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MISPRICING OF INITIAL PUBLIC OFFERINGS (IPOs):
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BY

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ABSTRACT

I examine the role of accounting information in the end-of-first day overpricing of IPO stocks. Sloan (1996) and Teoh et al. (1998) suggest earnings-based explanations for the mispricing while Healy and Palepu (1990) suggest a risk-based explanation. In view of the conflicting explanations for the end-of-first-day mispricing of IPOs from prior studies, I first examine which possible explanation (earnings-based vs. other) is consistent with my sample IPO firms. For this task, I employ the methodology first suggested by Bernard et al. (1997). This involves an examination of post-IPO abnormal returns. The results of my main tests using all my sample IPO firms suggest that, on average, the mispricing of IPOs is consistent with earning-based explanations. That is, the mispricing arises from market participants failing to incorporate the implication of pre-IPO earnings components for future earnings as in Sloan (1996). However, life cycle tests discussed later suggest that this result may be driven by growth firms.

I extend my examination to investigate the role of life cycle in IPO mispricing since life cycle has been offered as a possible explanation (e.g., Liu 2008) but the role of life cycle is largely unexplored. Thus, I examine possible mechanisms by which life cycle could affect IPO pricing. I examine two specific research questions. The first question is whether life cycle has any effect on IPO mispricing beyond affecting the relative proportion of accruals and cash flows. In this regard, I find no evidence that life cycle stage explains post-IPO abnormal returns, whether used alone in a regression explaining post-IPO returns, or used together with accrual and cash flow ranks. The second question I address is whether life cycle affects the form of mispricing

(earnings-based vs. other) and I document some evidence that life cycle moderates the type of mispricing. Specifically, the mispricing of growth- (mature-) stage sample IPO firms is (is not) consistent with earnings-based explanations. My evidence regarding the mispricing of decline-stage firms is mixed: the timing and associations tests provide evidence that the mispricing of decline-stage firms is consistent with earnings-based explanations; the combined test provides evidence consistent with other explanations. Thus, it seems that earnings play a role in the mispricing of decline stage IPOs but not in the Sloan (1996) sense.

This evidence has implications for the role of earnings in explaining future prospects, and hence value, of a firm. Specifically, it raises questions about why investors seemingly do a poor job of predicting the future prospects of growth and decline stage firms using current period earnings information when the opposite seems to be true for mature firms. Regulators might be interested to know what disclosures would mitigate this problem.

1. Introduction

The accounting and finance literature documents evidence that shares of initial public offering (IPO) firms are overpriced by the end of the first day of public trading, leading to inferior long-run stock price performance of IPO firms relative to non-IPO firms matched on size and industry (Ritter 1991, Loughran and Ritter 1995).[1] This study examines the overpricing of IPO stocks and explores a possible role for accounting information, particularly components of earnings, to explain the overpricing. Sloan (1996) documents evidence suggesting that companies with relatively high accruals or low cash flows are overpriced. The evidence from Sloan (1996) is particularly relevant for IPO firms which tend to be growth firms[2] that go public to finance investments and to fund shortfalls in operating cash flows. The earnings of these growth firms are likely to contain a larger (smaller) proportion of accruals (cash flows from operations) compared to earnings of firms that are not experiencing growth and this results in more mispricing for IPO firms. Thus, I examine a possible link between the overpricing of IPO stocks and Sloan's (1996) anomaly. I also examine a possible role for life cycle since prior studies of IPO performance (e.g., Liu 2008, Ball and Shivakumar 2008) have suggested life cycle as an omitted variable. The role of life cycle in the mispricing of IPO stocks is largely

[1] Another IPO pricing anomaly that is not part of my study is that shares of IPO firms are offered to the public at prices below fundamental values (Ibbotson et al. 1988).

[2] My sample includes growth, mature, and decline stage firms. Contrary to the intuition that only growth firms go public, mature and decline firms are likely to go public to retire debt when an increase in business risk is imminent (e.g., Healy and Palepu 1990) or for reasons unrelated to funding investments. Also refer to section 2.2.3 for a further discussion of why mature and decline firms go public.

unexplored. Therefore, I am interested in gaining a better understanding of the role that life cycle plays in the overpricing of IPOs.

Broadly, I classify possible explanations for the overpricing of IPO stocks into two groups: (a) *earnings-based* explanations, that is, the failure by market participants to incorporate the implications of earnings components in IPO financial statements for future earnings as in Sloan (1996)[3], or (b) *other* explanations. The latter group of explanations includes failure by researchers or market participants to estimate the risk associated with IPO stocks (as in Healy and Palepu 1990) and total failure by investors to utilize the information in financial statements (as in Shiller 1990 and Ritter 1991). To a large extent, both groups of explanations for IPO mispricing involve irrational investor behavior.[4] The first instance involves irrational investor behavior based on earnings. This is likely a numerator effect (see note 3) though earnings may inform investors about risk, a denominator effect. The second instance is irrational investor behavior based on everything else rather than earnings. This includes a failure to correctly estimate the risk associated with IPO firms or a total disregard of accounting information. I discuss this in detail later. My study attempts to examine which explanation for IPO overpricing (earnings vs. other) is consistent with the data.

Healy and Palepu (1990) provide evidence that IPOs convey information about changes in risk rather than changes in the level of expected earnings. In other words, Healy and Palepu (1990) provide evidence that other explanations, particularly risk,

[3] This is also known as the "numerator" explanation based on a classical firm valuation model. In this model, the value of a firm equals the sum of its expected future abnormal earnings discounted to the present using an appropriate measure of risk. The numerator of the valuation model comprises the expected earnings of a firm while the denominator represents a time value of money adjustment for level of risk. Earnings is usually considered a numerator factor in mispricing; many non-earnings factors are described as denominator factors though some could also be viewed as numerator factors.

[4] The exception is researcher errors which is unrelated to investor behavior.

are more likely to explain IPO mispricing than earnings-based explanations. Subsequent studies of IPO mispricing support earnings-based explanations. For example, Teoh et al. (1998a, 1998b) report evidence that overpricing of IPOs is linked to accruals although some controversy exists as to whether the role of accruals is limited to cases of earnings management or is broader in scope, as in Sloan (1996).

Since prior studies produce conflicting explanations for IPO mispricing, this study can enhance our understanding of IPO mispricing. I expect regulators to be interested in knowing whether the documented pricing anomaly is specific to IPO settings or a manifestation of a wider anomaly (as in Sloan 1996) which applies to all firms. This would, for instance, help in defining the scope (IPO firms only vs. all firms) of any financial reporting changes that are meant to address the anomaly. Furthermore, a better understanding of the source of the mispricing (e.g., earnings-based explanations vs. other explanations) could guide both regulators and preparers of IPO financial statements. On the other hand, the role of life cycle stage is likely to be of interest to sophisticated investors such as mutual fund managers specializing in securities of firms in specific life cycle stages.[5] Furthermore, by using pre-IPO financial statement information rather than the first post-IPO financial statements (as in Teoh et al. 1998a and 1998b), I am able to make a more refined inference regarding the role of accounting information in the mispricing of IPOs.

In tests using my full sample of IPO firms, I document evidence that, on average, overpricing of IPO stocks recorded at the end of the first day of public trading is consistent with earnings-based explanations. That is, earnings play a role in

[5] For instance, "growth funds" are a type of mutual fund that invests in the stocks of companies that have the potential for large capital gains; these companies are implicitly young firms in their growth stages (Black 1998).

IPO mispricing similar to the one documented in Sloan (1996). My findings contrast with Healy and Palepu's (1990) evidence that post-IPO stock returns cannot be explained by the revision of analysts' earnings forecasts subsequent to the IPO and changes in the level of earnings subsequent to the IPO date. In essence, they do not find a role for earnings in IPO mispricing, but I do. Healy and Palepu (1990) also find evidence of risk changes (asset and equity betas) around the IPO date. My results cannot completely rule out that some mispricing might be related to risk but suggest that risk is unlikely to be the sole explanation.

Regarding life cycle, I find no evidence that life cycle stage explains post-IPO returns, whether life cycle is used alone in a returns regression or life cycle is used together with accrual and cash flow ranks. However, in analyses that divide the sample IPO firms into life cycles, I find evidence that life cycle affects the type of mispricing (earnings vs. other). In particular, I find evidence that the mispricing of growth- (mature-) stage IPO firms is (is not) consistent with earnings-based explanations. Evidence relating to decline-stage IPO firms is mixed. Specifically, the timing and association tests support earnings-based explanations for mispricing of decline-stage IPOs while the combined test results do not. This might suggest that though earnings play a role in the mispricing of decline-stage IPOs, the role of earnings is different in context from Sloan (1996).

The rest of the paper proceeds as follows. Section 2 reviews the literature and develops the hypotheses that I test. Section 3 describes my tests and research design. Section 4 discusses the sample, section 5 presents the results and section 6 concludes.

2. Literature review and hypothesis development

2.1. Literature review

The accounting and finance literature documents two pricing anomalies related to IPO firms and a third pricing anomaly related to all firms. In the first IPO anomaly, IPO firms are offered to the market at prices below fundamental values (Ibbotson et al. 1988). In the second IPO anomaly, and focus of my study, IPO stocks are overpriced by the end of the first day of public trading which results in IPO firms registering inferior long-run stock price performance relative to non-IPO firms matched on size and industry (Ritter 1991, Loughran and Ritter 1995). A third anomaly related to all firms suggests that stock prices do not fully reflect the information about future earnings contained in current period earnings components (Sloan 1996). Stated differently, the evidence in Sloan (1996) suggests that cash flows are underpriced and/or accruals are overpriced. Dechow and Schrand (2004) provide an overview of the literature relating to Sloan's (1996) anomaly.

Prior studies of the mispricing and subsequent underperformance of IPO firms can be grouped into two categories. The first category comprises studies that attribute IPO mispricing to earnings, in particular to the weights attached to components of earnings. Within this group, a number of studies examine arguments for and against a possible role of earnings management in the mispricing. For example, Teoh et al. (1998a and 1998b) provide some evidence in support of an earnings management hypothesis whereas Ball and Shivakumar (2008) and Armstrong et al. (2009) provide some evidence that contradicts the earnings management hypothesis. The second category comprises studies that attribute IPO mispricing and underperformance to

factors other than earnings. This latter group includes studies that attribute the mispricing of IPO stocks to risk factors and what has come to be known as "fads" (investors being unjustifiably optimistic about the future prospects of a particular firm or industry). A growing number of studies examine life cycle as a possible alternative explanation for some of the key observations from the earnings management literature (e.g., Black 1998, Liu 2008, Ball and Shivakumar 2008). I discuss the prior studies in detail below.

Shiller (1990) provides a behavioral perspective on IPO mispricing and suggests that "firms go public when investors are irrationally overoptimistic about the future potential of certain industries." In other words, managers time the listing of firms to exploit investor sentiment. In a related study, Ritter (1991) examines the returns to a strategy of investing in IPO stocks at the close of public trading on the IPO date and holding the IPO stocks for 3-years. He documents 3-year holding period returns of about 34% for IPO firms compared to 62% for size- and industry-matched non-IPO firms.[6] Ritter (1991) also finds that younger companies and companies going public in high volume years perform worse than average. He examines whether the IPO firms underperform merely due to bad luck, or whether the market systematically overestimates the growth opportunities of IPO firms. He concludes that his evidence is

[6] The 28% differential in 3-year holding period returns in Ritter's (1991) study is concentrated in year 1 (10 %) and year 3 (13%). The remaining 5% is observed in year 2. Thus, an examination of a 12-month window from the IPO date captures a significant part of the abnormal returns of IPOs and is sufficient to understand the role of earnings in the end-of-first-day mispricing of IPOs. In additional tests reported later in this paper, I repeat all my main tests (timing, association, and combined) for both the full sample and the life cycle sample using a return window of 36 months instead of 12 months. My conclusions remain the same.

consistent with Shiller (1990), that many firms go public near the peak of industry-specific fads.

Healy and Palepu (1990) examine changes in risk (asset and equity betas), changes in earnings levels, and analyst forecast revisions[7] around primary equity offers (IPOs) and report evidence that the offers convey information about risk changes rather than changes in the level of future earnings. Finally, Kim and Ritter (1999) attribute the mispricing of IPOs to the low predictive ability of comparable firm multiples (P/E, market-to-book, price-to-sales) which are widely used in conjunction with accounting information to value IPO stocks.

Most studies of IPO mispricing provide evidence that IPO firms have, on average, higher accruals than non-IPO firms. Thus, the overpricing of IPO firms is consistent with Sloan's (1996) evidence that firms with high accruals (low cash flows) are overpriced. However, controversy exists regarding the cause of the high accruals documented for IPO firms. Specifically, some prior studies attribute the high accruals of IPO firms to earnings management while a growing literature supports an alternative explanation based on life cycle. I discuss these streams of research in the next two paragraphs.

Studies that combine earnings management and IPO mispricing examine whether managers manipulate accruals in the IPO prospectus to boost stock prices. For example, Teoh et al. (1998a, 1998b) examine discretionary accruals of IPO firms and

[7] Healy and Palepu (1990) examine Value Line analyst forecasts for the quarter of the IPO announcement and for the next 5 quarters. They compare actual earnings for the quarter of the IPO announcement and revised post-IPO forecasts for the next 5 quarters with corresponding pre-IPO forecasts. They find no evidence of downward revisions in analysts' earnings forecasts following the IPO.

report evidence of unusually high discretionary accruals in the IPO year and the year after, suggesting an earnings management explanation for the subsequent underperformance of IPO firms. Ball and Shivakumar (2008) study earnings quality in a sample of UK firms at the time of IPOs and find that contrary to the view espoused by the earnings management hypothesis of Teoh et al. (1998a, 1998b), IPO firms report more conservatively. In addition, Ball and Shivakumar (2008) raise important questions concerning the reliability of the discretionary accrual estimates in Teoh et al. (1998a, 1998b). Liu (2008) provides evidence suggesting that commonly used discretionary accrual models such as the one used in Teoh et al. (1998a, 1998b) are misspecified, resulting in an upward (downward) bias of discretionary accrual estimates for growth (decline) firms.[8]

Armstrong et al. (2009) provide some of the strongest evidence against the earnings management hypothesis of Teoh et al. (1998a, 1998b). Armstrong et al. (2009) examine the discretionary accruals of IPO firms after correcting for known biases in commonly used discretionary accrual models and find evidence that discretionary accruals in the year of the IPO are not statistically different from zero.[9] In addition, Armstrong et al. (2009) reexamine the incentives of managers of IPO firms to inflate accruals and find no evidence of a relation between several measures of discretionary accruals and IPO issue price, post-IPO equity values, insider trading profits, and executive compensation. Finally, they provide evidence that the widely

[8] Liu (2008) suggests that IPOs are associated with the growth stage of a firm's life cycle. My sample suggests that although IPOs are mainly growth firms, many mature and decline firms also go public. See section 2.2.3 for a brief explanation of why mature and decline firms might go public.

[9] Specifically, Armstrong et al. (2009) correct for the following: (1) the "small-denominator bias" raised in Ball and Shivakumar (2008), and (2) bias due to extreme operating performance (Kothari, Leone and Wasley, 2005).

reported negative correlation between IPO-year discretionary accruals and post-IPO returns is an artifact of cash flow mispricing. In other words, when cash flows are included in the analysis, accruals do not explain post-IPO abnormal returns.

Life cycle theory provides an alternative explanation for the high level of accruals documented by earnings management studies of IPO firms. In particular, life cycle theory suggests that growth firms are likely to have higher working capital accruals and lower operating cash flows relative to mature-stage and decline-stage firms (Black 1998, Liu 2008) even in the absence of earnings management. Thus, to the extent that life cycle leads to higher accruals and low cash flows for IPO firms, IPO stocks are likely to be overpriced as in Sloan (1996). Alternatively, life cycle may result in IPO mispricing by affecting the riskiness rather than the earnings components of IPO firms. In other words, whether life cycle moderates the form of mispricing (e.g., earnings-based vs. other) and/or the extent of mispricing is an empirical question.

To summarize, the cause of the end-of-first-day overpricing of the stocks of IPO firms is still an open question. Specifically, is overpricing related to risk changes around IPOs, or to the behavior of investors who are unjustifiably optimistic about the future prospects of an industry/ firm with no regard to accounting information? Alternatively, is overpricing a result of failure by market participants to incorporate the information about future earnings contained in IPO financial statements? Furthermore, the role of life cycle, which potentially affects both the relative proportions of earnings components and the riskiness of IPO firms, is unclear. For example, does life cycle affect IPO mispricing beyond its effect on earnings

components? In addition, what is the effect of life cycle on the likelihood of earnings-based vs. other explanations (e.g., risk) for IPO mispricing? This study attempts to address these questions.

2.2. Hypothesis development

I begin my quest for a better understanding of the overpricing of IPOs by investigating whether the overpricing is most consistent with an earnings-based explanation or with other explanations. This study does not attempt to separate the non-earnings (other) explanations. My main tests for discriminating between earnings-based and other explanations utilize an approach suggested by Bernard et al. (1997) and employed by Cheng and Thomas (2006). The approach involves an examination of the abnormal returns of IPO firms subsequent to offering. If investors fail to fully incorporate information about future earnings that is contained in IPO earnings, the resulting mispricing will be corrected as future earnings are reported. Consequently, post-IPO abnormal returns (a) will be concentrated around post-IPO earnings announcements, reflecting investors' surprise about future earnings, and (b) will be associated with the components of earnings in the IPO financial statements that investors failed to incorporate.[10] If I find evidence of both (a) and (b) occurring for IPO firms, then that evidence points to a failure to interpret earnings information as a source of IPO overpricing. If the overpricing of IPO stocks is not due to investors' failure to correctly interpret earnings, then perhaps it is due to risk or other explanations such as investors being unjustifiably optimistic about the future prospects

[10] Bernard et al. (1997) use accruals in their tests. However, based on evidence that the negative correlation between accruals and post-IPO returns is an artifact of cash flow mispricing (Armstrong et al. 2009), tests that use cash flows instead of (or together with) accruals are likely to have greater power. I use both accruals and cash flows in my tests.

of an industry or firm with little regard to accounting information (fads). These other explanations for IPO mispricing are likely to generate post-IPO abnormal returns that are (i) not concentrated around earnings announcements and/or (ii) are not associated with pre-IPO earnings components. Appendix I provides a detailed discussion of risk as a possible explanation for IPO mispricing. I develop the hypotheses in the subsequent subsections.

2.2.1 Initial assessment: IPO overpricing and the accrual anomaly

Life cycle theory suggests that before accessing external financing, growth firms are likely to have high accruals and low operating cash flows. Since the IPO firms in my sample are mainly growth firms, overpricing at the offering date might be a consequence of high accruals and low cash flows (Sloan 1996). Thus, my initial test assesses the extent to which IPO overpricing might be related to mispricing of earnings components documented in Sloan (1996). If IPO firms have, on average, a higher proportion of accruals and a lower proportion of operating cash flows compared to non-IPO firms matched on size and industry, and if earnings components are a major source of IPO overpricing (Sloan 1996), then the differences in performance between IPO firms and matched non-IPO firms can be explained by earnings components. This leads to the following hypothesis, stated in both the null and alternative forms:

$H1_{null}$: Differences in post-IPO stock price performance between IPO firms and non-IPO firms matched on size and industry cannot be explained by differences in the relative amounts of accruals and/or cash flows from operations.

$H1_{alt}$: Differences in post-IPO stock price performance between IPO firms and non-IPO firms matched on size and industry can be explained by differences in the relative amounts of accruals and/or cash flows from operations.

2.2.2 Further assessment: understanding more about the role of accounting in IPO overpricing

I first attempt to distinguish between earnings-based explanations and other explanations for overpricing of IPO stocks using an approach suggested by Bernard et al. (1997) and employed by Cheng and Thomas (2006). I apply this approach only to my sample IPO firms.[11] Broadly, the approach comprises a "timing" test which examines the pattern of post-IPO abnormal returns over time, and an "association" test which examines the association between post-IPO abnormal returns and earnings components in the pre-IPO year. I also include a "combined" test that exploits features of both the timing and association tests. I describe the tests and related hypotheses below.

2.2.2.1 Timing test

IPO financial statements provided with the prospectus at the time of offering constitute a major part of the information set that market participants use to form expectations about future earnings of IPO firms and to price IPO stocks at the IPO date. At future earnings announcement dates, market participants observe realized earnings and compare realized earnings to expected earnings. At this point, market participants correct for any deviations from expectations by selling or bidding down

[11] I expect that mispricing of matched non-IPO firms, if any, will be relatively trivial compared to the mispricing of IPO firms. That is why my main tests focus only on IPO firms.

stocks that were initially overpriced and buying or bidding up underpriced stocks. The timing test exploits this process by examining the timing of abnormal returns of IPO firms subsequent to the IPO. If, on average, post-IPO abnormal returns are concentrated around earnings announcement dates, this suggests that market participants correct a substantial portion of their expectations about future earnings when they receive new earnings information. This leads to the following hypothesis, stated in both the null and alternative forms:

$H2_{null}$: Post-IPO abnormal returns are not concentrated around earnings announcement dates.

$H2_{alt}$: Post-IPO abnormal returns are concentrated around earnings announcement dates.

The timing test can distinguish between earnings-based explanations and risk explanations based on researcher-error in estimating risk of IPOs or explanations based on market-error in estimating risk if the market corrects prior errors in a continuous manner (see Appendix I for a detailed discussion).

2.2.2.2 Association test

Rejecting the null form of H2 does not rule out other explanations in favor of earnings-based explanations. For instance, a market-error risk-based explanation (i.e. other explanation) could still be possible if the market learns of its risk-estimation

error when post-IPO earnings are announced.[12] To rule out this possibility, I use the association test to assess the link between abnormal returns subsequent to offering and the earnings information in IPO financial statements. Specifically, I employ the association test to examine how the magnitudes of components of earnings in IPO financial statements correlate with the magnitude of post-IPO mean annual abnormal returns. If mean annual abnormal returns a year after offering are negatively (positively) associated with accruals (cash flows) announced pre-IPO, this suggests that IPO overpricing is related to earnings. Specifically, such an association would be consistent with failure by market participants to accurately interpret the implications of accruals and cash flows in IPO financial statements for future earnings. Risk-based explanations (e.g., market participants correcting their errors in estimating risk when post-IPO earnings are announced) would be less likely.[13,14] Thus, I test the following hypothesis, stated in both the null and alternative forms:

$H3_{null}$: Post-IPO abnormal returns are not negatively (positively) associated with the level of accruals (cash flows from operations) in IPO financial statements.

[12] Prior studies (e.g., Epstein and Turnbull 1980, Holthausen and Verrecchia 1988) show that earnings announcements reduce risk associated with investing in a firm's stock by conveying information to investors about the firm's activities. In other words, these studies suggest that risk decreases around earnings announcements. A decrease in risk is unlikely to explain the observed negative returns, which would be more consistent with an increase in risk.

[13] As an alternative to a test of the association between post-IPO abnormal returns and pre-IPO earnings components, Bernard et al. (1997) propose a trading strategy of taking long (short) positions in the lowest (highest) accruals-to-total assets deciles of sample firms and then examining whether the returns from such a strategy are consistently positive over the sample years.

[14] My tests cannot completely rule out a risk-based explanation. However, finding support for the alternative forms of my hypotheses would make a risk-based explanation very difficult to formulate.

$H3_{alt}$: Post-IPO abnormal returns are negatively (positively) associated with the level of accruals (cash flows from operations) in IPO financial statements.

H1 and H3 are similar. However, H1 compares IPO and size- and industry-matched non-IPO firms whereas H3 makes the comparison within the sample of IPO firms. As discussed earlier, if the post-IPO abnormal returns are associated with the accrual and cash flow components of earnings in the pre-IPO year, this is inconsistent with a market error risk-based explanation unless the error in the market's risk estimate is closely linked with the earnings components in the IPO financial statements. Likewise, an association between post-IPO abnormal returns and the accrual and cash flow components of earnings in the pre-IPO year is inconsistent with researcher errors. In other words, an association between post-IPO abnormal returns and the accrual and cash flow components of earnings in the pre-IPO year makes the earnings-based explanation more likely.

2.2.2.3 Combined test

This test combines the essential features of the timing and association tests. Recall that the timing test examines whether post-IPO abnormal returns are concentrated around earnings announcements. On the other hand, the association test examines whether post-IPO abnormal returns covary with the accruals and cash flow components of earnings in pre-IPO financial statements. Consequently, a combined test examines the association between post-IPO abnormal returns and pre-IPO earnings components (accrual and cash flows variables) in the announcement window.

Thus, combining the timing and association tests leads to the following hypothesis, stated in both the null and alternative forms:

$H4_{null}$: The association between post-IPO abnormal returns and pre-IPO accrual and cash flow components of earnings is not different in the announcement window than in the non-announcement window.

$H4_{alt}$: The association between post-IPO abnormal returns and pre-IPO accrual and cash flow components of earnings is different in the announcement window than in the non-announcement window.

2.2.3 Role of life cycle stage

Ex ante, I expect IPOs to be firms in the growth stage of their life cycles. In fact, my sample of IPOs includes growth firms (1,917), mature firms (1,098) and decline firms (488). I examine the planned use of IPO proceeds to gain some understanding of why firms go public.[15] Based on my subsample of 10 firms for each life cycle stage, I find that growth firms use IPO proceeds for new production facilities and expansion of existing ones (90% of the time) and to repay debts (10%). Mature firms use IPO proceeds for repaying existing shareholders and repaying debts (70%) and for acquisitions (30%). Decline firms use IPO proceeds to repay debts (60%) and for potential acquisitions or diversification (40%).

Though IPOs cut across all life cycle stages, growth firms seem to be dominant in IPO samples. Thus, critics of the earnings management explanation for IPO

[15] My analysis uses 30 IPO firms, drawn to include (i) the two largest firms, and (ii) two firms around each of the 25th, 50th, 75th, and 90th size-percentiles of each life cycle stage. Due to the small sample used in this analysis, any generalization regarding the use of IPO proceeds should be done with extreme caution.

mispricing (e.g. Liu 2008) argue that life cycle is an omitted variable in studies such as Teoh et al. (1998a, 1998b) that attribute the mispricing of IPO stocks to earnings management. In other words, life cycle may be an alternative explanation for the evidence cited in support of the earnings management hypothesis. In particular, Liu (2008) provides evidence that commonly used discretionary accrual models are misspecified, leading to an upward (downward) bias in discretionary accrual estimates for firms in the growth (decline) stage of their life cycle.[16] However, the role of life cycle and the mechanism by which life cycle affects IPO mispricing is not clear.

In this study, I consider two potential roles for life cycle. First, life cycle could affect on the level of accruals and cash flows, which could in turn lead to IPO mispricing (Sloan 1996). Second, life cycle could affect the riskness of an IPO firm which in turn could lead to mispricing if market participants fail to estimate the riskiness of the firm. Thus, I investigate whether life cycle has any effect on IPO mispricing beyond its effect on earnings components. Then, I examine if life cycle affects the likelihood of earnings-based vs. other (non-earnings-based) explanations for IPO mispricing.[17] Thus, I attempt to address the following research questions:

[16] Liu (2008) uses a general sample of firms from Compustat to show that discretionary accrual estimates are biased for growth and decline firms. She then reexamines prior studies associated with IPOs (Teoh et al., 1998a, b) and write-downs (Rees et al., 1996), incorporating life cycle in her analysis. Liu (2008) provides evidence that IPOs and write-downs are largely associated with the growth and the decline stages of a firm's life cycle, respectively. After incorporating life cycle in her analysis, Liu (2008) shows that the inferences in Teoh et al (1998a, b) and Rees et al.(1996) change. In other words, life cycle is an omitted variable in both Teoh et al. (1998a, b) and Rees et al. (1996).

[17] Ex ante, it is tempting to predict the life cycle stage(s) likely to be associated with either earnings-based explanations or other explanations. However, extreme caution is necessary since the theoretical basis for such a prediction seems weak. For example, to the extent that mature firms have earnings generating opportunities that are in steady state, current period earnings are likely to be a reliable predictor of future earnings. Thus, overpricing of mature IPOs would more likely result from factors other than earnings. On the other hand, it could be argued that current period earnings of growth and decline firms are unlikely to be reliable predictors of future earnings since growth and turnaround

RQ1: Does life cycle have any effect on IPO mispricing beyond its effect on earnings components?

RQ2: How does life cycle stage affect the likelihood of earnings-based and non-earnings-based explanations for IPO mispricing?

In relation to RQ1, I suggest a possible path diagram in figure 1. In this diagram, life cycle potentially has two effects on IPO mispricing. In the first effect, life cycle is deemed to affect IPO pricing through the accrual and cash flow components of earnings. In this regard, evidence from life cycle theory (Black 1998, Liu 2008) suggests that growth firms are associated with high accruals and low cash flows from operations in a fundamental way even without earnings management. Specifically, growth firms use cash flows from operations to finance growth in working capital accounts (higher inventories, higher receivables, etc) prior to listing. Thus, higher accruals and lower cash flows from operations make IPO firms prone to mispricing in line with Sloan (1996). If this is so, the importance of life cycle in explaining returns diminishes when accruals and cash flows are included, consistent with first (topmost) path in figure 1.

In the second effect, life cycle stage is deemed to affect the risk associated with firms rather than affecting earnings components. Such an effect might be supported if, for instance, young, high growth firms tend to be very risky. Myers' (1977)

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efforts are likely to result in future earnings opportunities or earnings streams that are different from currently existing ones. Using this argument, mispricing of growth and decline IPOs could be associated with earnings-based explanations. However, such a conclusion assumes that investors have little difficulty estimating the riskiness (say) of growth and decline stage IPOs, which is another possible source of mispricing. Since there is no theory to support this, I make no predictions about the way in which life cycle affects the type of mispricing.

characterization of a firm's value as comprising the value of assets-in-place and the value of growth opportunities suggests that this will often be the case. In particular, growth opportunities may not materialize or may differ from expectations. This would explain the high risk associated with growth firms whose value mainly derives from growth opportunities. Similarly, decline-stage firms are likely to be very risky in that management's efforts to revive a declining firm might fail leading to bankruptcy. On the other hand, mature firms might be considered less risky in this regard since they are in a steady-state with stable sources of cash flows and profitable operations. If life cycle has a role in IPO mispricing beyond its effect on earnings components (e.g., through risk), I expect the life cycle variables to load when both the life cycle and earnings variables are included as independent variables in a regression explaining post-IPO returns [see equations (6) and (7)]. Thus, finding that life cycle has incremental explanatory power beyond accruals and cash flows would support the second path in figure 1.

To explore RQ2, I examine whether my main tests (H2 through H4) produce different results for firms in different life cycle stages. This involves running my main tests (timing, association, and combined) for each life cycle stage (growth, maturity, and decline).

3. Tests and research design

To minimize the potential for ambiguity when describing my tests, definitions are needed for the following terms.

IPO date	:	The date when the stocks of an IPO firm are first sold to the public.
Industry of a firm	:	Fama-French industry classification to which the firm belongs.
Size of IPO firm	:	Total assets of an IPO firm at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus.
Return window	:	Period for which returns are measured.
Annual window	:	For an IPO firm, the annual window refers to the period beginning 1 day after the IPO date through 250 trading days. For a matched non-IPO firm, the annual window corresponds to the annual window for the corresponding IPO firm.
Announcement window	:	12-day period comprising four 3-day quarterly earnings announcement windows within the annual window. Each quarterly announcement window is constructed to begin (end) with the day before (after) the quarterly earnings announcement date.
Non-announcement: window		Period comprising all days in the annual window which are not included in the announcement window.
Abnormal returns	:	Size-adjusted returns of a firm, constructed by subtracting the average return of the size-decile to which the firm belongs

from the raw returns of the firm.

I describe the tests in the following paragraphs.

3.1. Initial assessment: IPO overpricing and the accrual anomaly

This test compares the post-IPO performance (mean abnormal returns) of IPO firms with that of non-IPO firms matched on size and industry under the following two scenarios: (1) without controlling for accruals and cash flows, and (2) after controlling for accruals and cash flows. Thus, I propose to estimate the following cross-sectional regressions to compare the mean abnormal returns of IPOs and matched non-IPOs:

$$AR_i^{(post)} = a_1 + b_1 IPO_i + \varepsilon_{i1} \quad (1)$$

$$AR_i^{(post)} = a_2 + b_2 IPO_i + c_2[ACC\_Rank_i] + d_2[CF\_Rank_i] + \varepsilon_{i2} \quad (2)$$

$AR_i^{(post)}$ = mean annual abnormal returns of firm i over the year following the IPO date[18];

IPO_i = indicator variable which is equal to 1 if firm i is an IPO firm and 0 if it is a non-IPO firm;

ACC_Rank_i = decile rank[19] of accruals deflated by total assets $[ACC_i^{(pre)} / TA_i^{(pre)}]$ for firm i in the pre-IPO year less the mean decile rank (4.5),

[18] Whenever they are used, superscripts denote the point in time at which or the period of time over which the corresponding variable is measured, relative to the IPO date. For example, the superscript "(post)" used for abnormal returns indicates that the abnormal returns are measured over the year immediately following the IPO date. Similarly, the superscript "(pre)" which is used for the accrual, cash flow and total assets variables indicates that these variables are measured for the annual "reporting period" ending immediately before the IPO date. Financial statements for this most recent annual reporting period are provided with the IPO prospectus.

divided by 9; [20]

CF_Rank_i = decile rank of operating cash flows deflated by total assets [$CF_i^{(pre)}$ /$TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus[21];

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

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[19] I use decile ranks rather than actual values to mitigate skewness problems in the accruals and cash flows variables.

[20] Subtracting the mean rank effectively centers the ranks on zero. For a discussion of the benefits of centering, see Hunton et. al (2005).

[21] My definition of accruals as "total accruals" is consistent with Sloan (1996) except that Sloan (1996) uses differences in balance sheet accounts to estimate accruals whereas I estimate accruals by subtracting operating cash flows reported in the statement of cash flows from earnings. Some studies use "abnormal" accruals rather than total accruals (Xie 2006, Cheng and Thomas 2006), arguing that Sloan's (1996) anomaly is due primarily to abnormal accruals. I believe that total accruals capture the essential elements necessary to test my hypotheses.

ε_{in} = error term (firm i, equation n).

If the IPOs in my sample are overpriced relative to matched non-IPOs, I expect the coefficient "b_1" in equation (1) to be significantly negative. Furthermore, if the overpricing of IPO firms reported at the end of the first day of public trading is a symptom caused by a broader mispricing of earnings components, I expect the hypothesis that $c_2 = d_2 = 0$ to be rejected.[22]

3.2 Further assessment: understanding more about the role of accounting in IPO overpricing

In this section, I discuss my main tests for understanding the role of accounting in IPO mispricing. These are the timing, association and combined tests.

3.2.1 Timing test

I apply this test to my sample of IPO firms to examine the timing of post-IPO abnormal returns. I assess the timing of post-IPO abnormal returns by estimating averages of the coefficients obtained from running firm-specific regressions of daily abnormal returns in the year following the IPO date on an indicator variable that distinguishes whether the day of the return is within the announcement window or within the non-announcement window.[23] Thus, my model is:

$$AR_{id}^{(post)} = a_{3i} + e_{3i}AW + \varepsilon_{id3} \quad (3)$$

[22] To test the hypothesis that $c_2 = d_2 = 0$, I use the sum of squared residuals (SSR) in models (1) and (2) and the related degrees of freedom to compute my test statistic (F-statistic). Refer to Wooldridge (2003) for a detailed discussion.

[23] The use of firm-specific, rather than pooled, regressions mitigates the risk of biased regression coefficients. For a detailed discussion, refer to Teets and Wasley (1996).

$AR_{id}^{(post)}$ = daily abnormal returns for firm i for day "d" in the year following the IPO date;

AW = indicator variable which is equal to 1 if the day over which the daily abnormal return of firm i [$AR_{id}^{(post)}$] is measured falls in the announcement window and 0 if the day "d" falls in the non-announcement window (the subscripts "i" and "d" on the indicator variable AW are omitted for brevity);

ε_{id3} = error term (firm i, day "d", equation 3).

If the negative abnormal returns, representing overpricing, are concentrated in the announcement window, I expect the average of the estimated firm-specific coefficients ($\hat{e}_{3i}$) on the announcement window indicator variable to be significantly negative and the average of the firm-specific constants (a_{3i}) to be trivial.

3.2.2 Association test

The association test examines the association between post-IPO abnormal returns and earnings components (accruals and cash flows) in the pre-IPO year. Thus, I estimate a pooled regression of abnormal returns in the year following each IPO on accrual and cash flow ranks in the pre-IPO year as follows:

$$AR_i^{(post)} = a_4 + c_4 ACC\_Rank_i + d_4 CF\_Rank_i + \varepsilon_{i4} \quad (4)$$

The variables are as defined for equations (1) and (2). If the hypothesis that $c_4 = d_4 = 0$ is rejected, I consider the alternative form of H3 supported.[24]

3.2.3 Combined test

In the combined test, I test whether the incremental return that is concentrated around post-IPO earnings announcement dates is associated with pre-IPO accruals and cash flow components of earnings. My model of the combined test is a regression of the firm-specific coefficient estimates ($\hat{e}_{3i}$) from equation (3) onto the corresponding accruals and cash flows variables. Thus, the model for the combined test is:

$$\hat{e}_{3i} = a_5 + \delta_5[ACC\_Rank_i] + \eta_5[CF\_Rank_i] + \varepsilon_{i5} \quad (5)$$

where $\hat{e}_{3i}$ is the firm-specific coefficient of firm i on the announcement window indicator variable (AW) from the timing test model in equation (3).

If the alternative form of H4 is supported, I expect: (1) $\delta_5 = \eta_5 = 0$ to be rejected, and (2) a_5 to be trivial. The following combinations of δ_5 and η_5 are likely to be observed: (i) $\delta_5 = 0$ and $\eta_5 > 0$, suggesting that cash flow ranks explain the magnitude of post-IPO returns occurring during the announcement window but accrual ranks do not, (ii) $\delta_5 < 0$ and $\eta_5 = 0$, suggesting that accrual ranks explain announcement window post-IPO returns but cash flow ranks do not, and (iii) $\delta_5 < 0$ and $\eta_5 > 0$, suggesting that both accrual and cash flow ranks explain announcement window post-IPO abnormal returns. All three outcomes would be consistent with: (i) investors' trading decisions at the IPO date failing to fully incorporate earnings

[24] To test the hypothesis that $c_4 = d_4 = 0$, I do the following: (i) estimate the full model in equation (4) and record the corresponding sum of squared residuals (SSR) and, (ii) estimate a restricted model with only the constant and record the corresponding SSR. I then use the SSRs in (i) and (ii) to compute an F-statistic. To estimate the restricted model such as in (ii) above, I suppress the intercept and I run a regression of the dependent variable (e.g., post-IPO abnormal returns in model 4) on a column of 1s.

components reported in pre-IPO financial statements, and (ii) the investors correcting this oversight when earnings are reported in the subsequent year. The specific pattern of the coefficients (δ_5 and η_5) will reveal which component of earnings investors fail to incorporate. Although a debate exists regarding which of the earnings components investors are more likely to fail to fully incorporate, I expect cash flows rather than accruals to explain announcement window post-IPO returns based on evidence from Armstrong et al. (2009).

3.3 Role of life cycle stage

As stated earlier, my sample of IPOs includes growth firms, mature firms, and decline firms (refer to section 2.2.3 for a brief explanation of why mature and decline firms might go public). Although life cycle has been suggested as a possible explanation for the mispricing of IPOs, its role is largely unexplored. I envision two possible roles for life cycle. First life cycle could affect the level of accruals and cash flows which in turn affect IPO mispricing. Alternatively, life cycle might affect risk which leads to mispricing when market participants fail to accurately estimate the risk associated with IPOs.

Thus, to examine the role of life cycle stage in the performance of IPO firms, I divide my sample IPO firms into growth-, mature- and decline-stage firms (Anthony and Ramesh 1992, Hribar and Yehuda 2008).[25] Then, I use the life cycles to investigate (i) whether life cycle has any effect of IPO mispricing other than its effect on accruals and cash flow ranks (RQ1), and (ii) whether life cycle affects the form (earnings vs. other) of mispricing (RQ2). In relation to RQ1, I estimate the earlier

[25] See appendix II for a detailed discussion of the life cycle measure employed in this study.

regressions involving earnings components (regression model 4 and regression model 5) using two scenarios. In the first scenario, I use life cycle indicator variables in place of the earnings components. In the second scenario, I include life cycle variables together with the earnings components. The indicator variable GROWTH (DECLINE) is equal to 1 if the IPO firm is in the growth (decline) stage and 0 otherwise. The mature stage (omitted) is the baseline.

Scenario 1: Here I substitute the life cycle variables (GROWTH, DECLINE) for the earnings components in equations (4) and (5). Thus,

$$AR_i^{(post)} = a_6 + f_6 GROWTH_i + h_6 DECLINE_i + \varepsilon_{i6} \quad (6)$$

$$\hat{e}_{3i} = a_7 + f_7 GROWTH_i + h_7 DECLINE_i + \varepsilon_{i7} \quad (7)$$

All variables are as defined for equations (1) through (5).

Rejecting $f_6 = h_6 = 0$ in equation (6) above suggests that mean post-IPO abnormal returns vary across the life cycle stages. However, the question as to whether life cycle affects IPO pricing directly or only indirectly by affecting accrual and cash ranks (RQ1) remains unanswered despite the rejection of $f_6 = h_6 = 0$. Likewise, rejecting $f_7 = h_7 = 0$ in equation (7) suggests that the average of the firm-specific announcement window coefficients, $\hat{e}_{3i}$, vary across the life cycle stages but falls short of informing us whether the effect of life cycle is direct or occurs only indirectly by affecting the accrual and cash flow ranks. To address this, I use both the life cycle variables and the earnings variables (accrual and cash flow ranks) in the same equation. I examine this in scenario 2.

Scenario 2: Here, I include the life cycle variables together with the earnings components in equations (4) and (5), resulting in equations (8) and (9). Equations (8) and (9) address the limitation noted in equations (6) and (7). In other words, I can now examine whether life cycle has any effect on IPO mispricing beyond its effect on earnings components (RQ1).

$$AR_i^{(post)} = a_8 + c_8 ACC\_Rank_i + d_8 CF\_Rank_i + f_8 GROWTH_i + h_8 DECLINE_i + \varepsilon_{i8} \quad (8)$$

$$\hat{e}_{3i} = a_9 + \delta_9 [ACC\_Rank_i] + \eta_9 [CF\_Rank_i] + f_9 GROWTH_i + h_9 DECLINE_i + \varepsilon_{i9} \quad (9)$$

If life cycle has any effect on IPO mispricing beyond its effect on earnings components (RQ1), I expect $f_8 = h_8 = 0$ and $f_9 = h_9 = 0$ to be rejected.

Finally to examine whether life cycle moderates the form of mispricing (i.e. earnings-based versus other explanations for IPO mispricing) as in RQ2, I re-estimate models (3) through (5) for each life cycle stage and test whether my inferences about which explanation for IPO mispricing (earnings-based vs. other) change across the life cycle stages.

4. Sample

I draw my initial sample of IPO firms from the Field-Ritter datasets of IPO founding dates available on Jay Ritter's website (http://bear.cba.ufl.edu/ritter/ipodata.htm). The initial sample comprises 7,477 firms which have US initial public offerings during the period from 1988 to 2007. I exclude

IPOs that took place before 1988 since firms were not required to provide cash flow data (a key variable in my tests) prior to 1988. I obtain my final sample of 5,338 IPO firms after excluding: (i) firms which could not be found on Compustat (1,094), (ii) firms missing pre-IPO data on Compustat (734), (iii) firms with pre-IPO data on Compustat but with missing values for key Compustat variables (297), (iv) firms not found on CRSP (10), and (v) repeat IPOs (4). My sample selection is summarized in table 1, panel A. Panel B summarizes the industry composition of the final 5,338 firms. Finally, panel C provides a distribution of the 5,338 firms by IPO year. For tests incorporating life cycle, the sample is further reduced to 3,503 firms after excluding IPO firms with missing pre-IPO values of the variables required to classify firms into life cycles (dividend payout ratio, sales growth, firm age, capital expenditure and total assets).

Table 2 provides summary statistics of selected variables for the full sample of 5,338 firms. The full sample of 5,338 IPO firms has a mean (median) of: (i) -0.31 (-0.16) for mean annual post-IPO abnormal returns, (ii) -0.08 (-0.06) for total accruals deflated by total assets, (iii) -0.07 (0.04) for operating cash flows deflated by total assets, (iv) 19.4 % (0.0%) for dividend payout ratio, (v) 111% (19 %) for sales growth, (vi) 0.08 (0.06) for capital expenditure deflated by total assets, and (vii) 14.3 (8.0) for age of the firm.

5. Results

5.1 Initial assessment: IPO overpricing and the accrual anomaly

The initial assessment uses a sample of 5,338 IPO firms and 5,338 matched non-IPO firms. Table 3 (panel A) provides a correlation matrix for the IPO variable and the ranks for accruals and cash flows. As expected, IPOs are associated with higher accrual ranks and lower cash flow ranks.

Table 3 (panel B) presents the results of my initial assessment of the overpricing of IPO stocks. Specifically, the results in model (1) represent a pooled regression of annual abnormal returns on an IPO indicator variable (IPO=1 if the firm is an IPO firm; 0 otherwise), including both IPO firms and size- and industry-matched non-IPO firms in the regression. In this regression, the coefficient on the IPO indicator variable (b_1 = -0.131, t = -4.88) suggests that my sample IPO firms underperform relative to matched non-IPO firms by about 13% in the year immediately following the IPO date. In economic terms, this means that a trading strategy of selling short the stocks of IPO firms and buying stocks of matched non-IPO firms at the end of the IPO date would result in buy-and-hold returns of 13% in the post-IPO year.[26]

Model (2) in table 3 (panel B), which examines a possible role of earnings components in the overpricing of stocks of IPO firms at the end of the first day of trading, confirms the finding in model (1) that IPO firms underperform relative to matched non-IPO firms by about 13 % (b_2 = -0.132, t = -4.35). The coefficients on the accruals variable (c_2 = 0.056, t = 1.26) and the cash flows variable (d_2 = 0.245,

[26] This is consistent with Ritter (1991) who finds a first year differential of 10% between returns of IPO firms and those of matched non-IPO firms.

t = 5.38) in model (2) suggest a role for earnings components, particularly cash flows, in explaining post-IPO returns. In fact, table 3 (panel C) shows that the joint hypothesis of $c_2 = d_2 = 0$ is rejected (F = 234.81 vs. a critical value of 3.00 at a 5% level of significance). Thus, since accruals and cash flows explain post-IPO returns, we cannot rule out the possibility that the IPO anomaly might be linked to the wider anomaly in Sloan (1996).

5.2 Further assessment: understanding more about the role of accounting in IPO overpricing

Table 4 presents the results of the timing, association and combined tests for my full sample of IPO firms.[27] Recall that the timing test [model (3)] represents a regression of daily abnormal returns on an indicator variable AW (=1 if the day of the return lies within the announcement window, 0 otherwise). The association test [model (4)] represents a regression of annual post-IPO abnormal returns on pre-IPO accruals and cash flows ranks. Finally, the combined test [model (5)] represents a regression of the firm-specific coefficients on the AW variable from model (3) on pre-IPO accruals and cash flows variables.[28]

5.2.1 Timing test

In column 2 of table 4, I present the averages of the firm-specific intercepts and coefficients from regression model (3). To be specific, the average of the firm-

[27] Any attempt to compare the intercepts and coefficients across columns must be done with caution for the following reasons: (i) the dependent variables differ across columns, and (ii) the models do not include the same variables.

[28] In simulation results not presented in this paper, I find that the coefficients on the accruals and cash flows variables in the firm-specific version of the combined test [$\hat{e}_{3i} = a_5 + \delta_5(ACC\_Rank_i) + \eta_5(CF\_Rank_i) + \varepsilon_{i5}$] correspond to the coefficients δ_5 and η_5 in the pooled regression, $AR_{id}^{(post)} = a_5 + (c_5+\delta_5 AW)ACC\_Rank_i + (d_5 + \eta_5 AW)CF\_Rank_i + e_5 AW + \varepsilon_{id5}$. This latter equation is an alternative version of the combined test that I do not use due to concerns about correlated standard errors.

specific coefficients, $\hat{e}_{3i}$, on the announcement window indicator variable (AW) is significantly negative ($\hat{e}_{3i}$ = -0.00148, t = -4.70). This evidence suggests that in the year immediately subsequent to the IPO date, abnormal returns of my sample IPO firms are concentrated in the announcement window. Based on the intercept and coefficient in model (3), the cumulative returns in the announcement (non-announcement) window is approximately -2.3% (-10.5%). On the other hand, the announcement (non-announcement) window is 12 (238) days in length. The returns in the announcement window are about 22% of the returns in the non-announcement window even though the length of announcement window is only about 5% the length of the non-announcement window. Clearly, there is a disproportionate amount of negative returns in the announcement window, consistent with an earnings-based explanation.

5.2.2 Association test

Recall that negative abnormal returns concentrated in the announcement window are not considered conclusive evidence in separating earnings-based explanations of the end-of-first-day overpricing of the stocks of IPO firms from other explanations (e.g., risk-based explanations and fads). The association test provides additional evidence that potentially makes one explanation (earnings-based vs. other) more plausible and the alternative explanation more difficult to formulate. In particular, if post-IPO abnormal returns are associated with pre-IPO earnings components, this makes an earnings-based explanation for IPO mispricing more plausible than other explanations. Column 3 of table 4[model (4)] presents the results of the association test for my sample of IPO firms. I find that pre-IPO accrual ranks

are negatively associated with post-IPO annual abnormal returns (c_4 = -0.027, t = -1.98) while cash flow ranks are positively associated with post-IPO abnormal returns (d_4 = 0.240, t = 3.52) suggesting that post-IPO abnormal returns are associated with pre-IPO accrual and cash flow ranks.

In table 4, I also present the results of my test of the hypotheses that $c_4 = d_4 = 0$. In this table, $c_4 = d_4 = 0$ is rejected (F = 21.48 vs. a critical value of 3.00 at a 5% level of significance). Thus, the association test results for the full sample support an earnings-based explanation.

5.2.3 Combined test

As a reminder, the combined test examines the association between post-IPO returns and earnings components within the earnings announcement window. Table 4 (model 5) presents my results for the combined test. Specifically, results in table 4 suggest that I should reject the hypothesis that $\delta_5 = \eta_5 = 0$ for my full sample of IPO firms (F = 86.88 vs. a critical value of 3.00 at a 5% level of significance). This implies that, on average, investors adjust expectations of future earnings based on accruals and cash flows information reported during the earnings announcement window. Furthermore, table 4 shows that the coefficient on cash flow ranks is positive and significant at the 5% level (η_5 = 0.00346, t = 3.24) and the coefficient on accruals ranks is positive but insignificant at the 5% level (δ_5 = 0.0212, t = 1.88). These results imply that, on average, the overpricing of IPO is due to the accrual anomaly, with cash flows subsuming accruals in explaining announcement window abnormal returns. This is consistent with Armstrong et al. (2009) who document evidence that when cash flows are included, accruals do not explain post-IPO abnormal returns. In other words,

the combined test results for my full sample of IPOs support an earnings-based explanation for the overpricing of IPOs.

In summary, the results of my main tests (timing, association, and combined tests) support an earnings-based explanation for my full sample of IPO firms. That is, for the full sample, mispricing of IPOs seems consistent with failure to fully incorporate the implications of pre-IPO earnings components for future earnings. In subsequent subsections, I present results of tests aimed at understanding the role of life cycle stage in overpricing of IPOs.

5.3 Role of life cycle stage

Table 5 provides summary statistics for the life cycle sample. Out of the life cycle sample of 3,503 IPO firms, 1,917 firms are classified as growth firms, 1,098 as mature firms and 488 as decline firms. Thus, within my sample, growth stage IPOs outnumber non-growth (mature and decline) IPOs. In addition, growth IPOs have higher mean accruals deflated by total assets (-0.06 vs.-0.09 and -0.07) and lower cash flows deflated by total assets (0.01 vs. 0.12 and 0.10), relative to mature and decline IPOs. The distribution of the mean dividend payout ratios, mean sales growth rates, mean capital expenditure deflated by total assets and mean age of the firms across life cycle stage reflects my criteria for classifying sample IPO firms into life cycles.

Table 6 and table 7 present the results of the tests I employ to explore the role of life cycle stage in the overpricing of IPO firms. I discuss the results in the following subsections.

5.3.1 Does life cycle have any effect on IPO mispricing beyond its effect on earnings components (RQ1)?

Recall that the approach I adopt to investigate RQ1 involves an examination of whether life cycle explains post-IPO abnormal returns and/or the average of the firm-specific announcement window coefficients, $\hat{e}_{3i}$. In particular, I re-estimate models (4) and (5) under the following two scenarios: (i) using life cycle variables instead of accruals and cash flow ranks, and (ii) using life cycle variables together with accruals and cash flow ranks.

Column 2 of table 6 shows that the coefficients on the life cycle indicator variables are both statistically insignificant at the 5% level (f_6=0.078, t=1.29; h_6=0.022, t=0.34). Column 4 of table 6 presents the results for regression model (8) [29] that includes both life cycle and earnings variables. The lifecycle coefficients (f_8 = 0.044, t = 0.74; h_8 = 0.119, t = 1.85) and the accruals coefficient (c_8 = -0.035, t = -0.59) are insignificant while the cash flow coefficient (d_8 = 0.623, t = 10.02) is significant. Thus, the results in column 4 of table 6 are in line with the evidence from column 2. That is, life cycle does not explain post-IPO abnormal returns, whether used alone in a regression or with accruals and cash flow ranks. Later in table 6, I fail to reject the hypothesis that $f_6 = h_6 = 0$ (F = 1.46 vs. a critical value of 3.00 at a 5% level of significance). Likewise, I fail to reject $f_8 = h_8 = 0$ (F = 2.34 vs. a critical value of 3.00 at a 5% level of significance). Thus, I find no evidence that life cycle explains post-IPO abnormal returns for my sample firms.

[29] Note that the differences between the estimates in models (4) and (8) are partly due to differences in sample composition. Model (4) uses my full sample of 5,338 IPO firms whereas model (8) uses only the 3,403 firms which have the information required to assign life cycle stage.

In columns 3 and 5 of table 6, the lifecycle variables are insignificant (f_7= -0.00016, t= -0.14; h_7= -0.00123, t= -0.94; f_9=-0.00042, t= -0.36; h_9=-0.001, t= -0.76) while accruals (δ_9 = -0.00274, t = -2.21) and cash flows (η_9 = 0.00311, t = 2.50) are significant. In addition, I fail to reject the hypothesis that $f_7 = h_7 = 0$ (F = 2.74 vs. a critical value of 3.00 at a 5% level of significance equivalent). Similarly, I cannot reject $f_9 = h_9 = 0$ (F = 1.87 vs. a critical value of 3.00 at a 5% level of significance). Thus, I find no evidence that life cycle explains post-IPO abnormal returns and/or announcement window returns, whether life cycle is used alone or with earnings components in a regression.

5.3.2 How does life cycle stage affect the likelihood of earnings-based explanations and other explanations (RQ2)?

Recall that to answer RQ2, I re-estimate models (3) through (5), using only firms in the growth, mature, and decline stages in turn. Next, I examine whether my inference about the most likely explanation (earnings-based vs. other) for IPO mispricing changes across life cycle stage. Table 7 presents my results. I discuss the results in the following sections.

5.3.2.1 Growth Stage

For sample IPO firms in the growth stage, I find evidence in table 7 (panel A) that:

(i) *Timing test*: post-IPO abnormal returns are concentrated around earnings announcements ($\hat{e}_{10i}$ = -0.00131, t = -2.83);

(ii) *Association test*: pre-IPO earnings variables (particularly cash flow ranks) are associated with post-IPO abnormal returns (c_{11} = -0.0353, t = -0.36; d_{11} = 0.274, t = 2.69). In addition, the joint hypothesis that $c_{11} = d_{11} = 0$ is rejected (F = 13.6 vs. a critical value of 3.00 at the 5% level of significance).

(iii) *Combined test*: pre-IPO earnings variables (in particular, cash flow ranks) can explain announcement window returns (δ_{12} = 0.00231, t = 1.47; η_{12} = 0.00493, t = 3.09). The joint hypothesis that $\delta_{12} = \eta_{12} = 0$ is rejected (F = 35.6 vs. a critical value of 3.00 at the 5% level of significance).

In summary, for my sample firms that are in the growth stage, IPO overpricing seems to be consistent with earnings-based explanations rather than with other explanations.

5.3.2.2 Mature Stage

For mature stage sample IPO firms, the results of my main tests for distinguishing between earnings-based and other explanations (table 7, panel B) are:

(i) *Timing test*: post-IPO abnormal returns are not concentrated around earnings announcements ($\hat{e}_{10i}$ = -0.00114, t = -1.57);

(ii) *Association test*: pre-IPO earnings variables (in particular, cash flow ranks) are associated with post-IPO abnormal returns (c_{11} = -0.0678, t = -0.36; d_{11} = 0.397, t = 2.22). The joint hypothesis that $c_{11} = d_{11} = 0$ is rejected (F = 11.6 vs. a critical value of 3.00 at the 5% level of significance);

(iii) *Combined test*: pre-IPO accrual and cash flow ranks cannot explain announcement window returns (δ_{12} = 0.00274, t=1.01; η_{12} = -0.00265, t = -1.09). I fail to reject the joint hypothesis that $\delta_{12} = \eta_{12} = 0$ (F = 0.73 vs. a critical value of 3.00 at the 5% level of significance).

In summary, results from the timing and combined tests do not support an earnings-based explanation for IPO mispricing. In fact, t-statistics for both the constant term and the AW variable in the second column of panel B of table 7 (timing test) suggest that mispricing of mature IPOs, if any, is minimal.

5.3.2.3 Decline Stage

For sample IPO firms in the decline stage, the results of my main tests for distinguishing between earnings-based and other explanations (table 7, panel C) are:

(i) *Timing test*: post-IPO abnormal returns are concentrated around earnings announcements ($\hat{e}_{10i}$ = -0.00238, t = -3.62).

(ii) *Association test*: pre-IPO cash flow (accrual) ranks are (are not) associated with post-IPO abnormal returns (d_{11}= 0.405, t = 2.09; c_{11} = -0.0190, t = -0.81). I reject the joint hypothesis that $c_{11} = d_{11} = 0$ (F = 5.6 vs. a critical value of 3.00 at the 5% level of significance).

(iii) *Combined test*: pre-IPO accrual and cash flow ranks cannot explain announcement window returns (δ_{11} = 0.00296, t = 1.14; η_{11} = -0.00036, t = -0.13). I fail to reject the joint hypothesis that $\delta_{12} = \eta_{12} = 0$ (F = 1.16 vs. a critical value of 3.00 at the 5% level of significance).

Thus, I find mixed results regarding the role of earnings in explaining the mispricing of decline stage IPO firms. To be specific, the timing and association tests are consistent with an earnings-based explanation. However, the combined test does not support an earnings-based explanation.

In summary, I find evidence that the mispricing of my growth-stage sample IPO firms is consistent with earnings-based explanations. On the other hand, mispricing of mature-stage sample IPO firms, if any, is not consistent with earnings-based explanations. As for decline-stage sample IPO firms, I find mixed evidence. Specifically, the timing and association tests point toward earnings-based explanations whereas the combined test does not support earnings-based explanations.

5.4 Results of Additional Tests

To address concerns that my results may have been affected by the choice of return window used in my tests (12 months), I repeat the main tests using a longer window of 36 months.[30] Thus, the timing test now uses daily abnormal returns and announcement windows measured over the 36-month period beginning the day after the IPO date. The association test uses 36-month cumulative abnormal returns from the day after the IPO date and examines whether or not these returns are associated with accrual and cash flow components in the IPO financial statements. Similarly, the combined test is now based on a 36-month return window instead of a 12-month (annual) window. I repeat the main tests for both my full sample and my life cycle sample of IPO firms.

[30] This is chosen to be consistent with the window used by Ritter (1991). See also footnote 6.

5.4.1 Full sample tests

Table 8 presents the results of the timing, association and combined tests using my full sample of 5,338 IPO firms and a return window of 36 months subsequent to the IPO date.

5.4.1.1 Timing test

Table 8 (column 2) presents the results of the timing test for the full sample of IPOs but using a returns window of 36 months instead of 12 months. In this table, average daily abnormal returns in the announcement window are -0.0018 and -0.00039 in the non-announcement window. Remember that using a 36-month window, the announcement (non-announcement window) is 36 (714) days long. Thus total announcement (non-announcement) window returns are -6.5% (-27.8%). In other words, announcement window returns are about 23% of the non-announcement window returns. On the other hand, the announcement window is only 5% of the non-announcement window in length. In other words, for the full sample of IPOs, returns are concentrated in the announcement window. Thus, the alternate form of H2 is supported.

5.4.1.2 Association test

Association test results are presented in column 3 of table 8. The intercept is -0.455 (t = -2.36), the coefficient on the accruals variable is -0.188 (t = -0.15), and the coefficient on the cash flow variable is 0.778 (t = 2.76). The higher intercept relative to the 12-month return window is partly due to the longer return window resulting in higher total returns. Thus, cash flows in the IPO financial statement are associated with 36-month post-IPO abnormal returns though accruals are not. Furthermore, the

hypothesis that $c_4 = d_4 = 0$ (implying that accruals and cash flows in IPO financial statements are not associated with 36-month post-IPO returns) is rejected (F-statistic = 11.1 vs. a critical value of 3.00 at the 5% level of significance). This suggests that IPO mispricing results from failure to fully incorporate the implication of earnings components in IPO financial statements for future earnings.

5.4.1.3 Combined test

Combined test results are shown in column 4 of table 8. In this case the coefficient on the accruals variable is 0.00026 (t = 0.39) and that on the cash flow variable is 0.0235 (t = 3.80). In addition, the hypothesis that $\delta_5 = \eta_5 = 0$ is rejected (F-statistic = 19.6 vs. a critical value of 3.00 at the 5% level of significance). This suggests that the association between abnormal returns and earnings components is different in the announcement window than in the non-announcement window. Thus, the alternate form of H3 is supported.

In summary, all the main tests using a 36-month return window support an earnings-based explanation on average (i.e. for the full sample of IPOs). This is consistent with the findings using a 12 month return window.

5.4.2 Life cycle sample tests

As before, these tests are restricted to the 3,503 firms with enough data to be classified into life cycle stages. However, I now use a 36-month return window. The results are presented in table 9. In summary, the results are as follows:

5.4.2.1 Growth Firms Only

The results for growth IPOs are shown in panel A of table 9.

5.4.2.1.1 Timing test

For growth IPOs, post-IPO abnormal returns are concentrated around earnings announcements: intercept (a_{10}) is equal to -0.00038 (t = -3.81) and the coefficient on the indicator variable AW ($\hat{e}_{10i}$) is -0.00146 (t = -3.73). Thus, announcement window returns are about 24% of non-announcement window returns. In other words, abnormal returns are concentrated in the announcement window (alternate form of H2 is supported).

5.4.2.1.2 Association test

For growth IPOs, the coefficient on the accrual variable is -0.327 (t = -2.13) and that on the cash flow variable is 0.950 (t = 6.05). Thus, both accruals and cash flows are associated with 36-month post-IPO abnormal returns. In fact, the joint hypothesis of $c_{11} = d_{11} = 0$ is rejected (F = 19.8 vs. a critical value of 3.00 at a 5% level of significance). In other words, the alternate form of H3 is supported, consistent with an earnings-based explanation.

5.4.2.1.3 Combined test

Firm-specific coefficients on the announcement window indicator variable (AW) are associated with cash flow ranks ($\eta_{12} = 0.0016$, t = 1.96) but not with accrual ranks ($\delta_{12} = 0.00043$, t = 0.55). I reject the joint hypothesis that $\eta_{12} = \delta_{12} = 0$ (F = 12.9 vs. a critical value of 3.00 at a 5% level of significance). Thus, the alternate form of H4 (that the association between earnings components in IPO financial statements and 36-month post-IPO returns is different in the announcement window than in the non-

announcement window) is supported. This suggests an earnings-based explanation for the mispricing of growth IPOs.

In summary, all the main tests support an earnings-based explanation for the mispricing of growth IPOs. This is the same conclusion that follows from using a 12-month return window.

5.4.2.2 Mature Firms Only

Results for mature stage IPOs using a 36-month return window are presented in table 9 (panel B).

5.4.2.2.1 Timing test

Results for the timing test suggest that earnings are not concentrated around earnings announcements (intercept = -0.00039, t = -3.61; $\hat{e}_{10i}$ = -0.00140, t = -1.15). In other words, earnings-based explanations are not supported.

5.4.2.2.2 Association test

The association test results show that cash flow ranks (d_{11} = 1.244, t = 3.33) are associated with 36-month post-IPO returns but accruals are not (c_{11} = -0.206, t = -0.56). The joint hypothesis that $c_{11} = d_{11} = 0$ is rejected (F = 16.7 vs. a critical value of 3.00 at a 5% level of significance). This supports the alternate form of H3.

5.4.2.2.3 Combined test

The coefficient on the accruals variable (δ_{12} = 0.00093, t = 0.38) and the cash flow variable (η_{12} = 0.0016, t = 0.74) are both insignificant. The joint hypothesis that $\eta_{12} = \delta_{12} = 0$ cannot be rejected (F = 0.41 vs. a critical value of 3.00 at a 5% level of

significance). Thus, the association between 36-month post-IPO returns and the earnings components in IPO financial statements is not different in the announcement window than in the non-announcement window (null form of H4 is not rejected).

To summarize, the results in table 9 (panel B) suggest that mispricing of mature IPOs is consistent with factors other than earnings. This is the same conclusion I arrived at using a 12-month return window.

5.4.2.3 Decline Firms Only

Panel C of table 9 presents the results for decline firms using a 36-month return window.

5.4.2.3.1 Timing test

For IPOs in the decline stage, post-IPO abnormal returns are concentrated around earnings announcements. Specifically, the intercept is -0.00040 (t = -5.23) and the coefficient on the indicator variable AW ($\hat{e}_{10i}$) is -0.00152 (t = -2.86). Announcement window returns are about 24% of non-announcement window returns. In other words, abnormal returns are concentrated in the announcement window (alternate form of H2 is supported).

5.4.2.3.2 Association test

Here, earnings components in IPO financial statements (in particular, cash flow ranks) are associated with post-IPO abnormal returns (c_{11} = -0.129, t = -0.48; d_{11} = 1.105, t = 3.76). The joint hypothesis that $c_{11} = d_{11} = 0$ is rejected (F = 10.4 vs. a critical value of 3.00 at a 5% level of significance) suggesting a role for earnings components in the mispricing of decline stage IPOs.

5.4.2.3.3 Combined test

The coefficient on the accruals variable ($\delta_{12} = 0.0025$, t = 1.20) and the cash flow variable ($\eta_{12} = 0.0033$, t = 1.57) are both insignificant. In addition, the joint hypothesis that $\eta_{12} = \delta_{12} = 0$ cannot be rejected (F = 2.1 vs. a critical value of 3.00 at a 5% level of significance). This implies that the association between returns and IPO earnings components is not different in the announcement window than in the non-announcement window (null form of H4 is not rejected).

To summarize, the both the timing and association test results in panel C of table 9 support earnings-based explanations for the mispricing of decline stage IPOs. However, the combined test suggests factors other than earnings. This is consistent with the conclusions made using 12-month returns. Thus, I find no evidence to suggest that my results are materially affected by the use of a 12-month return window.

6. Conclusion

In this study, I examine a potential role for accounting information and Sloan's (1996) accrual anomaly to explain the overpricing of IPO stocks observed at the end of the first day of trading. Sloan's (1996) accrual anomaly refers to evidence that accruals are overpriced and/or cash flows underpriced. Prior studies provide conflicting conclusions regarding the cause of the long-run poor stock price performance of IPOs and the related overpricing. For example, Teoh et al. (1998a, 1998b) suggest that accounting information (high accruals) may contribute to the overpricing (as in Sloan 1996). In particular, Teoh et al. (1998a, 1998b) attribute the high level of discretionary accruals to earnings management. Liu (2008) provides evidence that discretionary accrual models such as the one used in Teoh et al (1998a,

1998b) are misspecified resulting in a positive bias in discretionary accrual estimates for growth firms. She concludes that IPO firms have high working capital accruals due to life cycle stage rather than earnings management. Armstrong et al. (2009) report evidence that after controlling for known biases, discretionary accrual estimates of IPO firms are (1) not statistically different from zero in the IPO year, and (2) unrelated to measures of managerial incentives to inflate IPO earnings. On the other hand, Healy and Palepu (1990) suggest that the overpricing is a consequence of risk changes around the IPO date which are not incorporated into investors' pricing decisions at the IPO date. I address the issue of which of the two explanations (earnings-based vs. other) is more plausible. To distinguish between earnings-based and other explanations, I employ the methodology of Bernard et al (1997) which involves an examination of post-IPO abnormal returns. Finally, I examine the role of life-cycle stage in the IPO pricing anomaly.

In tests using my full sample of IPO firms, I find evidence that the overpricing of IPO stocks recorded at the end of the first day of public trading is consistent with earnings-based explanations. These findings are at odds with Healy and Palepu (1990) who look for an earnings effect but find none.

Regarding the role of life cycle, I do not find any evidence that life cycle stage explains post-IPO abnormal returns, whether used alone or together with accruals and cash flow ranks. However, I find evidence that life cycle may explain the form of mispricing. In particular, I report evidence that the mispricing of growth- (mature-) stage sample IPO firms is (is not) consistent with earnings-based explanations. Regarding the mispricing of decline-stage sample IPO firms, I report mixed evidence

as follows: (i) the timing and association tests suggest that earnings-based explanations are more likely than other explanations, and (ii) the combined test results are inconsistent with earnings-based explanations. Thus, for decline stage IPO firms, earnings appear to play an important role in the mispricing. However, the results of combined test suggest that the role of earnings in the mispricing of these decline stage firms is not entirely consistent with Sloan's (1996) anomaly.

These results raise questions that could be considered for possible future research. For example, why is it that market participants seemingly do a poor job of using earnings to predict future prospects of growth- and decline-stage IPO firms when the opposite appears to be true for mature IPO firms? Does this extend to all growth and decline firms or is it limited to IPO settings? From regulators' point of view, what disclosures might help financial statement users to accurately predict future performance of IPO firms irrespective of life cycle stage?

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APPENDICES

Appendix I: Risk as an alternative to earnings-based explanations for IPO mispricing

Risk provides an alternative to earnings as an explanation for IPO mispricing. I consider two possible types of risk-based explanations for the evidence of overpricing of IPOs: researcher errors and market errors. If a researcher fails to consider some important risk factors (e.g., size of a firm) when estimating the risk associated with IPO firms and if the errors are predominantly positive, then the researcher's estimates of expected returns will be too high, which produces spurious negative post-IPO abnormal returns. This could lead the researcher to conclude that stocks of IPO firms are overpriced when they are not. The biased abnormal returns resulting from researcher errors are likely to be spread uniformly across time (e.g., each additional day in the cumulation period induces a little more bias). Consequently, evidence that negative abnormal returns are not concentrated around earnings announcements but are spread across time would be consistent with researcher errors in estimating risk.

The other type of risk-based explanation for overpricing of IPOs is that the market underestimates the risk associated with IPO firms. If so, the subsequent upward adjustments of the risk estimates are likely to result in negative post-IPO abnormal returns. As an example, Healy and Palepu (1990) provide evidence of increases in the systematic risk of IPO firms around the IPO date and of the market apparently failing to incorporate these increases in systematic risk into pricing decisions at the IPO date. The pattern of the negative abnormal returns over time will

depend on how the market corrects its prior errors in estimating risk. One possibility is for the market to observe new information about risk continuously for each IPO firm; this leads to small abnormal returns each day following the IPO until the error is corrected. This pattern will be similar to the abnormal return pattern predicted in the researcher-error explanation above.

Another possibility is that the market observes information related to risk on specific days in a non-continuous (discrete) manner for each firm, in which case abnormal returns will be large on the day the market observes risk and zero on other days. In this scenario, the post-IPO abnormal returns could be clustered around post-IPO earnings announcements if accounting information helps investors to learn about risk. Alternatively, if the market learns about risk discretely on random dates (e.g., through means other than future earnings), the abnormal returns of a portfolio of IPO firms will not be clustered. Instead, the portfolio abnormal returns pattern over time will be similar to the scenario where risk is observed continuously.

Thus, evidence that negative abnormal returns are concentrated around post-IPO earnings announcements would rule out a market-errors risk-based explanation where the errors are corrected continuously, but it does not rule out discrete corrections if future earnings announcements are important to revealing past errors in estimating risk. Discriminating between an earnings-based explanation and a risk-based, discrete correction of market errors explanation requires a further test. Specifically, if the abnormal returns surrounding post-IPO earnings announcements are associated with the components in IPO earnings, then the evidence is inconsistent with a risk-based explanation unless the error in the market's risk estimate is closely

linked with the magnitude of pre-IPO earnings components. In summary, the tests I propose can distinguish between earnings-based and risk-based explanations by examining evidence that makes one explanation (e.g., risk) very unlikely.

Appendix II: Life cycle measure (proxy)

A major concern in studies incorporating life cycle of a firm is the lack of a universally accepted measure of life cycle stage. For example, DeAngelo, DeAngelo and Stulz (2006) use the ratio of retained earnings to total equity as a proxy for life cycle. In this study, I use a life cycle measure based on Anthony and Ramesh (1992) and Liu (2008). I divide the life cycle of a firm into early growth, late growth, maturity, early decline and late decline stages using quintiles of a composite measure derived from rankings of dividend payout ratios, sales growth rates, capital expenditures (scaled by total assets) and firm's age. Specifically, I first rank all Compustat firms (including my sample IPOs) within each industry and year based on dividend payout ratio, sales growth rate, capital expenditure, and age. Thus, each year, each Compustat firm has a within industry rank for each of these variables. Rankings for dividend payout ratio and firm age are assigned in such a way that the rank "1" is assigned to the firm with the lowest measure on the variable. On the other hand, rankings for sales growth rate and capital expenditure are made in such a way that the rank "1" is assigned to the firm with the highest measure on the variable. This way of assigning ranks ensures that after summing the ranks of each firm to get a composite measure of rank, the lowest (highest) score on the composite measure relates to early growth (late decline). In other words, the composite measure is increasing in life cycle stage. Within each industry and year, firms in the Compustat sample are divided into quintiles based on the composite measure. I classify quintile 1 as early growth, quintile 2 as late growth, quintile 3 as mature, quintile 4 as early decline, and quintile 5 as late decline. The life cycle stage for each sample IPO equals its Compustat quintile. This

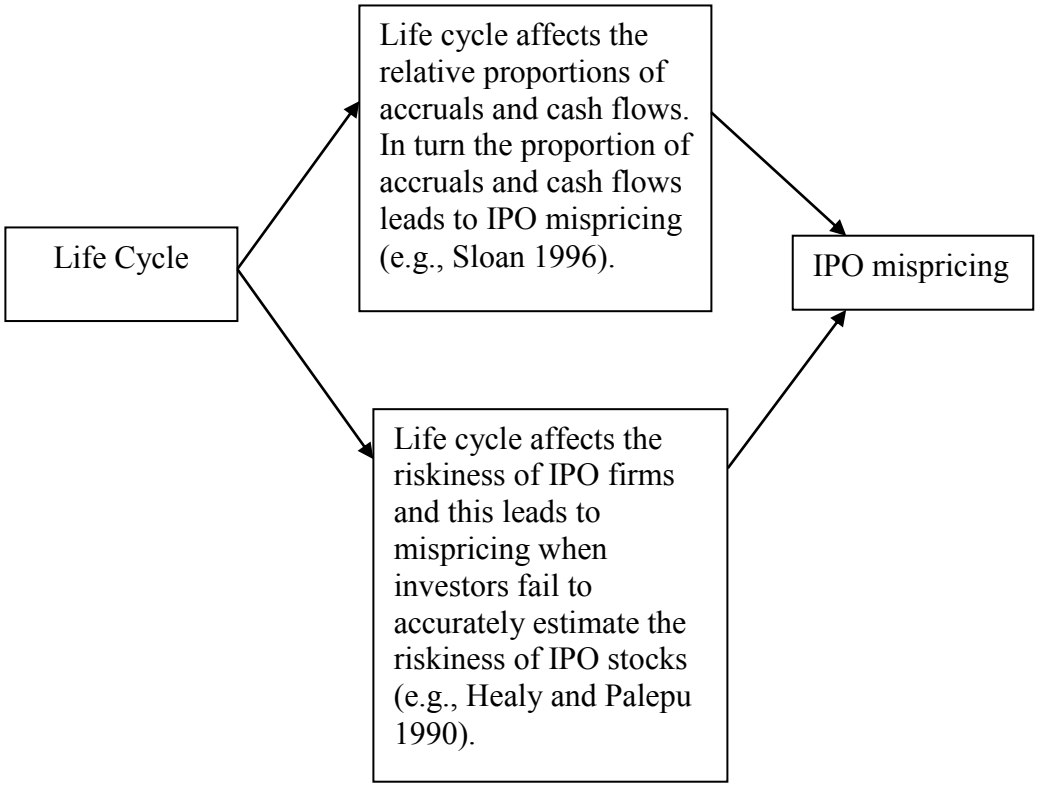
approach could result in all my IPOs being in the first quintile (all growth) but as reported in table 5, that does not happen.

To enhance the power of my tests, I treat IPOs in life cycle quintile 1 of the Compustat universe as growth firms, IPOs in life cycle quintile 3 as mature firms, and IPOs in life cycle quintile 5 as decline firms. The table below summarizes the construction of my life cycle proxy.

Within each industry and for each year, I perform the following steps:					
Step 1 (all firms): Rank dividend payout ratios (1=lowest)	Low		Medium		High
Step 2 (all firms): Rank sales growth rates (1=highest)	High (positive)		Approx. Zero		Low (negative)
Step 3 (all firms): Rank capital expenditures (scaled) (1=highest)	High		Medium		Low
Step 4 (all firms): Rank firm ages (1=lowest)	Low		Medium		High
Step 5 (all firms): Sum the ranks in steps 1 through 4 by firm to create a composite rank for each firm. Group the firms into quintiles based on composite ranks.	Quintile 1 (Early growth)	Quintile 2 (Late growth)	Quintile 3 (Maturity)	Quintile 4 (Early decline)	Quintile 5 (Late decline)
Step 6: Classify IPO firms into life cycle	IPOs in quintile 1 =Growth		IPOs in quintile 3 =Mature		IPOs in quintile 5 =Decline

Dividend payout ratio	=	annual dividend as a percentage of income before extraordinary items and discontinued operations;
Sales growth rate	=	sales growth rate over the pre-IPO year;
Capital expenditure	=	capital expenditures, as a proportion of total assets;
Firm age	=	The difference between the current year and the year in which the business was formed (or the year of incorporation if the year of formation is not available). If firms merge, the age of the merged firm is the larger of the ages of the merging firms.

Figure 1: Possible causes of IPO mispricing



Life cycle potentially has two effects on IPO mispricing. To be specific, life cycle affects the relative proportions of earnings components. Life cycle also affects the riskiness of a firm.

TABLES

Table 1: Selection, Industry and IPO years of Final Sample

PANEL A: Selection of sample IPO Firms

Firms with an initial public offering (IPO) in the US during 1988-2007[a]	7,477
Less: repeat IPOs and IPO firms which could not be found on CRSP	(14)
Less: IPO firms which could not be found on Compustat	(1,094)
IPOs with both Compustat and CRSP identifiers	6,369
Less: IPOs without pre-IPO data on Compustat	(734)
Less: IPOs with missing values for key variables	(297)
IPO firms with CRSP identifiers and key Compustat data	5,338

PANEL B: Industry Composition of Sample of IPO Firms

Industry	**Companies**	**% of sample**
Computer Software/Hardware	317	5.9
Manufacturing/Equipment	915	17.3
Services	1,655	31.0
Trade-Wholesale/Retail	705	13.2
Transportation	210	3.9
Pharmaceuticals	399	7.5
Financial Institutions	156	2.9
Telecommunications	214	4.0
Textile/Lumber and Paper Products	29	0.5
Oil and Gas	131	2.5
Insurance and Real Estate	215	4.0
Mining and Construction	114	2.1
Food/Tobacco	94	1.8
Utilities	65	1.2
Other	119	2.2
	5,338	100.0

Table 1: PANEL C: Annual Distribution of IPOs

Year	IPOs	% of sample
1988	77	1.4
1989	124	2.3
1990	208	3.9
1991	389	7.3
1992	457	8.6
1993	435	8.1
1994	423	7.9
1995	619	11.6
1996	434	8.1
1997	309	5.8
1998	419	7.8
1999	398	7.5
2000	99	1.9
2001	71	1.3
2002	69	1.3
2003	180	3.4
2004	176	3.3
2005	200	3.7
2006	218	4.1
2007	33	0.7
	5,338	100.0

[a] : From the Field-Ritter datasets of IPO founding dates available on Jay Ritter's webpage (http://bear.cba.ufl.edu/ritter/FoundingDates.htm). Since firms were not required to provide cash flow data before 1988, I exclude IPOs that took place before 1988.

Table 2: Descriptive Statistics of sample IPO firms (full sample)

[Numbers refer to the mean (median) of the variable concerned].

	Mean post-IPO returns	*TACC_TA*	*CFO_TA*	*Dividends*	*%ΔSales*	*Capex_TA*	*Age (years)*
All sample IPOs (5,338 firms)	-0.13 (-0.08)	-0.08 (-0.06)	-0.07 (0.04)	19.4 % (0.0 %)	111 % (19 %)	0.08 (0.06)	14.3 (8.0)

TACC_TA : Total accruals deflated by total assets = (EXBI – CFO)/ TA where EXBI = income before extraordinary items; CFO = net operating cash flows; TA = total assets;

CFO_TA : Operating cash flows deflated by total assets;

Dividends : Annual dividend as a percentage of income before extraordinary items and discontinued operations;

Sales : Sales growth rate over the pre-IPO year;

Capex_TA : Capital expenditures, as a proportion of total assets;

Age (years) : The difference between the IPO year and the year in which the business was formed (or the year of incorporation if the year of formation is not available). If firms merge, the age of the merged firm is the larger of the ages of the merging firms.

Table 3: Initial Assessment and Correlation Matrix for the IPO variable, Accrual and Cash Flow Ranks:

PANEL A: Correlation Matrix for the IPO variable, Accrual Rank and Cash Flow Rank:

	Pearson Correlation Coefficient (p-value)		
	IPO	ACC_Rank_i	CF_Rank_i
IPO	1.00000		
ACC_Rank_i	0.26256 (<0.0001)	1.00000	
CF_Rank_i	-0.30752 (<0.0001)	-0.21320 (<0.0001)	1.00000

PANEL B: Initial Assessment (IPO overpricing and the accrual anomaly)

$$AR_i^{(post)} = a_1 + b_1 IPO_i + \varepsilon_{i1} \quad (1)$$

$$AR_i^{(post)} = a_2 + b_2 IPO_i + c_2[ACC\_Rank_i] + d_2[CF\_Rank_i] + \varepsilon_{i2} \quad (2)$$

	Model (1)	Model (2)
Dependent variable	Annual abnormal returns	Annual abnormal returns
Type of regression	Pooled (IPOs and matched non-IPOs)	Pooled (IPOs and matched non-IPOs)
Constant	0.18531 (t= 8.87)	0.19960 (t= 8.52)
IPO_i	-0.13149 (t= -4.88)	-0.13232 (t= -4.35)
ACC_Rank_i		0.05656* (t= 1.26)
CF_Rank_i		0.24516 (t= 5.38)
Sum of Squared Residuals (SSR)	1,607.83	1,540.06

Table 3 (cont'd):

PANEL C: Testing $c_2 = d_2 = 0$:

Numerator degrees of freedom = 2

Denominator degrees of freedom = 10,672

F-statistic = [(1,607.83 – 1,540.06)/2]/[1,540.06/10,672] = 234.81 (vs. critical value of 3.00 at the 5% significance level)

Thus $c_2 = d_2 = 0$ is rejected.

* : In a regression model of abnormal returns on the accruals rank and the IPO indicator variable, $b_2 = -0.021$ (t = -1.99). Thus, it seems that for my sample firms accruals explain post-IPO returns but once cash flows are included, accruals do not explain returns (Barone and Magilke 2009; Armstrong et al. 2009).

$AR_i^{(post)}$ = annual abnormal returns of firm i over the year following the IPO date;

IPO_i = indicator variable which is equal to 1 if firm i is an IPO firm and 0 if it is a non-IPO firm;

ACC_Rank_i = decile rank of $[ACC_i^{(pre)} / TA_i^{(pre)}]$ for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

CF_Rank_i = decile rank of $[CF_i^{(pre)} / TA_i^{(pre)}]$ for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

ε_{in} = error term (firm i, equation n).

Table 4: Discriminating between earnings-based explanations and other explanations of IPO mispricing (using all my sample IPOs)

$$AR_{id}^{(post)} = a_3 + e_{3i}AW + \varepsilon_{id3} \quad (3)$$

$$AR_i^{(post)} = a_4 + c_4[ACC\_Rank_i] + d_4[CF\_Rank_i] + \varepsilon_{i4} \quad (4)$$

$$\hat{e}_{3i} = a_5 + \delta_5[ACC\_Rank_i] + \eta_5[CF\_Rank_i] + \varepsilon_{i5} \quad (5)$$

	Timing Test Model (3)	Association Test Model (4)	Combined Test Model (5)
Type of regression	Firm-specific	Pooled (all my sample IPOs)	Pooled (all my sample IPOs)
Dependent variable	Daily abnormal returns	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{3i}$, from model (3)
Constant	-0.00044 (t= -5.20)	-0.13355 (t= -6.21)	-0.00172 (t= -5.27)
AW	-0.00148 (t= -4.70)		
ACC_Rank_i		-0.02682 (t= -1.98)	0.00212 (t= 1.88)
CF_Rank_i		0.23959 (t= 3.52)	0.00346 (t= 3.24)
F-test of $c_4 = d_4 = 0$		21.48 ($p < 0.001$)	
F-test of $\delta_5 = \eta_5 = 0$			86.88 ($p < 0.001$)
Number of firms	5,338	5,338	5,338
Number of observations	1,223,281	5,338	5,338

$AR_i^{(post)}$	=	annual abnormal returns of firm i over the year following the IPO date;
$AR_{id}^{(post)}$	=	daily abnormal returns for firm i for day "d" in the year following the IPO date;
AW	=	indicator variable which is equal to 1 if the day over which the daily abnormal return of firm i [$AR_{id}^{(post)}$] is measured falls in the announcement window and 0 if the day "d" falls in the non-announcement window (the subscripts "i" and "d" on the indicator variable AW are omitted for brevity);
$\hat{e}_{3i}$	=	firm-specific coefficient of firm i on the announcement window indicator variable (AW) from the timing test model in equation (3).
ACC_Rank_i	=	decile rank of accruals deflated by total assets [$ACC_i^{(pre)}$ /$TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;
CF_Rank_i	=	decile rank of cash flows deflated by total assets [CFi(pre) /TAi(pre)] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;
$CF_i^{(pre)}$	=	operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;
$ACC_i^{(pre)}$	=	accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;
$TA_i^{(pre)}$	=	total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;
ε_{in}	=	error term (firm i, equation n).
ε_{id3}	=	error term (firm i, day "d", equation 3);

Table 5: Descriptive Statistics of sample IPO firms (life cycle sample only)

[Numbers refer to the mean (median) of the variable concerned].

	Mean post-IPO returns	*TACC_TA*	*CFO_TA*	*Dividends*	*%ΔSales*	*Capex_TA*	*Age (years)*
Growth IPOs (1,917 firms)	-0.12 (-0.08)	-0.06 (-0.05)	0.01 (0.07)	13.4% (0.0%)	172% (46.6%)	0.10 (0.07)	13.5 (7.0)
Mature IPOs (1,098 firms)	-0.10 (-0.06)	-0.09 (-0.09)	0.12 (0.10)	42.6% (20%)	28.8% (8%)	0.08 (0.05)	15.1 (8.0)
Decline IPOs (488 firms)	-0.14 (-0.08)	-0.07 (-0.10)	0.10 (0.07)	55.1% (30%)	2.2% (-23%)	0.01 (0.01)	26.6 (11.0)

TACC_TA : Total accruals deflated by total assets = (EXBI – CFO)/ TA where EXBI = income before extraordinary items; CFO = net operating cash flows; TA = total assets;

CFO_TA : Operating cash flows deflated by total assets;

Dividends : Annual dividend as a percentage of income before extraordinary items and discontinued operations;

Sales : Sales growth rate over the pre-IPO year;

Capex_TA : Capital expenditure, as a proportion of total assets;

Age (years) : The difference between the IPO year and the year in which the business was formed (or the year of incorporation if the year of formation is not available). If firms merge, the age of the merged firm is the larger of the ages of the merging firms.

Table 6: The role of life cycle stage (using the life cycle sample IPOs)

$$AR_i^{(post)} = a_6 + f_6 GROWTH_i + h_6 DECLINE_i + \varepsilon_{i6} \quad (6)$$

$$\hat{e}_{3i} = a_7 + f_7 GROWTH_i + h_7 DECLINE_i + \varepsilon_{i7} \quad (7)$$

$$AR_i^{(post)} = a_8 + c_8 ACC\_Rank_i + d_8 CF\_Rank_i + f_8 GROWTH_i + h_8 DECLINE_i + \varepsilon_{i8} \quad (8)$$

$$\hat{e}_{3i} = a_9 + \delta_9 [ACC\_Rank_i] + \eta_9 [CF\_Rank_i] + f_9 GROWTH_i + h_9 DECLINE_i + \varepsilon_{i9} \quad (9)$$

	Model (6)	Model (7)	Model (8)	Model (9)
Type of regression	Pooled (sample IPOs with life cycle data)	Pooled (sample IPOs with life cycle data)	Pooled (sample IPOs with life cycle data)	Pooled (sample IPOs with life cycle data)
Dependent variable	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{3i,}$, from model (3)	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{3i,}$, from model (3)
Constant	-0.34471 (t= -6.22)	-0.00114 (t= -1.07)	-0.36197 (t= -6.62)	-0.00127 (t= -1.20)
$GROWTH_i$	0.07848 (t= 1.29)	-0.00016 (t= -0.14)	0.04436 (t= 0.74)	-0.00042 (t= -0.36)
$DECLINE_i$	0.02164 (t= 0.34)	-0.00123 (t= -0.94)	0.11945 (t= 1.85)	-0.00100 (t= -0.76)
ACC_Rank_i			-0.03524 (t= -0.59)	-0.00274 (t= -2.21)
CF_Rank_i			0.62318 (t= 10.02)	0.00311 (t= 2.50)
F-test of $f_n = h_n = 0$ (n = 6, 7, 8, and 9)	1.46 (p > 0.10)	2.74 (p > 0.05)	2.34 (p > 0.10)	1.87 (p > 0.10)
Number of firms	3,403	3,403	3,403	3,403
Number of observations	3,403	3,403	3,403	3,403

$AR_i^{(post)}$ = annual abnormal returns of firm i over the year following the IPO date;

$\hat{e}_{3i}$ = firm-specific coefficient of firm i on the announcement window indicator

variable (AW) from the timing test model in equation (3).

$GROWTH_i$ = indicator variable which is equal to 1 if the IPO firm is in the growth stage and 0 otherwise;

$DECLINE_i$ = indicator variable which is equal to 1 if the IPO firm is in the decline stage and 0 otherwise

ACC_Rank_i = decile rank of accruals deflated by total assets $[ACC_i^{(pre)} / TA_i^{(pre)}]$ for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

CF_Rank_i = decile rank of cash flows deflated by total assets $[CF_i^{(pre)} / TA_i^{(pre)}]$ for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

ε_{in} = error term (firm i, equation n).

Table 7: Discriminating between earnings-based explanations and other explanations of IPO mispricing (using the life cycle sample IPOs)

$$AR_{id}^{(post)} = a_{10} + e_{10i}AW + \varepsilon_{id10} \quad (10)$$

$$AR_{i}^{(post)} = a_{11} + c_{11}[ACC\_Rank_i] + d_{11}[CF\_Rank_i] + \varepsilon_{i11} \quad (11)$$

$$\hat{e}_{10i} = a_{12} + \delta_{12}[ACC\_Rank_i] + \eta_{12}[CF\_Rank_i] + \varepsilon_{i12} \quad (12)$$

	Timing Test Model (10)	Association Test Model (11)	Combined Test Model (12)
Type of regression	Firm-specific	Pooled (all my sample IPOs)	Pooled (all my sample IPOs)
Dependent variable	Daily abnormal returns	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{10i}$, from model (10)
PANEL A: Growth Firms Only (1,917 firms)			
Constant	-0.00045 (-3.58)	-0.14177 (-4.45)	-0.00188 (-3.87)
AW	-0.00131 (-2.83)		
ACC_Rank_i		-0.03530 (-0.36)	0.00231 (1.47)
CF_Rank_i		0.27393 (2.69)	0.00493 (3.09)
F-test of $c_{11} = d_{11} = 0$		13.6 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			35.6 ($p < 0.001$)

Table 7 (cont'd)

	Timing Test Model (10)	Association Test Model (11)	Combined Test Model (12)
Type of regression	Firm-specific	Pooled (all my sample IPOs)	Pooled (all my sample IPOs)
Dependent variable	Daily abnormal returns	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{10i}$, from model (10)
PANEL B: Mature Firms Only (1,098 firms)			
Constant	-0.00035 (-1.51)	-0.08376 (-1.48)	-0.00123 (-1.67)
AW	-0.00114 (-1.57)		
ACC_Rank_i		-0.06778 (-0.36)	0.00274 (1.01)
CF_Rank_i		0.39713 (2.22)	-0.00265 (-1.09)
F-test of $c_{11} = d_{11} = 0$		11.6 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			0.73 ($p > 0.10$)
PANEL C: Decline Firms Only (488 firms)			
Constant	-0.00043 (-2.26)	-0.08751 (-2.60)	-0.00255 (-3.63)
AW	-0.00238 (-3.62)		
ACC_Rank_i		-0.01903 (-0.81)	0.00296 (1.14)
CF_Rank_i		0.40482 (2.09)	-0.00036 (-0.13)
F-test of $c_{11} = d_{11} = 0$		5.6 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			1.16 ($p > 0.10$)

$AR_i^{(post)}$ = annual abnormal returns of firm i over the year following the IPO date;

$AR_{id}^{(post)}$ = daily abnormal returns for firm i for day "d" in the year following the IPO date;

$\hat{e}_{3i}$ = firm-specific coefficient of firm i on the announcement window indicator variable (AW) from the timing test model in equation (3).

AW = indicator variable which is equal to 1 if the day over which the daily abnormal return of firm i [$AR_{id}^{(post)}$] is measured falls in the announcement window and 0 if the day "d" falls in the non-announcement window (the subscripts "i" and "d" on the indicator variable AW are omitted for brevity);

ACC_Rank_i = decile rank of accruals deflated by total assets [$ACC_i^{(pre)}$ /$TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

CF_Rank_i = decile rank of cash flows deflated by total assets [$CF_i^{(pre)}$ /$TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5),divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

ε_{id10} = error term (firm i, day "d", equation 10);

ε_{in} = error term (firm i, equation n).

Additional tests

Table 8: Discriminating between earnings-based explanations and other explanations of IPO mispricing (using all my sample IPOs and 750 post-IPO days)

$AR_{id}^{(post)} = a_3 + e_{3i}AW + \varepsilon_{id3}$ (3)

$AR_i^{(post)} = a_4 + c_4[ACC\_Rank_i] + d_4[CF\_Rank_i] + \varepsilon_{i4}$ (4)

$\hat{e}_{3i} = a_5 + \delta_5[ACC\_Rank_i] + \eta_5[CF\_Rank_i] + \varepsilon_{i5}$ (5)

	Timing Test Model (3)	Association Test Model (4)	Combined Test Model (5)
Type of regression	Firm-specific	Pooled (all my sample IPOs)	Pooled (all my sample IPOs)
Dependent variable	Daily abnormal returns	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{3i}$, from model (3)
Constant	-0.00039 (t= -6.99)	-0.45544 (t= -2.36)	-0.00133 (t= -7.00)
AW	-0.00141 (t= -6.45)		
ACC_Rank_i		-0.18804 (t= -0.15)	0.00026 (t= 0.39)
CF_Rank_i		0.77757 (t= 2.76)	0.00235 (t= 3.80)
F-test of $c_4 = d_4 = 0$		11.1 ($p < 0.001$)	
F-test of $\delta_5 = \eta_5 = 0$			18.6 ($p < 0.001$)
Number of firms	5,338	5,338	5,338
Number of observations	3,609,000	5,338	5,338

$AR_i^{(post)}$ = annual abnormal returns of firm i over the year following the IPO date;

$AR_{id}^{(post)}$ = daily abnormal returns for firm i for day "d" in the year following the IPO date;

AW = indicator variable which is equal to 1 if the day over which the daily abnormal return of firm i [$AR_{id}^{(post)}$] is measured falls in the announcement window and 0 if the day "d" falls in the non-announcement window (the subscripts "i" and "d" on the indicator variable AW are omitted for brevity);

$\hat{e}_{3i}$ = firm-specific coefficient of firm i on the announcement window indicator variable (AW) from the timing test model in equation (3).

ACC_Rank_i = decile rank of accruals deflated by total assets [$ACC_i^{(pre)}/TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

CF_Rank_i = decile rank of cash flows deflated by total assets [CFi(pre) /TAi(pre)] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO

prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

ε_{in} = error term (firm i, equation n).
ε_{id3} = error term (firm i, day "d", equation 3);

Table 9: Discriminating between earnings-based explanations and other explanations of IPO mispricing (using the life cycle sample IPOs and 750 post-IPO days)

$AR_{id}^{(post)} = a_{10} + e_{10i}AW + \varepsilon_{id10}$ (10)

$AR_{i}^{(post)} = a_{11} + c_{11}[ACC\_Rank_i] + d_{11}[CF\_Rank_i] + \varepsilon_{i11}$ (11)

$\hat{e}_{10i} = a_{11} + \delta_{12}[ACC\_Rank_i] + \eta_{12}[CF\_Rank_i] + \varepsilon_{i12}$ (12)

	Timing Test Model (10)	Association Test Model (11)	Combined Test Model (12)
Type of regression	Firm-specific	Pooled (all my sample IPOs)	Pooled (all my sample IPOs)
Dependent variable	Daily abnormal returns	Annual abnormal returns	Firm-specific coefficients, $\hat{e}_{10i}$, from model (10)
PANEL A: Growth Firms Only (1,917 firms)			
Constant	-0.00038 (t= -3.81)	-0.47071 (t= -9.63)	-0.00103 (t= -4.22)
AW	-0.00146 (t= -3.73)		
ACC_Rank_i		-0.32685 (t= -2.13)	0.00043 (t= 0.55)
CF_Rank_i		0.95016 (t= 6.05)	0.00158 (t= 1.96)
F-test of $c_{11} = d_{11} = 0$		19.8 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			12.9 ($p < 0.001$)
PANEL B: Mature Firms Only (1,098 firms)			
Constant	-0.00039 (t= -3.61)	-0.47344 (t= -4.29)	-0.00145 (t= -2.18)
AW	-0.00140 (t= -1.15)		
ACC_Rank_i		-0.20583 (t= -0.56)	0.00093 (t= 0.38)
CF_Rank_i		1.24450 (t= 3.33)	0.00164 (t= 0.74)
F-test of $c_{11} = d_{11} = 0$		16.7 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			0.41 ($p > 0.10$)

Table 9 cont'd
PANEL C: Decline Firms Only (488 firms)

Constant	-0.00040 (t= -5.23)	-0.53444 (t= -5.62)	-0.00139 (t= -2.49)
AW	-0.00152 (t= -2.86)		
ACC_Rank_i		-0.12854 (t= -0.48)	0.00248 (t= 1.20)
CF_Rank_i		1.10456 (t= 3.76)	0.00334 (t= 1.57)
F-test of $c_{11} = d_{11} = 0$		10.4 ($p < 0.001$)	
F-test of $\delta_{12} = \eta_{12} = 0$			2.1 ($p > 0.10$)

$AR_i^{(post)}$ = annual abnormal returns of firm i over the year following the IPO date;

$AR_{id}^{(post)}$ = daily abnormal returns for firm i for day "d" in the year following the IPO date;

AW = indicator variable which is equal to 1 if the day over which the daily abnormal return of firm i [$AR_{id}^{(post)}$] is measured falls in the announcement window and 0 if the day "d" falls in the non-announcement window (the subscripts "i" and "d" on the indicator variable AW are omitted for brevity);

$\hat{e}_{3i}$ = firm-specific coefficient of firm i on the announcement window indicator variable (AW) from the timing test model in equation (3).

ACC_Rank_i = decile rank of accruals deflated by total assets [$ACC_i^{(pre)}$ /$TA_i^{(pre)}$] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

CF_Rank_i = decile rank of cash flows deflated by total assets [CFi(pre) /TAi(pre)] for firm i in the pre-IPO year less the mean decile rank (4.5), divided by 9;

$CF_i^{(pre)}$ = operating cash flows of firm i measured for the last reporting period before the IPO date. This is the amount of operating cash flows in the statement of cash flows provided with the IPO prospectus;

$ACC_i^{(pre)}$ = accruals of firm i measured for the last reporting period before the IPO date. This is measured as the difference between earnings before extraordinary items and operating cash flows reported in the IPO prospectus;

$TA_i^{(pre)}$ = total assets of firm i measured at the last reporting date before the IPO date. This is the level of total assets in the financial statements provided with the IPO prospectus;

ε_{in} = error term (firm i, equation n);

ε_{id10} = error term (firm i, day "d", equation 10);