offerings has been widely documented in the prior research. Similarly, research has also shown that aggressive earnings management around equity offerings had severe negative consequences for post-issue operating and stock return performance and survival of issuers. The incentives of managing earnings are large if insiders of issuing firms are able to sell larger equity stakes at public offering or immediately after the offering. Lockup, a formal agreement between underwriter and IPO firm insiders, prevents pre-IPO shareholders from selling their equity for certain period after the IPO. A lockup not only "forces insiders to put their money where their mouth is but to keep it there as well"(Brau et al., 2005). Poor post-IPO performance related with aggressive earnings management around offering will result in larger wealth losses for insiders of firms with longer lockups. Accordingly, insiders of firms with longer lockup have incentive to constrain earnings management to protect wealth losses after lockup expiry. We predict a significant negative association between lockup length and earnings management.

Based on a sample of 268 UK IPOs with lockups during 1995 and 2006, we find that lockup length is negatively related to earnings management in the year of IPO. We interpret these results to mean that firms with longer lockups have lower incentives for managing earnings around IPO given the considerable costs associated with longer lockups in post-IPO period. We continue to observe the negative impact of lockup length on earnings management even after adjusting for the possible endogeneity of lockup length or the simultaneous determination of lockup length and earnings management. The results from simultaneous equations also suggest that the direction of causality flows form lockup length to earnings management and not vice-versa. Our results from all model specification are also robust to measuring earnings management from cash flow approach using total accruals as proxy for earnings management.

This paper makes important contribution to the literature that deals with the constraints of aggressive earnings management. Prior research documents a positive impact of reputed third party certifiers (VCs, Underwriters, auditors) and certain corporate governance mechanisms (independent boards, audit committees) in reducing earnings management by equity issuers. We add to this literature by showing that lockups can effectively work as an alternative mechanism in reducing earnings management. Our research has also implications for practitioners and regulators, who perceive earnings management as pervasive and problematic (Dechow and Skinner, 2000).

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## Table 1- Sample Distribution

This table presents distribution of sample IPOs across years and industry groups. Discretionary working capital accruals (DWCA) are estimated using the cross sectional modified Jones model. Panel A presents sample distribution and DWCA across offer years, while Panel B gives the industry distribution of sample IPOs and DWCA.

**Panel A: Time distribution**

| | | | DWCA | | |
|---|---|---|---|---|---|
| Year | Freq. | % | Mean | Median | Std. dev. |
| 1995 | 27 | 10.07 | -0.016 | -0.012 | 0.141 |
| 1996 | 40 | 14.93 | 0.068 | 0.028 | 0.257 |
| 1997 | 36 | 13.43 | 0.066 | 0.026 | 0.223 |
| 1998 | 27 | 10.07 | 0.098 | 0.049 | 0.357 |
| 1999 | 18 | 6.72 | 0.005 | 0.046 | 0.660 |
| 2000 | 54 | 20.15 | 0.038 | 0.058 | 0.442 |
| 2001 | 6 | 2.24 | 0.003 | -0.024 | 0.166 |
| 2002 | 12 | 4.48 | 0.063 | 0.055 | 0.127 |
| 2003 | 5 | 1.87 | 0.195 | 0.165 | 0.174 |
| 2004 | 15 | 5.60 | 0.119 | 0.070 | 0.284 |
| 2005 | 14 | 5.22 | 0.109 | 0.028 | 0.214 |
| 2006 | 14 | 5.22 | -0.065 | -0.062 | 0.094 |
| **Total** | **268** | **100** | **0.051** | **0.033** | **0.329** |

**Panel B: Industry (SIC) distribution**

| | | | | DWCA | | |
|---|---|---|---|---|---|---|
| Industry | Two-digit SIC | Freq. | % | Mean | Median | Std. dev. |
| Oil and Gas | 13 | 10 | 3.73 | -0.010 | 0.012 | 0.140 |
| Paper and Paper Products | 24-27 | 7 | 2.61 | -0.046 | 0.033 | 0.220 |
| Chemical Products | 28 | 17 | 6.34 | 0.088 | 0.036 | 0.262 |
| Electronic Equipment | 36 | 13 | 4.85 | 0.111 | 0.097 | 0.230 |
| Scientific Instruments | 38 | 13 | 4.85 | 0.030 | 0.033 | 0.119 |
| Communications | 48 | 16 | 5.97 | -0.017 | 0.010 | 0.667 |
| Durable Goods | 50 | 15 | 5.60 | -0.028 | -0.025 | 0.327 |
| Computer Equipment and Services | 35,73 | 75 | 27.99 | 0.120 | 0.090 | 0.421 |
| Engineering and Management Services | 87 | 20 | 7.46 | -0.003 | -0.028 | 0.210 |
| Retail | 53,54,56,57,59 | 20 | 7.46 | 0.011 | 0.004 | 0.151 |
| Eating and Drinking Establishments | 58 | 6 | 2.24 | 0.042 | 0.019 | 0.186 |
| Transportation | 37,39,40-42,44,45 | 6 | 2.24 | -0.180 | -0.078 | 0.280 |
| All Others | | 50 | 18.66 | 0.062 | 0.001 | 0.213 |
| **Total** | | **268** | **100** | **0.051** | **0.033** | **0.329** |

## Table 2- Descriptive Statistics

Panel A presents descriptive statistics of variables used in the regression analyses for 268 IPOs from 1995 to 2006. *DWCA* is discretionary working capital accruals based on the modified Jones model. *LU Months* is the length of lockup period in months. *IR* is initial returns calculated as first day closing price minus offer price divided by the offer price. *UW Reputation* is underwriter reputation measured as the number of IPOs sponsored by an underwriter as a percentage of the total number of IPOs during the year prior to the IPO year. *VC* is a dummy variable equal to one if the IPO is backed by venture capital/private equity, and zero otherwise. *Insider Ownership* is percentage of post-IPO equity retained by the directors and officers. *Assets* is the total assets before IPO in £ millions. *Age* is IPO firm age calculated as the difference (in years) between the date of IPO and the date company was founded. *ROA* is earnings before extraordinary items divided by total assets in the year before IPO. *CFO* is operating cash flow divided by total assets in the year before the IPO. *Leverage* is long term debt divided by total assets in the year before IPO. Panel B shows descriptive statistics of DWCA for various lockup length groups and tests of difference in means and medians for selected groups. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

**Panel A: Descriptive Statistics**

| Variable | Mean | Median | First Quartile | Third Quartile | Std. Dev. |
|---|---|---|---|---|---|
| DWCA | 0.051 | 0.033 | -0.044 | 0.164 | 0.329 |
| LU Months | 15.205 | 12.367 | 12.167 | 18.167 | 6.022 |
| IR (%) | 12.017 | 7.974 | 1.460 | 17.522 | 18.019 |
| UW Reputation (%) | 2.360 | 2.410 | 1.030 | 3.185 | 1.377 |
| VC | 0.563 | 1.000 | 0.000 | 1.000 | 0.497 |
| Insider Ownership (%) | 24.646 | 19.800 | 5.370 | 40.850 | 21.980 |
| Total Assets | 195.451 | 22.637 | 9.575 | 100.643 | 570.040 |
| Age | 15.727 | 9.558 | 5.808 | 16.790 | 18.277 |
| ROA | -0.257 | 0.070 | -0.080 | 0.170 | 1.380 |
| OCF | -0.202 | 0.090 | -0.065 | 0.211 | 1.143 |
| Leverage | 0.251 | 0.084 | 0.004 | 0.374 | 0.394 |

**Panel B: Test of difference in means (t-test) and medians (Mann-Whitney test)**

| | | DWCA | |
|---|---|---|---|
| Lockup Length | Obs. | Mean (p-value) | Median (p-value) |
| A. 0-12 Months | 132 | 0.0693 (0.0298) | 0.0469 (0.0001) |
| B. 13-18 Months | 70 | 0.0530 (0.1034) | 0.0108 (0.1811) |
| C. > 18 Months | 66 | 0.0116 (0.7668) | -0.0032 (0.4154) |
| Total | 268 | | |
| t-value $_{C-A}$ | | 1.7194* | |
| z-value $_{C=A}$ | | | 1.784* |

**Table 3- Bivariate Correlations**

This table presents Spearman correlations (upper triangle) and Pearson correlations (lower triangle) between variables used in the estimations. All variables are defined in Table 2. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

| | DWCA | LU Months | IR | UW Reputation | VC | Insider Ownership | Ln(Total Assets) | Ln (Age) | ROA | OCF | Leverage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DWCA | 1 | -0.15** | 0.14** | 0.12** | -0.10 | 0.06 | -0.06 | 0.08 | 0.21*** | -0.07 | -0.07 |
| LU Months | -0.12** | 1 | -0.01 | 0.01 | -0.03 | 0.18*** | -0.18*** | 0.11* | 0.12 | 0.00 | 0.05 |
| IR | -0.04 | -0.03 | 1 | -0.05 | -0.01 | 0.14** | -0.22*** | -0.08 | 0.12*** | -0.03 | -0.09 |
| UW Reputation | 0.07 | 0.01 | -0.04 | 1 | 0.08 | -0.04 | 0.09 | -0.01 | -0.03 | -0.05 | 0.08 |
| VC | -0.06 | -0.02 | 0.00 | 0.09 | 1 | -0.21*** | 0.13** | 0.00 | -0.07 | 0.09 | 0.23*** |
| Insider Ownership | 0.07 | 0.14** | 0.03 | -0.02 | -0.31*** | 1 | -0.42*** | -0.05 | 0.32*** | 0.10 | -0.18*** |
| Ln(Total Assets) | -0.01 | -0.18*** | -0.18*** | 0.08 | 0.08 | -0.36*** | 1 | 0.27*** | 0.08 | 0.36*** | 0.31*** |
| Ln (Age) | 0.07 | 0.08 | -0.15** | 0.01 | -0.01 | -0.07 | 0.29*** | 1 | 0.27*** | 0.30*** | 0.11* |
| ROA | 0.24*** | 0.06 | -0.11* | -0.06 | -0.05 | 0.08 | 0.24*** | 0.27*** | 1 | 0.68*** | -0.03 |
| OCF | -0.11** | 0.04 | -0.16*** | -0.09 | 0.02 | 0.01 | 0.33*** | 0.29*** | 0.84*** | 1 | 0.15** |
| Leverage | -0.08 | -0.01 | -0.04 | 0.02 | 0.19*** | -0.14** | 0.14** | 0.09 | 0.10* | 0.14** | 1 |

## Table 4- OLS Regression Models for Earnings management and Lockup Length

This table presents ordinary least squares estimates for 268 IPOs from 1995 to 2006. The dependant variable is earnings management defined as discretionary working capital accruals *(DWCA*) from a modified Jones model. All the variables are defined in Table-2. All tests use white heteroskedasticity robust standard errors. The t-values are in brackets. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

| | DWCA | | | | |
|---|---|---|---|---|---|
| **Variables** | 1 | 2 | 3 | 4 | 5 |
| LU Months | -0.039** | -0.041*** | -0.030* | -0.040** | -0.028* |
| | (-2.51) | (-2.62) | (-1.88) | (-2.34) | (-1.65) |
| IR | 0.011 | 0.0123 | 0.012 | 0.011 | 0.011 |
| | (0.91) | (1.07) | (0.96) | (0.96) | (0.88) |
| Insider Ownership | -0.007 | -0.007 | -0.009 | -0.005 | -0.007 |
| | (-1.47) | (-1.20) | (-1.43) | (-0.81) | (-1.15) |
| Ln(Total Assets) | -0.241*** | -0.262*** | -0.282*** | -0.257** | -0.290** |
| | (-2.73) | (-2.87) | (-2.76) | (-2.52) | (-2.41) |
| Ln(Age) | 0.102 | 0.103 | 0.174 | 0.0897 | 0.153 |
| | (0.83) | (0.86) | (1.36) | (0.72) | (1.16) |
| ROA | 0.890*** | 0.862*** | 0.885*** | 0.855*** | 0.881*** |
| | (2.80) | (2.70) | (2.84) | (2.62) | (2.74) |
| OCF | -1.386*** | -1.298*** | -1.234*** | -1.296*** | -1.234*** |
| | (-4.37) | (-4.20) | (-3.91) | (-4.14) | (-3.86) |
| Leverage | -0.302* | -0.341* | -0.381* | -0.326* | -0.371* |
| | (-1.88) | (-1.96) | (-1.92) | (-1.84) | (-1.77) |
| UW Reputation | | 0.293*** | 0.291*** | 0.273** | 0.292** |
| | | (2.71) | (2.73) | (2.44) | (2.54) |
| VC | | 0.008 | 0.078 | 0.048 | 0.103 |
| | | (0.03) | (0.25) | (0.15) | (0.32) |
| Constant | 1.889*** | 1.298** | 1.304* | 1.158* | 1.37 |
| | (3.40) | (2.34) | (1.78) | (1.79) | (1.60) |
| Industry | No | No | No | Yes | Yes |
| Year | No | No | Yes | No | Yes |
| N | 268 | 268 | 268 | 268 | 268 |
| Adj. R-sq | 0.239 | 0.267 | 0.257 | 0.244 | 0.228 |

## Table 5- 2SLS Regression on Earnings Management

This table presents two stage least squares (2SLS) estimates for 268 IPOs from 1995 to 2006.In the first stage, lockup length is estimated using OLS regression. In second stage, the fitted values of lockup length from the first regression are replaced for lockup period. The dependant variable in the first stage is length of lockup in months (*LU Months*). The dependant variable in second stage is earnings management measured by discretionary working capital accruals (*DWCA)* from a modified Jones model. *Bubble Dummy* equals one for all IPOs during 1999-2000, and zero otherwise. All variables are defined in Table-2. All tests use white heteroskedasticity robust standard errors. The t-values are in brackets. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

| Independent Variables | 1st Stage | 2nd Stage |
|---|---|---|
| LU Months_hat | | -0.194** |
| | | (-2.26) |
| IR | 0.003 | 0.011 |
| | (0.17) | (0.97) |
| UW Reputation | 0.101 | 0.291*** |
| | (0.43) | (2.64) |
| VC | -0.487 | -0.024 |
| | (-0.62) | (-0.08) |
| Insider Ownership | 0.043** | 0.000 |
| | (2.26) | (0.03) |
| Ln(Total Assets) | -0.719** | -0.368*** |
| | (-2.59) | (-2.89) |
| Ln(Age) | 0.348 | 0.213 |
| | (0.80) | (1.4) |
| Leverage | 0.096 | -0.328 |
| | (0.11) | (-1.48) |
| Bubble Dummy | -3.895*** | |
| | (-4.18) | |
| OCF | 0.157 | -1.225*** |
| | (0.42) | (-4.28) |
| ROA | -0.189 | 0.845*** |
| | (-0.75) | (-2.85) |
| Constant | 17.011*** | 3.615** |
| | (8.28) | (2.43) |
| Industry | Yes | Yes |
| N | 268 | 268 |
| R-sq | 0.2097 | 0.1566 |

**Table 6- Simultaneous Equations Model for Earnings Management and Lockup Length**

This table reports results of simultaneous relationship between lockup length and earnings management in the system of three stage least squares (3SLS) equations. The sample includes 268 IPOs with lockups from 1995 to 2006. The dependant variables are earnings management defined as discretionary working capital accruals (*DWCA*) from a modified Jones model and the length of lockup period in months (*LU Months*). *Bubble Dummy* equals one for all IPOs during 1999-2000, and zero otherwise. The variables are defined in Table-2. All tests use white heteroskedasticity robust standard errors. The t-values are in brackets. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

| | Model (1) | | Model (2) | |
|---|---|---|---|---|
| | Dependant Variable | Dependant Variable | Dependant Variable | Dependant Variable |
| Independent Variables | LU Months | DWCA | LU Months | DWCA |
| DWCA | -0.145 | | -0.022 | |
| | (-0.32) | | (-0.06) | |
| LU Months | | -0.198** | | -0.178** |
| | | (-2.26) | | (-2.44) |
| IR | 0.005 | 0.011 | | |
| | (0.22) | (1.53) | | |
| UW Reputation | 0.148 | 0.293*** | | 0.261*** |
| | (0.51) | (3.12) | | (3.05) |
| VC | -0.487 | -0.0257 | | |
| | (-0.65) | (-0.09) | | |
| Insider Ownership | 0.041** | 0.001 | 0.045*** | |
| | (2.27) | (0.02) | (2.84) | |
| Ln(Total Assets) | -0.766*** | -0.373*** | -0.688*** | -0.356*** |
| | (-2.95) | (-3.53) | (-2.87) | (-3.69) |
| Ln(Age) | 0.354 | 0.212 | | |
| | (0.79) | (1.19) | | |
| Leverage | 0.0204 | -0.333 | | |
| | (0.02) | (-1.02) | | |
| Bubble Dummy | -3.709*** | | -3.997*** | |
| | (-3.84) | | (-4.47) | |
| OCF | | -1.220*** | | -1.287*** |
| | | (-5.58) | | (-6.20) |
| ROA | | 0.856*** | | 0.894*** |
| | | (5.14) | | (5.58) |
| Constant | 17.88*** | 3.697** | 17.71*** | 3.890*** |
| | (6.72) | (2.39) | (11.80) | (2.68) |
| Industry | Yes | Yes | Yes | Yes |
| N | 268 | 268 | 268 | 268 |
| R-sq | 0.2143 | 0.1495 | 0.2066 | 0.1725 |

## Table 7- Robustness Tests for Alternative Measure of Earnings Management

This table presents the results of ordinary least squares (OLS); two stage least squares (2SLS) and Simultaneous Equations model (3SLS) for 268 IPOs from 1995 to 2006. All models use discretionary total accruals *(DTAC*) from a modified Jones model as the proxy for earnings management. *Bubble Dummy* equals one for all IPOs during 1999-2000, and zero otherwise. The variables are defined in Table-2. All tests use white heteroskedasticity robust standard errors. The t-values are in brackets. ***, ** and * represent 1%, 5% and 10% significant levels respectively.

| | OLS | 2SLS (2nd Stage) | Simultaneous Equations | |
|---|---|---|---|---|
| Variables | DTAC | DTAC | LU Months | DTAC |
| DTAC | | | -0.028 | |
| | | | (-0.06) | |
| LU Months | -0.003* | -0.016** | | -0.016** |
| | (-1.861) | (-2.24) | | (-2.04) |
| IR | 0.001*** | 0.001** | -0.007 | 0.001* |
| | (2.628) | (2.10) | (-0.36) | (1.78) |
| UW Reputation | 0.001 | 0.002 | 0.179 | 0.002 |
| | (0.09) | (0.25) | (0.71) | (0.25) |
| VC | 0.016 | 0.018 | -0.031 | 0.018 |
| | (0.65) | (0.79) | (-0.04) | (0.69) |
| Insider Ownership | 0.000 | 0.001 | 0.029* | 0.001 |
| | (0.83) | (1.10) | (1.67) | (1.11) |
| Ln(Total Assets) | 0.001 | -0.009 | -0.791*** | -0.01 |
| | (0.12) | (-1.02) | (-3.64) | (-0.91) |
| Ln(Age) | 0.001 | 0.012 | 0.309 | 0.012 |
| | (0.86) | (0.86) | (0.69) | (0.72) |
| Leverage | -0.052* | -0.05 | 0.221 | -0.05 |
| | (-1.70) | (-1.56) | (0.25) | (-1.57) |
| Bubble Dummy | | | -4.012*** | |
| | | | (-4.67) | |
| OCF | -1.049*** | -1.046*** | | -1.045*** |
| | (-24.89) | (-27.48) | | (-50.95) |
| ROA | 1.034*** | 1.035*** | | 1.035*** |
| | (30.07) | (35.44) | | (61.87) |
| Constant | 0.075 | 0.268*** | 17.195*** | 0.271** |
| | (1.31) | (2.68) | (10.31) | (2.07) |
| Industry | Yes | Yes | Yes | Yes |
| N | 268 | 268 | 268 | 268 |
| R-sq | 0.943 | 0.934 | 0.1311 | 0.9364 |