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ARE RECENT POST-IPO STOCK ACQUIRERS INFLUENCED BY JENSEN'S OVERVALUED STOCK HYPOTHESIS?

Cumulative abnormal returns of M&A conducted post five-years IPO

Master's Thesis
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Abstract of master's thesis

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Abstract

Using overvalued stock as a method of payment for acquisitions commonly raises the question of whether managers are influenced by Jensen's overvalued stock hypothesis. Jensen's overvalued stock hypothesis posits that managers are pressured to engage in value-destructive investments to justify the high valuation of equity. Additionally, the cheap and accessible equity capital, as well as the overconfidence and enthusiasm of recent IPO firms are expected to further exacerbate this behavior. As a result, post-IPO stock acquisitions are expected to underperform post-IPO cash acquisitions.

Taking a sample of 760 stock-financed acquisition post-five-years IPO from 1 January 1985 to 31 December 2009, this paper references the (i) linear prediction model and (ii) various propensity score matching methodology by Golubov, Petmezas, and Travlos (2015) to obtain the pure takeover effect, independent of equity issuance effect. The paper presents a univariate analysis on the pure takeover effect for cash and stock-acquirers respectively. With a multivariate regression, the paper also compares the effect of stock as a method of payment, against other firm and deal-related characteristics.

This paper does not find evidence of Jensen's overvalued equity hypothesis, indicating that there are no signs of post-IPO managers being influenced by Jensen's overvalued equity pressure, i.e. managers are not wrongly incentivized to pursue negative net present value investments. This is consistent with the general research conducted on both recent IPO and mature acquirers by Golubov, Petmezas, and Travlos (2015). The analysis on post-one-year and three-years IPO also do not present evidence for Jensen's hypothesis. This puzzle might be resolved by future research on stringent public market regulations and the influence of institutional ownership, both for recent IPO and mature public firms.

Keywords post-IPO, agency cost, overvalued stock hypothesis, stock-financed M&A

1. Introduction

Why do recent IPO (initial public offering) firms engage in stock-financed acquisitions when cash is abundant? Are IPO managers driven to seek out positive NPV (net present value) investment opportunities, or perhaps, motivated by seemingly opportunistic investments primarily driven by overvalued equity agency cost? In any case, there lies a danger for overconfident IPO managers, potentially blinded by the creation of, commonly overvalued public stock currency, together with the abundance of cash, to engage in value-destructive M&A. Even without the element of IPO, the use of stock as a method of payment for general firms is widely known to yield a subpar return in comparison to cash-financed acquisitions (Travlos, 1987). Loughran and Vijh (1997) also showed evidence for an excess return of -25.0 percent in stock acquisitions, whereas cash acquisitions would earn an excess return of +61.7 percent between the years of 1970 to 1989. The conventional theory explains that a manager's financing decision is presumed by the market participants to have an adverse selection, in other words, signaling "bad news" whenever stock issuance is used to engage in any investment activity, hence any stock-related issuance, including stock-financed acquisition and SEO (secondary equity offering) will follow a downward announcement effect (Myers and Majluf, 1984; Baker and Wurgler, 2002). For recent-IPO firms, it is possible to circumvent this by using the abundant cash in acquiring other companies, yet oddly there is still a handful of acquirers who prefer stock as a method of payment. Even in the worst-case scenario where IPO proceeds are insufficient to cover deal value, the ease (access to public equity market) of conducting a post-IPO SEO and debt financing followed by a cash-acquisition is more favorable than outrightly conducting a stock-financed acquisition.

A prelude to the hypothesis in this paper is presented by Celikyurt, Sevilir, and Shivdasani's (2010) study, in that, recent-IPO firms with overvalued stock are found to engage in a greater number of stock-financed acquisitions. This phenomenon invites the presence of Jensen's (2005) "agency costs of overvalued equity" hypothesis, which argues that such an environment facilitates an unhealthy pressure on managers to meet or exceed earning expectations to justify "overvalued" equity prices. This pressure incentivizes managers to engage in risky and negative net present value investments, especially with easy access to cheap equity. Brau, Couch, and Sutton (2012) further provide evidence of the value-destructive post-IPO M&A, citing the "enthusiasm" of IPO exacerbates classic value-destructive theories like acquirer's overconfidence and overpaying tendencies (Roll, 1986), prestige overconfidence (Rau and Vermaelen, 1998; Malmendier and Tate,

2008), overconfidence within the technology industry acquirers (Kohers and Kohers, 2001) and agency cost by cash-rich firms (Jensen, 1986). Similarly, this paper expects to find recent-IPO stock-acquirers underperforming cash-acquirers, as well as mature firms.

Another unique feature of this paper is that it recognizes the joint takeover announcement effect in an $ACAR_{stock}$ (stock-acquisition announcement) as a combination of (i) an equity issuance announcement effect (HCAR) and (ii) a takeover announcement effect ($PCAR_{stock}$). It is possible that the information effect from the (i) equity issuance announcement effect more than offset any positive (ii) takeover announcement effects. In that case, the paper would wrongly conclude the presence of agency cost amongst overconfident recent IPO firms. Following the empirical method by Golubov, Petmezas, and Travlos (2015), this paper disentangles the financing announcement returns (HCAR) from acquisition announcement returns ($ACAR_{stock}$) before comparing the returns and performing a regression between stock payment and acquirer's return.

$$Stock\ Acquiror\ CAR \equiv Takeover\ CAR + Equity\ CAR \quad (1)$$

$$ACAR \equiv PCAR + HCAR \quad (2)$$

Taking a sample of 1,853 post-IPO M&A – 1,093 cash-financed and 760 stock-financed from 1 January 1985 to 31 December 2009, this paper uses (1) a linear prediction and (2) various propensity matching technique to obtain HCAR (hypothetical cumulative abnormal returns). The linear prediction approach uses the coefficients from a regression of SEO returns on various firm characteristics to estimate equity HCAR for stock-financed acquirers, whereas the propensity matching approach restricts the SEO sample group using different matching methods (full-optimal matching, 1-nearest, and 10-nearest neighbor) to find HCAR. The next step is to subtract the HCAR from the $ACAR_{stock}$ to obtain the $PCAR_{stock}$. To clarify, $PCAR_{cash}$ is expected to be the same as $ACAR_{cash}$, given the lack of HCAR, equity issuance effect. If indeed Jensen's hypothesis is true, the pure takeover announcement effect, $PCAR_{stock}$ will be lower than $PCAR_{cash}$.

The results from this paper cannot conclude that recent-IPO managers make ill investment decisions under the influence of Jensen's overvalued equity hypothesis, since $PCAR_{stock}$ is statistically insignificant for all models (Table V). In the multivariate regression, the negative method of payment dummy cannot also conclude the presence of value-destructive post-IPO M&A

with stock payment. This is due to the statistically insignificant results, as well as the relatively small magnitude, and mixed coefficient signs. Similar results are found in the analysis conducted for one-year and three-year post-IPO M&As (see Appendix 7.3).

This paper primarily contributes to the M&A literature by examining whether the deliberate decision for a stock-financed post-IPO acquisition is due to Jensen's overvalued equity hypothesis. In addition, this paper hopes to vindicate the similar but broader scoped M&A research by Golubov et al. (2015), however to no avail; again, finding no presence of Jensen's hypothesis. This paper also contributes to the IPO literature by examining whether the IPO motives are justified. Since the decision of going public via an IPO is strongly contingent on the desire to conduct an M&A (Celikyurt et al., 2010; Brau and Fawcett, 2006), it is important to evaluate whether this motivation is valid. When a post-IPO M&A creates value despite the use of overvalued stock as acquisition currency, then the decision for an IPO remains a rational one.

The paper is organized as follows. Section 2 explores existing literature on post-IPO M&A, related methods of payment choices, and empirical design. Section 3 describes the IPO, M&A, and SEO sample. Section 4 showcase the main findings of the tests. Section 5 concludes by explaining the conclusion, limitations, and future research directions.

2. Literature review and empirical design

2.1 Post-IPO M&A

Initial Public Offering (IPO) is the offering of public shares on a securities exchange for the first time. In the context of IPO, the question of inefficient investment decisions arose, when many observed the long-run underperformance of IPO firms. Ritter (1991) in analyzing 1,526 US IPO firms from 1975 to 1984 reports an underperformance of -15.81% three years post-IPO against other mature firms. Similarly, Loughran and Ritter (1995) reports a 7% difference between NASDAQ, NYSE, AMEX mature firms, and 4,753 recent-US IPO firms five years post-IPO.

In a recent paper by Brau, Couch, and Sutton (2012), they suggest that IPO underperformance is caused by post-IPO M&A activity, especially when these firms undertake the role as an acquirer. The authors noticed the prevalence of post-IPO M&A activity (Rau and Stouraitis, 2011; Celikyurt et. al., 2010; Brau and Fawcett, 2006), as well as, the coincidental period of IPO underperformance, then empirically conclude that active M&A activity as an acquirer explains the −15.6% (−23.1%) three-year (five-year) average abnormal buy-and-hold return compared to 5.9% (1.1%) for non-

acquirers. Regardless of IPO maturity, this is in line with traditional M&A theories which supports the notion of underperformance amongst M&A acquirers (Loughran and Vijh, 1997; Rau and Vermaelen, 1998).

Related to M&A underperformance also exists other inefficiencies, largely related to methods of payment. Generally, the presence of asymmetric information regarding buyer or seller (Hansen, 1987), greater investment opportunities (Jung, Kim, and Stulz, 1995), and lower institutional holdings (Jensen, 1991) prompts a higher probability of conducting a stock-financed acquisition for all firms alike, despite ample research on the underperformance of using stock as a method of payment (Travlos, 1987; Wansley, Lane, and Yang, 1987; Franks, Harris, and Mayer, 1988; Asquith, Bruner, and Mullins, 1987; Servaes, 1991; Amihud, Lev, and Travlos, 1990; Agrawal, Jaffe, and Mandelker, 1992; Linn and Switzer, 2001). Although there is little direct research pointing to the method of payments affecting post-IPO M&A performance, Brau, Couch and Sutton (2012) allude to several stock-related inefficiencies that arise within post-IPO M&A, largely related to overconfidence. Naturally, this paper also aims to bridge the lack of research in this field.

Since many pieces of literature found a positive and significant relationship between method of payment and underperformance as an acquirer, one would expect only a handful of stock-financed acquisition amongst acquirers, especially post-IPO firms whose cash reserves are high and access to debt and SEO market is easy. Contrary to expectations, it is found more often than not, (i) an IPO wave is closely followed by a stock-financed acquisition wave (Rau and Stouraitis, 2011), (ii) the increase in the use of stock as payment increased drastically from 3% three-years prior IPO to 21% three-years after IPO (Signori and Vismara, 2016) and (iii) recent-IPO firm engage in a higher volume of stock-financed acquisition than that of mature firms (Celikyurt, et.al., 2010). Against these findings, financial slack - cash and marketable securities scaled by total assets, is also oddly found to increase the likelihood of using stock as a method of payment. (Hovakimian and Hutton, 2009). It is crucial to note that these observations do not imply that cash-financed acquisitions are few compared to stock-financed acquisitions. In fact, cash is quite often the preferred method of payment for post-IPO acquisitions (Celikyurt, 2010; Arikan and Stultz, 2016). However, since there still exist these handful of post-IPO stock-financed acquisitions, it is important to question the justifications for these post-IPO stock-acquisitions.

A contrarian might argue that that recent IPO firms can be rightly motivated by the desires to pursue targets that are value-accretive, however, only to be hindered by expensive cost ie. “larger and have higher market-to-book ratio” (Hovakimian and Hutton, 2009) where the primary IPO proceeds are insufficient to pay for these expensive value-accretive targets. This position, however, is inconsistent with the acquirer’s well position in the debt and SEO market (Celikyurt, et. al., 2010). It is seen as more reasonable to either accumulate more cash via an SEO or debt financing and then subsequently conduct a cash-financed acquisition. All rational reasoning dissuades post-IPO acquirers from engaging in a stock-financed acquisition. Since many prominent authors found the creation of overvalued stock currency to be the main motivation for stock acquisitions, the literature review continues in this direction (Celikyurt et. al., 2010; Hovakimian and Hutton, 2009; Jensen, 2005).

2.2 Overvalued equity hypothesis

The motivation for post-IPO stock-financed acquisitions is found to be driven by the presence of overvalued equity, especially with the creation of often overvalued stock currency (Celikyurt, et. al., 2010). While there are several positive motivations for using overvalued equity in acquisitions, such as “lower effective cost of paying for an equally overvalued target”, to obtain “information of true firm value or synergy” and have a greater selection pool of value-accretive targets (Celikyurt, et. al., 2010), it is equally well-recognized that overvalued stock equity often accompanies various agency cost problems, famously pioneered by Jensen (2005). While Golubov, et al. (2015) find no evidence of Jensen’s hypothesis in their general stock-financed M&A sample, Hovakimian and Hutton (2009) and Brau, Sutton, and Couch (2012) propose that the overconfidence of IPO managers could make recent IPO firms more susceptible than mature firms.

Jensen (2005) explains that, with overvalued equity, managers are influenced by pressure to sustain an impossible high stock price, hence excessively undertaking risky and negative value-destroying investments with its now cheap equity issues. Brau, Couch, and Sutton (2012) explain that the overenthusiasm and overconfidence of recent-IPO firms compared to mature firms induces classic value-destructive theories like acquirer’s overconfidence and overpaying tendencies (Roll, 1986), prestige overconfidence (Rau and Vermaelen, 1998; Malmendier and Tate, 2008), overconfidence within the technology industry acquirers (Kohers and Kohers, 2001) and agency cost by cash-rich firms (Jensen, 1986).

Under the overconfidence argument, decision-makers (often founder CEOs) of recent-IPO firms are often characterized as overconfident, which leads to a higher likelihood of engaging in value-destroying acquisitions. Many types of research supported this stance, showing that entrepreneurs have higher levels of optimism compared to non-entrepreneurial individuals (Camerer and Lovallo, 1999; Cooper, Woo, and Dunkelberg, 1988; Lowe and Ziedonis, 2006). Forbes (2005) also finds a higher confidence level in founder-managers than in non-founder managers. Lee, Kim, and Reuer (2016) further justify this viewpoint that founder CEO-managed firms experience worse abnormal returns than professional CEO-managed firms in M&A transactions due to overconfidence by ruling out other alternative reasons such as private benefits of control and inferior M&A skills. Consistent with other prominent research, when overconfidence is a factor of post-IPO M&A consideration, these overconfident managers often overestimate synergy potential and have a higher tendency to overpay and engage in bidding competitions, which leads to value-destroying acquisitions (Roll, 1987; Malmendier and Tate, 2008). Overall, the above reasons predict that managers of recent-IPO firms are more prone to exploit the overvalued equity window due to the post-IPO overconfidence.

Another motivation for value-destructive decision-making is the increased availability of cash and access to greater financing options. Compared to mature firms, recent IPO firms have greater cash for potential acquisitions, a better position for SEO proceeds, and a better debt financing structure (Arikan and Stulz, 2016). Harford (1999) provides evidence that a higher cash holding is found to prompt managers to engage in acquisitions, in which, majority of these bids each bid destroys 7% of excess cash reserves in market value. Jensen (1986) also shows how the presence of large free cash flows creates agency cost conflict between shareholders and managers and especially for equity takeover activities, in which there are strong grounds to believe that recent-IPO firms will exhibit a clearer presence of Jensen's overvalued equity hypothesis than general or mature firms.

Interestingly, the converse is plausible as well. Recent-IPO firms experience less time pressure to decide on hasty investments, which could be less value-destructive; unlike mature firms whose "cash flow outstrips their internal growth opportunities and management becomes more entrenched" (Arikan and Stultz, 2016). The mature firm then eventually engages in desperate acquisitions at the expense of shareholder wealth (Mueller, 1972; Jensen, 1986).

In summary, this paper expects to find evidence of Jensen's overvalued equity hypothesis, which is yet found in the more general stock-financed acquisition research by Golubov et al. (2015).

2.3 Empirical method

Apart from being the first paper to examine the effects of method of payments on post-IPO M&A, this paper also strives to be critical upon the takeover effect, given the many cautions against confounding effects of equity financing and takeover announcement returns. The clear statement put forth by Rau and Stouraitis (2011): "A stock-financed acquisition is a combination of a financing activity (an SEO) and an investment activity (an acquisition). A cash-financed acquisition is more likely to be a pure investment." clearly summarizes the need to assess takeover effect, independent of equity financing effects. Other authors such as Hansen (1987: 77), Eckbo, Giammarino, and Heinkel (1990: 668), Bhagat et al. (2005) and Golubov, et al. (2015) also share the same beliefs, emphasizing the potential spillover effect from equity-financing announcement effects into stock-acquisitions announcement effects.

Similar attributes between SEO and stock-financed acquisitions are seen in the stock price run-ups prior to an event announcement, as well as, the similar explanatory variables influencing event announcement returns. One example is the positive stock-price run-up before SEO and stock-acquisition events (Asquith and Mullins, 1986; Rosen, 2006).

For the IPO sample, this poses an even greater danger with the possibility of a third confounding effect from a recent IPO announcement (Jegadeesh, Weinstein, and Welch, 1993), depending on the duration between IPO and M&A. To minimize this effect, the analysis below will take a five-year post-IPO duration. Additional analysis performed on the one-year and three-year sample (see Appendix 7.3) must be read with this in mind. The following empirical method aims to make a distinction between the information conveyed via an equity-financing event and a stock-acquisition event, following the same method by Golubov et al. (2015).

2.3.1 Linear prediction

The first approach is to regress the SEO issuer announcement returns ($ICAR_{SEO}$) with its respective firm variables (X') – LNMARCAP, BEME, RUNUP, SIGMA, RELSIZE, LEVERAGE, CASHHOLD, CF/EQ and OPERPERF with industry and year fixed effects. The description of these variables can be found in the Appendix 7.1 and the coefficients in Table IV- Panel A Specification (1).

$$\mathrm{ICAR}_i = X_i'\beta + u_i, \tag{3}$$

The implied HCAR for post-IPO acquirers, assumed to independently announced an SEO rather than an equity-financed acquisition, are then estimated by fitting the same X' variables of stock-acquirers with the respective β coefficients. From the actual announcement effect of stock-financed acquirers ($ACAR_{stock}$), HCAR is used to separate the equity-financing effect, leaving behind the pure takeover value ($PCAR_{stock}$) essential for decision-making.

$$\mathrm{PCAR}_j = \begin{cases} \mathrm{ACAR}_j - \mathrm{HCAR}_j & \text{if } \mathrm{STOCK}_j = 1 \\ \mathrm{ACAR}_j & \text{if } \mathrm{STOCK}_j = 0. \end{cases} \tag{4}$$

Lastly, $PCAR_{all}$ is regressed against various firm and deal characteristic variables to examine whether stock as a method of payment has a significant effect on $PCAR_{all}$, with the presence of other variables that could potentially affect $PCAR_{all}$ as well.

2.3.2 Propensity score matching

The second approach uses the propensity-score matching technique, taking first a probit regression between the binary choices of stock-financed M&A or SEO with firm characteristics X' and then match both sample groups using the full-optimal, 1-nearest, and 10-nearest-neighbors' methods. Instead of creating a set of hypothetical unreal HCAR in linear prediction, this method selectively restricts or matches the control SEO samples to its treatment stock-financed acquirers based on propensity scores, and subsequently pool a set of real $ICAR_{SEO}$ from the matched control SEO sample.

The objective of this matching technique is to find the closest SEO peer in approximating HCAR while reducing the confounding effects since the treatment (stock-financed acquirers) and control (SEO issuers) group share the same covariates (X' firm characteristics) (Ho et al., 2007). This is achieved by assessing the balance, or standardized mean differences that are near zero (see Appendix 7.2).

The most common method is 1-nearest matching (Thoemmes and Kim, 2011; Zakrison, Austin, and McCredie, 2018), where the software package (MATCHIT in R) seeks to pair the propensity score of one treatment sample with the closest propensity score of one control sample. The balance

with this method is decent in comparison to unmatched SEO (see Appendix 7.2). 10-nearest matching instead finds 10 nearest control samples to match with each treatment group.

Full optimal matching "assigns every treated and control unit in the sample to one subclass each" (Hansen 2004; Stuart and Green 2008). This method best optimizes the mean of the absolute within-subclass distances in the matched sample (see Appendix 7.2), where most covariates are near zero compared to before matching. Each subclass is free to have a different number of paired controls i.e. one treated unit and one or more control units or one control unit and one or more treated units, regardless, in order to achieve the best covariate balance. Full matching does not discard any control samples, however, at times might be at the cost of precision when the weighted matched controls would at times contribute less than in unmatched sample and 1-nearest matched sample. But since 1-nearest and 10-nearest matching are not effective (see Appendix 7.2), full matching provides the best alternative matching.

Again, the paper regress $PCAR_{all}$ found from the propensity score estimated effects, against other deal characteristics to find explanatory power for pure takeover effects.

3. Sample selection and description

This paper has three sets of samples. First, the paper collects a set of IPO samples from 1 January 1985 to 31 December 2009. From the IPO sample, a set of M&A samples is collected with an emphasis to examine the raw cumulative announcement returns (ACAR), 5-years after the IPO event as an acquirer. To remove the announcement effect (refer to Equation 1), a set of SEO samples is collected to approximate and estimate the equity financing effect (HCAR). This equity financing effect is used to purify the raw cumulative announcement returns found in the M&A samples before further analysis.

3.1 IPO sample

5,234 IPO sample was extracted from EIKON Equity Screener, from 1 January 1985 to 31 December 2009, with a focus on issuer within the United States of America, excluding transactions that are canceled or unknown. The sample is also filtered by the CRSP share code of 10 and 11 to ensure that they do not contain closed-end funds, unit investment trusts, real estate investment trusts, and American Depositary Receipts. These IPO firms trade on the NYSE, AMEX, and NASDAQ exchanges. Out of these 5.234 IPO, only 1,383 IPO engages in a post-IPO M&A as an acquirer. The low 26.4% participation rate as an acquirer post-IPO does not contradict Celikyurt's

(2010) findings, because unlike Celikyurt, this paper does not restrict the IPO sample with gross proceeds above USD 57 million (in 1985 dollars).

Table I reports descriptive statistics for the 1,383 IPO sample. The number of IPO is rather stable across the years but with increased volume in the year 1991-2000. The gross proceeds range from USD 2 – 759 million, but on average, USD 63.6 million across the 25 years. The highest IPO proceeds is seen in 2009 and this is consistent with the occurrence of the 2008 financial bubble.

IPO underpricing is shown to be a proxy for IPO overvaluation (Purnanandam and Swaminathan, 2004). IPO overvaluation is a factor of consideration while deciding between stock versus cash acquisition methods (Celikyurt, 2010), however, a large 83% of the sample data do not report price 1 day after offer. Amongst these IPO firms, 23.6% engaged in an M&A in the immediate one-year post-IPO. By year 4, every IPO firm would have already conducted an M&A as an acquirer (Table I).

Table I. IPO sample descriptive statistics

The table shows the sample descriptive statistic for 1,343 completed post-IPO public acquisitions in the United States of America from 1 January 1985 and 31 December 2009. Data are collected from the Thomson Financial SDC M&A Database. All variables are defined in Appendix 7.1.

			Average gross	Number of M&As with n-years post-IPO				
Year	N	%	proceed (USD mil)	0-1	0-2	0-3	0-4	0-5
Panel A: Distribution by Year								
1985	20	1.5%	$13.0	0	1	3	3	6
1986	50	3.7%	$21.2	1	6	12	20	26
1987	46	3.4%	$23.4	10	14	19	26	30
1988	18	1.3%	$36.9	1	4	5	7	9
1989	23	1.7%	$30.9	0	2	12	15	21
1990	28	2.1%	$29.7	1	4	13	23	31
1991	68	5.1%	$34.5	7	28	42	70	88
1992	82	6.1%	$35.0	11	40	58	100	117
1993	113	8.4%	$31.2	28	70	112	146	177
1994	82	6.1%	$27.8	10	45	71	103	123
1995	96	7.1%	$38.5	31	71	106	135	147
1996	159	11.8%	$43.1	47	140	220	268	292
1997	95	7.1%	$35.9	36	86	99	107	116
1998	62	4.6%	$45.7	27	70	106	126	145
1999	108	8.0%	$67.8	43	98	113	128	157
2000	68	5.1%	$83.7	18	49	63	74	91
2001	20	1.5%	$55.3	2	4	12	20	25
2002	20	1.5%	$101.2	4	9	16	22	28
2003	17	1.3%	$147.1	5	12	18	23	24
2004	38	2.8%	$142.8	4	12	28	38	41
2005	37	2.8%	$219.7	9	26	40	49	51
2006	40	3.0%	$137.7	7	20	33	40	49
2007	41	3.1%	$189.6	11	16	28	37	44
2008	3	0.2%	$182.3	0	0	1	2	3
2009	9	0.7%	$368.3	4	8	12	12	12
Total	1343	100.0%	$63.6	317	835	1242	1594	1853

3.2 M&A sample

In the subsequent 5 years post-IPO, a total of 1,853 M&As were filtered from a list of 10,349 M&A activity related to the IPO firms. Most of the M&A activity excluded was due to the period of M&A either before the IPO or after the five years window post-IPO. Other exclusion was due to a lack of firm or deal characteristic information, as well as, M&A engagement as a target. Most of the IPO firms conducted at least one M&A within the first four years post-IPO (Table I).

These M&A activities are tracked from EIKON Deal Analytics and Thomson Eikon SDC. The sample includes completed M&A activity both as an acquirer, with either stock or cash method of payment exclusively (100%). All acquirers are located in the United States of America. The criteria however exclude any acquisitions related to bankruptcy acquisition, going private, leveraged buyout, liquidation, privatization, repurchase, reverse takeover, and restructuring. The percentage share held before an acquisition is less than 10% and post-acquisition is more than 50%. When

cross-referenced with the Centre for Research in Security Prices (CRSP) database, the acquirers are under share code 10 and 11 to exclude closed-end funds, unit investment trusts, real estate investment trusts, and American Depositary Receipts. Most of these criteria are consistent with other M&A literature such as Golubov, Petmezas, and Travlos (2015), Savor and Lu (2009), and Masulis, Wang, and Xie (2007). The selection process yielded 1,853 deals with 1,093 cash-only acquisitions and 760 stock-only acquisitions.

Table II - Panel A showcased the variables and in particular the ACAR (see Appendix 7.1 for description) of the acquirer in the -2 to +2 announcement period between the acquisition announcement day. The expected market returns are based on a CAPM market model estimated over 200 trading days ending 41 days before the announcement. The mean (median) of $ACAR_{all}$ is 0.67% (0.60%). The mean with a p-value of 0.538 is not statistically significant. Between the different methods of payment, the average $ACAR_{stock}$ is -0.57% and $ACAR_{cash}$ are 1.54% (statistically significant at a <1% level). The difference in mean between $ACAR_{stock}$ and $ACAR_{cash}$ is a high 2.11%, highly statistically significant at a 5% significant level. Overall, this is consistent with Travlos' (1987) research that cash-financed acquisitions yield a higher return than a stock-financed acquisition, as well as, the sample descriptions by the reference paper Golubov et.al. (2015).

In general, stock-financed acquisitions are larger (MARCAP), higher in firm idiosyncratic volatility (SIGMA), has a higher amount of debts (LEVERAGE), higher cash holdings (CASHHOLD), higher deal size (DEAL VALUE) compared to cash-financed acquisitions. Again, the curious case of high cash holdings (and debt), implies the possibility of a cash-financed acquisition, yet 41% of the M&A sample decides to use stock in an acquisition. On top of that, a low book-to-market ratio (BEME) also indicates a relative overvaluation for stock-acquirers as anticipated by Jensen's hypothesis. Cash-financed acquisitions, on the other hand, have a higher book-value to market-value ratio (BEME), buy-and-hold return (RUNUP), better operating performance (OPERPERF) and cash flow-to-equity ratio (CF/EQ).

The number of tender offers (TENDER) and number of competing bidders (MULTIBID) of cash-financed acquisitions also exceed that of stock-financed acquisitions. From Panel D, it is evident that the period of 1994-2001 was the most active period for M&A activities. This trend is similar for both cash and stock-financed acquisitions.

Table II. M&A sample descriptive statistics

The table shows the sample descriptive statistics for 1,853 completed post-IPO public acquisitions in the United States of America from 1 January 1985 and 31 December 2014. Data are collected from the Thomson Financial SDC M&A Database. All variables are defined in Appendix 7.1. Panels A–C are for all deals, stock deals, and cash deals, respectively. Panel D shows the yearly composition, and Panel E the industry composition of the sample. $N_{M\&A}$ denotes the number of observations respectively for all deals, stock deals, and cash deals.

	$N_{M\&A}$	Mean	SD	Min	P25	Median	P75	Max
Panel A: All								
MARCAP (in $ mil.)	1853	6,208.69	31,119.18	12.87	172.26	489.53	1289.22	490,266.75
BEME	1853	0.334	0.365	-2.118	0.137	0.254	0.445	7.591
RUN-UP	1853	0.007	0.116	-0.788	-0.046	0.002	0.058	1.090
SIGMA	1853	0.037	0.018	0.005	0.025	0.032	0.045	0.166
LEVERAGE	1853	0.170	0.146	0.008	0.081	0.133	0.211	1.928
CASHHOLD	1853	0.296	0.260	0.000	0.047	0.244	0.496	0.999
OPERPERF	1853	0.007	0.176	-1.600	-0.008	0.047	0.090	0.725
CF/EQ	1853	0.150	0.441	-1.554	-0.008	0.000	0.128	6.177
DEAL VALUE	1853	184.557	849.248	0.010	9.875	30.000	97.562	21422.965
RELSIZE	1853	0.177	0.406	0.000	0.021	0.058	0.166	5.149
HOSTILE	1853	0.001	0.023	0.000	0.000	0.000	0.000	1.000
TENDER	1853	0.056	0.230	0.000	0.000	0.000	0.000	1.000
MULTIBID	1853	0.005	0.073	0.000	0.000	0.000	0.000	1.000
ACAR	1853	0.67%	11.72%	-105.05%	-4.47%	0.60%	6.16%	83.30%
Panel B: Stock								
MARCAP (in $ mil.)	760	9,428.66	41,989.43	13.46	240.16	664.56	1847.43	490,266.75
BEME	760	0.247	0.347	-0.496	0.091	0.191	0.319	7.591
RUN-UP	760	-0.006	0.132	-0.788	-0.069	-0.011	0.056	1.090
SIGMA	760	0.044	0.020	0.009	0.029	0.039	0.055	0.166
LEVERAGE	760	0.215	0.175	0.011	0.107	0.164	0.273	1.659
CASHHOLD	760	0.388	0.270	0.000	0.148	0.373	0.615	0.985
OPERPERF	760	-0.038	0.224	-1.600	-0.094	0.036	0.087	0.337
CF/EQ	760	0.058	0.272	-1.554	-0.006	-0.001	0.022	4.430
DEAL VALUE	760	304.743	1267.438	0.010	14.999	46.000	160.698	21422.965
RELSIZE	760	0.166	0.240	0.000	0.023	0.067	0.203	1.882
HOSTILE	760	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TENDER	760	0.012	0.108	0.000	0.000	0.000	0.000	1.000
MULTIBID	760	0.004	0.063	0.000	0.000	0.000	0.000	1.000
ACAR	760	-0.57%	13.32%	-105.05%	-6.70%	-0.87%	6.16%	83.30%
Panel C: Cash								
MARCAP (in $ mil.)	1093	3,960.90	20,060.89	12.87	145.99	411.53	971.23	245,003.58
BEME	1093	0.396	0.366	-2.118	0.184	0.332	0.524	3.407
RUN-UP	1093	0.016	0.102	-0.788	-0.032	0.010	0.060	0.548
SIGMA	1093	0.033	0.014	0.005	0.023	0.029	0.040	0.120
LEVERAGE	1093	0.138	0.111	0.008	0.072	0.115	0.172	1.928
CASHHOLD	1093	0.232	0.233	0.000	0.030	0.145	0.390	0.999
OPERPERF	1093	0.038	0.123	-1.547	0.010	0.052	0.093	0.725
CF/EQ	1093	0.214	0.519	-1.288	-0.009	0.011	0.235	6.177
DEAL VALUE	1093	100.657	295.067	0.011	7.500	22.000	66.000	0.011
RELSIZE	1093	0.184	0.490	0.000	0.020	0.054	0.136	5.149
HOSTILE	1093	0.001	0.030	0.000	0.000	0.000	0.000	1.000
TENDER	1093	0.087	0.282	0.000	0.000	0.000	0.000	1.000
MULTIBID	1093	0.006	0.080	0.000	0.000	0.000	0.000	1.000
ACAR	1093	1.54%	10.38%	-105.05%	-2.84%	1.24%	6.09%	54.32%

	All		Cash		Stock	
Year	$N_{M\&A,\ all}$	%	$N_{M\&A,\ cash}$	%	$N_{M\&A,\ stock}$	%
Panel D: Distribution by Year						
1985	0	0.0%	0	0.0%	0	0.0%
1986	0	0.0%	0	0.0%	0	0.0%
1987	6	0.3%	4	0.4%	2	0.3%
1988	16	0.9%	9	0.8%	7	0.9%
1989	14	0.8%	9	0.8%	5	0.7%
1990	20	1.1%	13	1.2%	7	0.9%
1991	17	0.9%	13	1.2%	4	0.5%
1992	39	2.1%	20	1.8%	19	2.5%
1993	55	3.0%	35	3.2%	20	2.6%
1994	100	5.4%	68	6.2%	32	4.2%
1995	126	6.8%	60	5.5%	66	8.7%
1996	149	8.0%	68	6.2%	81	10.7%
1997	215	11.6%	105	9.6%	110	14.5%
1998	242	13.1%	134	12.3%	108	14.2%
1999	166	9.0%	62	5.7%	104	13.7%
2000	167	9.0%	62	5.7%	105	13.8%
2001	99	5.3%	50	4.6%	49	6.4%
2002	77	4.2%	67	6.1%	10	1.3%
2003	50	2.7%	38	3.5%	12	1.6%
2004	48	2.6%	40	3.7%	8	1.1%
2005	33	1.8%	31	2.8%	2	0.3%
2006	45	2.4%	44	4.0%	1	0.1%
2007	49	2.6%	44	4.0%	5	0.7%
2008	44	2.4%	44	4.0%	0	0.0%
2009	25	1.3%	22	2.0%	3	0.4%
2010	26	1.4%	26	2.4%	0	0.0%
2011	17	0.9%	17	1.6%	0	0.0%
2012	8	0.4%	8	0.7%	0	0.0%
2013	0	0.0%	0	0.0%	0	0.0%
2014	0	0.0%	0	0.0%	0	0.0%
Total	1853	100.0%	1093	100.0%	760	100.0%

The industry distribution of M&A is seen in Panel E. The most heavily distributed is business services, including the information technology, research and development and service sectors, which boomed during and post-2000. This might overweight the presence of agency cost given that Kohers and Kohers (2001) show evidence of overconfidence amongst technology-related acquisitions.

	All		Cash		Stock	
	$N_{M\&A,\ all}$	%	$N_{M\&A,\ cash}$	%	$N_{M\&A,\ stock}$	%
Panel E: Distribution by Fama-French 48 industries						
Agriculture	5	0.3%	4	0.1%	1	0.1%
Food Products	6	0.3%	6	0.1%	0	0.0%
Candy & Soda	1	0.1%	1	0.0%	0	0.0%
Beer & Liquor	0	0.0%	0	0.0%	0	0.0%
Tobacco Products	2	0.1%	2	0.0%	0	0.0%
Recreation	7	0.4%	7	0.3%	0	0.0%
Entertainment	22	1.2%	15	1.3%	7	0.9%
Printing and Publishing	20	1.1%	20	0.7%	0	0.0%
Consumer Goods	10	0.5%	10	0.3%	0	0.0%
Apparel	11	0.6%	11	0.8%	0	0.0%
Healthcare	82	4.4%	51	4.1%	31	4.1%
Medical Equipment	66	3.6%	49	3.7%	17	2.2%
Pharmaceutical Products	59	3.2%	23	2.8%	36	4.7%
Chemicals	10	0.5%	8	0.8%	2	0.3%
Rubber and Plastic Products	10	0.5%	6	0.8%	4	0.5%
Textiles	9	0.5%	8	0.4%	1	0.1%
Construction Materials	13	0.7%	11	0.3%	2	0.3%
Construction	3	0.2%	3	0.3%	0	0.0%
Steel Works Etc	21	1.1%	21	0.0%	0	0.0%
Fabricated Products	6	0.3%	6	0.0%	0	0.0%
Machinery	69	3.7%	54	5.3%	15	2.0%
Electrical Equipment	53	2.9%	8	3.5%	45	5.9%
Automobiles and Trucks	17	0.9%	14	0.4%	3	0.4%
Aircraft	11	0.6%	11	0.0%	0	0.0%
Shipbuilding, Railroad Equipment	0	0.0%	0	0.0%	0	0.0%
Defense	4	0.2%	3	0.0%	1	0.1%
Precious Metals	0	0.0%	0	0.0%	0	0.0%
Non-Metallic and Industrial Metal	1	0.1%	1	0.3%	0	0.0%
Coal	0	0.0%	0	0.0%	0	0.0%
Petroleum and Natural Gas	52	2.8%	51	4.1%	1	0.1%
Utilities	5	0.3%	3	1.3%	2	0.3%
Communication	168	9.1%	102	4.5%	66	8.7%
Personal Services	56	3.0%	42	1.7%	14	1.8%
Business Services	564	30.4%	244	28.1%	320	42.1%
Computers	85	4.6%	45	9.8%	40	5.3%
Electronic Equipment	77	4.2%	45	5.9%	32	4.2%
Measuring and Control Equipment	34	1.8%	25	4.4%	9	1.2%
Business Supplies	12	0.6%	9	0.8%	3	0.4%
Shipping Containers	5	0.3%	5	0.0%	0	0.0%
Transportation	18	1.0%	10	0.6%	8	1.1%
Wholesale	67	3.6%	34	3.1%	33	4.3%
Retail	76	4.1%	40	3.5%	36	4.7%
Restaurants, Hotels, Motels	27	1.5%	19	2.5%	8	1.1%
Banking	16	0.9%	11	0.7%	5	0.7%
Insurance	25	1.3%	16	1.0%	9	1.2%
Real Estate	5	0.3%	3	0.1%	2	0.3%
Trading	24	1.3%	20	0.0%	4	0.5%
Almost Nothing	19	1.0%	16	1.4%	3	0.4%
Total	1853	100.0%	1093	100.0%	760	100.0%

3.3 SEO sample

1,092 SEO samples are collected between the period of 1 January 1985 to 31 December 2009 and their issuer nation is the United States of America. The transaction excludes status of unknown and canceled issuance, as well as issues classified as a rights issue or a shelf offering, or simultaneous offers of securities of other types (warrants or units). They are traded on the NYSE, AMEX, and NASDAQ. The common stock issue is offered to the US public of the combination

of both primary and secondary shares. Then using CRSP, the sample is trimmed based on share codes 10 and 11 to exclude closed-end funds, unit investment trusts, real estate investment trusts, and American Depositary Receipts). Any missing data insufficient to calculate returns are also excluded. The criteria are in accordance with the reference paper – Golubov et.al. (2015), as well as older SEO performance papers by Eckbo, Masulis, and Norli (2000).

Following the argument by Golubuv et. al. (2015) – supposed an equity-financed acquisition has a similar value effect as cash-financed acquisitions, one should not expect any difference between cash and equity-financed acquisition CAR after the removal of equity financing effect. If there exists a difference where stock-financed acquisitions are lower than cash-financed acquisitions, then it is safe to conclude the possibilities of Jensen's overvalued equity hypothesis. This hypothesis elaborates that overvalued equity facilitates an environment where managers of a firm have lower managerial discipline and has the tendency to select non-value-added investment projects.

For the SEO issuance $ICAR_{SEO}$ (Table III), the mean (median) $ICAR_{SEO}$ reported is -2.27% (-2.14%), significant at a 1% significance level. This negative return is also consistent with the findings from Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995). By taking a quick calculation, subtracting -2.26% ($ICAR_{SEO}$) from -0.57% ($ACAR_{stock}$) yields a 1.69%. This pure-takeover return is quite close to $ACAR_{cash}$, hence this back envelop calculation does not suggest the presence of Jensen's overvalued equity hypothesis.

It is also imperative to look into the firm characteristics of SEO issuers and equity-acquirers for a fair comparison. This biggest difference noticed is the MARCAP – market capitalization of the sample, where equity acquirers are on average 30x bigger than SEO firms. SEO firms also have on average a lower book-to-market ratio (BEME), lower buy-to-hold excess returns (RUNUP), lower idiosyncratic volatility (SIGMA) and lower debt outstanding (LEVERAGE). In terms of liquid assets and operational ratios, SEO issuers outperform equity acquirers. Higher OPERPERF, higher cash-holding (CASHHOLD), and cash-flow-to equity ratio (CF/EQ) are seen on average for SEO issuers. Since there are significant differences between the issuers and acquirers, it is not possible to directly subtract the CAR returns, but it is necessary to imply the SEO announcement returns given a set of characteristics or conduct propensity score matching.

Table III. SEO sample descriptive statistics
The table shows the sample descriptive statistics for 1,092 completed SEOs by US issuers from 1 January 1985 and 31 December 2009. Data are collected from the Thomson Financial SDC New Issues Database. All variables are defined in Appendix 7.1. Panel A describes the variables, Panel B presents the yearly composition, and Panel C the industry composition of the sample. N_{SEO} denotes the number of observations.

	N_{SEO}	Mean	SD	Min	P25	Median	P75	Max
Panel A: Variables summary statistics								
MARCAP (in $ mil.)	1092	363.31	995.86	8.47	96.59	186.22	373.60	19,569.93
BEME	1092	0.358	0.277	-0.536	0.182	0.290	0.462	2.595
RUN-UP	1092	-0.022	0.097	-0.507	-0.078	-0.024	0.031	0.424
SIGMA	1092	0.038	0.015	0.013	0.029	0.036	0.045	0.155
LEVERAGE	1092	0.188	0.210	0.000	0.012	0.119	0.309	1.829
CASHHOLD	1092	0.269	0.274	0.000	0.034	0.167	0.439	0.980
OPERPERF	1092	0.046	0.452	-12.413	0.036	0.122	0.187	0.535
CF/EQ	1092	0.036	0.138	-1.660	0.000	0.044	0.089	1.489
PROCEED	1092	60.342	112.477	1.200	21.375	40.350	72.000	2782.500
RELSIZE	1092	0.241	0.146	0.008	0.148	0.213	0.298	1.179
COMBINED	1092	0.560	0.497	0.000	0.000	1.000	1.000	1.000
ACAR	1092	(2.27%)	9.86%	(62.20%)	(7.95%)	(2.14%)	3.60%	37.96%

Year	N_{SEO}	%
Panel B: Distribution by Year		
1985	36	3.3%
1986	52	4.8%
1987	36	3.3%
1988	19	1.7%
1989	27	2.5%
1990	18	1.6%
1991	59	5.4%
1992	50	4.6%
1993	93	8.5%
1994	77	7.1%
1995	101	9.2%
1996	111	10.2%
1997	84	7.7%
1998	49	4.5%
1999	43	3.9%
2000	48	4.4%
2001	19	1.7%
2002	21	1.9%
2003	35	3.2%
2004	32	2.9%
2005	22	2.0%
2006	24	2.2%
2007	22	2.0%
2008	3	0.3%
2009	11	1.0%
Total	1092	100.0%

	N_{SEO}	%
Panel C: Distribution by Fama-French 48 industries		
Agriculture	6	0.5%
Food Products	11	1.0%
Candy & Soda	0	0.0%
Beer & Liquor	1	0.1%
Tobacco Products	0	0.0%
Recreation	7	0.6%
Entertainment	19	1.7%
Printing and Publishing	2	0.2%
Consumer Goods	7	0.6%
Apparel	11	1.0%
Healthcare	43	3.9%
Medical Equipment	49	4.5%
Pharmaceutical Products	115	10.5%
Chemicals	11	1.0%
Rubber and Plastic Products	5	0.5%
Textiles	3	0.3%
Construction Materials	8	0.7%
Construction	7	0.6%
Steel Works Etc	14	1.3%
Fabricated Products	4	0.4%
Machinery	39	3.6%
Electrical Equipment	47	4.3%
Automobiles and Trucks	9	0.8%
Aircraft	3	0.3%
Shipbuilding, Railroad Equipment	0	0.0%
Defense	3	0.3%
Precious Metals	0	0.0%
Non-Metallic and Industrial Metal Mining	1	0.1%
Coal	0	0.0%
Petroleum and Natural Gas	16	1.5%
Utilities	20	1.8%
Communication	25	2.3%
Personal Services	20	1.8%
Business Services	178	16.3%
Computers	52	4.8%
Electronic Equipment	84	7.7%
Measuring and Control Equipment	27	2.5%
Business Supplies	1	0.1%
Shipping Containers	0	0.0%
Transportation	35	3.2%
Wholesale	49	4.5%
Retail	69	6.3%
Restaurants, Hotels, Motels	39	3.6%
Banking	12	1.1%
Insurance	9	0.8%
Real Estate	1	0.1%
Trading	17	1.6%
Almost Nothing	13	1.2%
Total	1092	100.0%

4. Empirical findings

4.1 Implied equity financing

There are two methods of estimation based on the firm characteristics of SEO firms. The first uses a linear prediction method where the HCAR implied is a result of directly using the coefficient estimates of a cross-sectional regression of SEO samples on the stock-financed acquirer variables. The second method removes the confounding effect and increases the similarity between stock-acquirers (treatment) and SEO issuers (control) using one-dimensional propensity score (1-nearest and 10-nearest matching) and subclass weights as propensity score (full-optimal matching) to estimate the treatment effects.

The difference in methods is mainly that for the linear prediction method, HCAR is synthetically produced, extrapolating coefficient estimates from SEO sample and obtaining fitted values with stock-financed takeover sample, whereas the propensity score matching method is critical upon the sample of SEO and only selects (match) those SEO samples that are similar in characteristics to treatment sample, then taking the real $ACAR_{stock}$ to obtain $PCAR_{stock}$. Since there is no way to justify a more superior model, this paper will only draw conclusions when the results show a majority or two-out-of-four negative $PCAR_{all}$ and STOCK coefficients.

The variables selected for SEO and M&A acquirers are such that they are applicable to both SEO issuers and M&A acquirers and they are found to have a significant impact on returns of both events in prior research. All of these explanatory variables are both in the linear prediction model –the cross-sectional model of SEO announcement returns, as well as determinants of the propensity score (probit model) in the propensity-score matching method. As with the reference paper (Golubov et.al., 2015), this paper similarly included variables (not restricted to post-IPO SEO and stock-financed mergers): “firm size (LN (MARCAP)) (Lee and Masulis (2009) for SEOs; Moeller, Schlingemann, and Stulz (2004) for mergers), book-to-market ratio (BEME) (Bayless and Chaplinsky (1996) for SEOs; Servaes (1991) and Dong et al. (2006) for mergers), stock price run-up (RUN-UP) (Bayless and Chaplinksy (1996) for SEOs; Rosen (2006) for mergers), stock return idiosyncratic volatility (SIGMA) (Dierkens (1991) for SEOs and Moeller, Schlingemann, and Stulz (2007) for mergers), the relative size of the deal (issue or acquisition) (RELSIZE) (Asquith and Mullins (1986) for SEOs; Fuller, Netter, and Stegemoller (2002) for mergers), cash holdings (CASH HOLD) (Kim and Purnanandam (2014) for SEOs; Harford (1999) for mergers),

leverage ratio (LEVERAGE) (Lee and Masulis (2009) for SEOs; Maloney, McCormick and Mitchell (1993) for mergers), operating performance measured by the return on assets (OPER PERFORM) (Bayless and Chaplinsky (1996) for SEOs; Morck, Shleifer and Vishny (1990) for mergers) and cash-flow-to-equity (CF/EQ) (Jung, Kim, and Stulz (1996) for SEOs; Lang, Stulz, and Walkling (1991) for mergers)." Calendar year and Fama-French 48 industries classification fixed effects are also included.

Table IV- Panel A shows a fixed-effect regression for the cross-sectional regression model of SEO returns (Specification (1)) and the probit model of equity issuance choice (Specification (2)). The first specification shows that RUNUP and CF/EQ have a significant and positive effect on announcement returns. Although both are inconsistent with the general SEO literature since a negative effect is expected for both coefficients (McLaughlin, Safieddine Vasudevan, 1996; Lucas and Macdonald, 1990), the RUNUP inconsistency works to the favor of this paper because of its relevance towards post-IPO SEO (Jiang, Stohs, and Xie, 2008). For the second specification, the positive and significant coefficients are LN(MARCAP), BEME, RUNUP, LEVERAGE, CASHHOLD, and CF/EQ. Only OPERPERF is negative. Therefore, firms choosing to engage in the stock-financed acquisition are relatively larger, have higher book value/market value ratios, have larger pre-announcement stock price runups, higher leverage, higher cash holdings, higher cash-flow-to-equity ratio, but lower operating performance. Again, since the objective is to minimize the difference between these 2 events, the paper hopes to diminish the significant difference using propensity score matching.

Table IV – Panel B continues to show the matching diagnostics for the propensity-score matching method together with the explanatory variables. The various propensity score model is stock-financed acquisitions, unmatched SEOs, full optimal matching, 1-nearest, and 10-nearest neighbors. It is important to compare the difference in various models and the effectiveness of reducing the difference between these variables. The desired outcome is for the p-value to be large statistically insignificant, which indicates that the treatment and control sample characteristics are similar.

Starting with the unmatched SEO, most variables show a p-value at 0.000, except for RUNUP (0.003), LEVERAGE (0.003), and CF/EQ (0.037), meaning most variables are very different for treatment (equity-financed acquirers) and control (SEO issuers). Across all the models, the

evidence shows a great reduction in magnitude differences for most variables – LNMARCAP, BEME, RUNUP, SIGMA, RELSIZE, CASHHOLD and PROPENSITY SCORE. The full-optimal matching seems to provide the best improvement, large and positive change, which allows for the greatest minimizing of absolute standardized mean difference (refer Appendix 7.2). For example, the RUNUP variable achieved a reduction of 90.9% for full-optimal matching compared to 1-nearest (63.2%) or 10-nearest (2.1%). Similarly, SIGMA achieved a reduction of 63.7% in full-matching, 11.9% in 1-nearest, and a worsen -10.4% in 10-nearest matching. This is not surprising because full-optimal matching forces an "optimal" matching that provides the minimum absolute standardized mean difference, by catering to different control-treatment pairing across the sample. In other words, some treatments might be paired with one-nearest and some others might be paired with 2-nearest to achieve the greatest result. One-nearest matching also manages to reduce the difference to an extent (range: 11.9% to 63.2%), however, the p-value does not show a significant difference between treatment and control. 10-nearest matching performed the worst with most of the variables increase in absolute standardized mean difference (negative % change) and the p-value significance is rather unchanged from unmatched SEO.

The average propensity score of full-optimal matching is almost the same as stock-financed M&A, with the p-value almost reaching 1, meaning the treatment and control are almost identical. One-nearest and 10-nearest however do not show convincing p-value to argue for a successful match. Overall, these diagnostics demonstrate that the full-optimal matching is the best propensity-score matching technique, followed by 1-nearest.

Table IV. Cross-sectional OLS regression of ICARs, probit regression of equity issuance choice, and variable matching diagnostic

The first column in Panel A shows the estimation results of a cross-sectional OLS regression of issuer CAR (ICAR) on issuer and offer characteristics common to both seasoned equity issuers and stock acquirers (Specification (1)). The second column in Panel A shows the probit regression results of choosing between issuing stock via a stock-financed acquisition and an SEO using the same explanatory variables (Specification (2)). All variables are defined in Appendix 7.1. Symbols ***, **, and * denote statistical significance at the 0%, 1%, and 5% level, respectively. N_{SEO} denotes the number of observations for SEO ICAR. $N_{SEO+M\&A,\ stock}$ denotes the number of observations for SEO ICAR and stock-financed M&A ACAR.

Panel B presents matching diagnostics for the propensity-score matching methodology. % |Diff| is the absolute difference in means for stock acquirers and SEO firms, as percentage of the former. % Δ |Diff| is the achieved percentage reduction in the absolute difference in means for stock-acquirers and SEO firms resulting from matching (negative values indicate increases in differences). The p-values for the differences in means for the two samples are also presented.

Panel A: Estimation results	ICAR (1)	STOCK DEAL/SEO (2)
Intercept	0.001	-30.034
	(0.913)	*(0.975)*
LMNARCAP	0.000	0.786 ***
	(0.923)	*(0.000)*
BEME	-0.001	0.553 **
	(0.551)	*(0.009)*
RUN-UP	1.001 ***	2.011 ***
	(0.000)	*(0.000)*
SIGMA	-0.044	-3.610
	(0.358)	*(0.544)*
RELSIZE	0.000	-0.444
	(0.945)	*(0.223)*
LEVERAGE	0.000	2.730 ***
	(0.970)	*(0.000)*
CASHHOLD	0.002	2.037 ***
	(0.562)	*(0.000)*
CF/EQ	0.011 *	3.276 ***
	(0.015)	*(0.000)*
OPERPERF	0.000	-0.796 *
	(0.864)	*(0.019)*
Year FE	Yes	Yes
Industry FE	Yes	Yes
$N_{SEO;}\ N_{SEO+M\&A,\ stock}$	1092	1855
R2 (Adjusted R2) [Pseudo R2]	0.974 (0.972)	[0.393]

Panel B: Matching diagnostics		Stock-financed M&As	Unmatched SEOs	Full Optimal	1 Nearest	10 Nearest
LMNARCAP	Mean	13.575	12.144	13.441	12.552	12.121
	%|Diff|		10.5%	1.0%	7.5%	10.7%
	%Δ|Diff|		.	90.6%	28.5%	-1.7%
	p-Value		0.000	0.095	0.000	0.000
BEME	Mean	0.289	0.358	0.358	0.343	0.365
	%|Diff|		-23.8%	-23.8%	-18.7%	-26.4%
	%Δ|Diff|		.	91.4%	13.2%	-7.0%
	p-Value		0.000	0.523	0.000	0.000
RUN-UP	Mean	-0.006	-0.022	-0.004	-0.012	-0.022
	%|Diff|		-293.9%	27.7%	-108.2%	-288.2%
	%Δ|Diff|		.	90.9%	63.2%	2.1%
	p-Value		0.003	0.785	0.302	0.004
SIGMA	Mean	0.044	0.038	0.046	0.039	0.038
	%|Diff|		12.8%	-4.6%	11.2%	14.1%
	%Δ|Diff|		.	63.7%	11.9%	-10.4%
	p-Value		0.000	0.030	0.000	0.000
RELSIZE	Mean	0.166	0.241	0.169	0.207	0.239
	%|Diff|		-45.6%	-1.8%	-25.1%	-44.4%
	%Δ|Diff|		.	96.1%	45.0%	2.5%
	p-Value		0.000	0.750	0.000	0.000
LEVERAGE	Mean	0.215	0.188	0.272	0.194	0.186
	%|Diff|		12.5%	-26.3%	10.1%	13.4%
	%Δ|Diff|		.	-110.2%	19.3%	-7.3%
	p-Value		0.003	0.000	0.035	0.001
CASHHOLD	Mean	0.388	0.269	0.391	0.317	0.267
	%|Diff|		30.7%	-0.9%	18.3%	31.1%
	%Δ|Diff|		.	97.1%	40.3%	-1.3%
	p-Value		0.000	0.797	0.000	0.000
CF/EQ	Mean	0.058	0.036	0.016	0.039	0.038
	%|Diff|		38.4%	72.7%	32.8%	34.3%
	%Δ|Diff|		.	-89.1%	14.6%	10.6%
	p-Value		0.037	0.000	0.078	0.060
OPERPERF	Mean	-0.038	0.046	-0.274	0.020	0.051
	%|Diff|		220.6%	-621.2%	153.4%	233.6%
	%Δ|Diff|		.	-181.7%	30.4%	-5.9%
	p-Value		0.000	0.000	0.005	0.000
PROPENSITY SCORE	Mean	0.590	0.287	0.590	0.366	0.273
	%|Diff|		51.4%	0.0%	37.9%	53.8%
	%Δ|Diff|		.	100.0%	26.2%	-4.6%
	p-Value		0.000	0.992	0.000	0.000

4.2 "Pure" takeover returns

With the use of implied equity financing returns (HCAR), the pure-takeover returns ($PCAR_{stock}$) of stock-financed acquisitions can be found. This $PCAR_{stock}$ is derived by removing (subtracting) HCAR from $ACAR_{stock}$, essentially separating the announcement effect of equity financing. For cash-financed acquisitions, this is not necessary because it is assumed that $ACAR_{cash}$ is equivalent to $PCAR_{cash}$.

From Table V, the average $PCAR_{stock}$ are -0.02%, -0.32%, 0.39%, and -0.18% for linear prediction, full-matching, 1-nearest, and 10-nearest neighbor respectively. None of this is statistically significant, hence there lacks evidence that stock-financed acquisitions are consistently value-destructive investments. Looking at statistically significant results for cash acquisitions, it can be

concluded that cash acquisitions create a relatively high value (1.54%) for the firm. Naturally, the paper is also interested in the disparity between pure-takeover returns of cash and stock deals. There is a significant difference (p-value < 0.000) between cash and stock deal for most of the model except for the linear prediction model. The differences of 2.11%, 1.86%, 1.93%, and 1.72% for conventional, full-optimal, one-nearest, and 10-nearest neighbors are all significantly different from zero, hence the paper finds a systematic difference between cash and stock deal, providing the first support for Jensen's hypothesis (2005).

Table V. Comparisons of ACARs, HCARs, and PCARs
The table shows the univariate comparisons of mean ACARs, HCARs, and PCARs. All variables are defined in Appendix 7.1. The different columns present five types of cumulative abnormal returns (CAR from the market model). The ACAR and PCAR for cash acquisitions reported are unchanged. For conventional ACAR, stock acquirer's CARs are not adjusted for financing effect. For linear PCAR, the HCAR financing effects are hypothetical CARs generated from a regression between SEO ICAR and firm characteristics (Equation 3). For the one-nearest and 10-nearest models, the HCAR financing effects are based on the one or ten-matched SEO ICAR. For full-optimal CAR, the HCAR financing effect is based on the n-matched SEO ICAR, individually customized n to minimize the absolute standardized mean difference (Appendix 7.2). Numbers in parentheses are p-values (significance tests are two-tailed). N denotes the number of observations for all deals, cash deals and stock deals.

	Conventional	Linear		Full Optimal		1 nearest		10 nearest	
	ACAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR
All (1)									
Mean	0.67%	-0.55%	1.22%	-0.24%	0.92%	-0.18%	0.85%	-0.39%	1.06%
	0.538	0.280	0.000	0.657	0.000	0.265	0.000	0.304	0.000
$N_{M\&A, all}$	1853	1853	1853	1853	1853	1853	1853	1853	1853
Cash (2)									
Mean	1.54%	.	1.54%	.	1.54%	.	1.54%	.	1.54%
	0.000	.	0.000	.	0.000	.	0.000	.	0.000
$N_{M\&A, cash}$	1093	.	1093	.	1093	.	1093	.	1093
Stock (3)									
Mean	-0.57%	-0.55%	-0.02%	-0.24%	-0.32%	-0.18%	-0.39%	-0.39%	-0.18%
	0.241	0.280	0.811	0.657	0.133	0.265	0.988	0.304	0.718
$N_{M\&A, stock}$	760	760	760	760	760	760	760	760	760
Difference (2) - (3)									
Mean	2.11%	.	1.56%	.	1.86%	.	1.93%	.	1.72%
	0.000	.	0.291	.	0.000	.	0.000	.	0.000

A multi-variate regression is also important because this difference could be explained by acquirer or deal characteristics like firm size and deal attitude, apart from the different methods of payment. In that case, the paper could incorrectly conclude the presence of Jensen's overvalued equity agency cost due to method of stock payment. In Table VI, the $PCAR_{all}$ is regressed against the method of payment variable (STOCK) and other acquirer and deal-specific characteristics. The variables taken into account are similar to the acquirer/issuer variables in Table IV, with an addition of deal characteristics – TENDER (Jensen and Ruback, 1983), HOSTILE (Servaes, 1991),

and MULTIBID (James and Wier, 1987). All these are further defined in Appendix 7.1. The regression is also estimated with year and industry fixed effects.

Table VI. Cross-sectional regressions of PCARs and ACARs
The table presents the results of cross-sectional regression analysis of PCARs and ACARs. PCARs are pure takeover abnormal returns, adjusted for financing effects (Equation 4). ACARs are raw announcement effects post-M&A. All variables are defined in Appendix 7.1. The p-values are reported with symbols ***, **, and * denote statistical significance at the 0%, 1%, and 5% level, respectively. N denotes the number of observations for cash and stock-financed M&A. Year and industry fixed effects (coefficients suppressed) are based on calendar year and Fama-French 48 industry classification dummies.
The different columns present five types of cumulative abnormal returns (CAR from the market model). The CARs for cash acquisitions reported are the same across all columns. For conventional ACAR, stock acquirer's CARs are not adjusted for financing effect. For linear PCAR, the financing effects are hypothetical CARs generated from a regression between SEO ICAR and firm characteristics (Equation 3). For the one-nearest and 10-nearest models, the financing effects are based on the one or ten-matched SEO ICAR. For full-optimal CAR, the financing effect is based on the n-matched SEO ICAR, individually customized n to minimize the absolute standardized mean difference (Appendix 7.2).

	Coventional ACAR	Linear PCAR	Full Optimal PCAR	1 nearest PCAR	10 nearest PCAR
STOCK	0.001	-0.007	-0.009 *	0.006	0.008 ***
	(0.563)	*(0.074)*	*(0.012)*	*(0.127)*	*(0.000)*
LMNARCAP	0.000	0.002	0.001	-0.005 ***	-0.002 ***
	(0.194)	*(0.139)*	*(0.333)*	*(0.000)*	*(0.000)*
BEME	0.004 **	0.003	0.000	0.009	0.003
	(0.001)	*(0.573)*	*(0.933)*	*(0.082)*	*(0.086)*
RUN-UP	1.004 ***	0.449 ***	0.451 ***	0.994 ***	0.999 ***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
SIGMA	0.025	0.486 ***	0.433 ***	-0.020	-0.002
	(0.533)	*(0.000)*	*(0.000)*	*(0.889)*	*(0.968)*
RELSIZE	0.002	0.009 *	0.008 *	-0.003	0.002
	(0.137)	*(0.016)*	*(0.027)*	*(0.497)*	*(0.301)*
TENDER	-0.001	0.004	0.005	-0.003	0.000
	(0.635)	*(0.533)*	*(0.426)*	*(0.729)*	*(0.953)*
HOSTILE	-0.002	0.023	0.021	0.007	0.004
	(0.911)	*(0.713)*	*(0.719)*	*(0.912)*	*(0.866)*
MULTIBID	0.008	-0.015	-0.021	0.023	0.006
	(0.184)	*(0.461)*	*(0.294)*	*(0.297)*	*(0.469)*
LEVERAGE	0.001	-0.011	-0.011	0.005	-0.004
	(0.843)	*(0.378)*	*(0.384)*	*(0.702)*	*(0.463)*
CASH HOLD	0.001	-0.007	-0.006	-0.001	-0.007 *
	(0.790)	*(0.342)*	*(0.387)*	*(0.913)*	*(0.019)*
CF/EQ	-0.001	-0.003	-0.002	-0.005	-0.003
	(0.616)	*(0.441)*	*(0.636)*	*(0.242)*	*(0.050)*
OPERPERF	-0.001	0.020 *	0.021 **	0.008	0.007
	(0.735)	*(0.061)*	*(0.043)*	*(0.478)*	*(0.104)*
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
$N_{M\&A, all}$	1853	1853	1853	1853	1853
R2 (Adjusted R2)	0.978 (0.977)	0.475 (0.451)	0.492 (0.469)	0.768 (0.758)	0.956 (0.954)

Across the four models, there is a mix of negative and positive STOCK coefficients, similar to the results by reference paper – Golubov et al. (2015), however inconsistent with Jensen's hypothesis that post-IPO stock-financed acquisitions destroy more value than post-IPO cash-financed acquisitions. The latter analysis shows only a significance at a 5% level of significance for the full-optimal model, however, indicates that the method of payment does not significantly explain the

$PCAR_{all}$, apart from other firms and deal characteristics. The variable RUNUP appears to be consistently large, positive and statistically significant at <0.001% level as an explanatory variable for $PCAR_{all}$. This is inconsistent with the research by Celikyurt et. al. (2010) and Purnanandam and Swaminathan (2004), however, this finding points towards the counterargument of Jensen's hypothesis, in which, the merger momentum is shown rewarding enthusiastic managers who are driven to find positive investments instead.

In order to test for the recency of IPO firms, the paper also repeated the analysis for a post-one year and three years M&As (Appendix 7.3 – Table VII, VIII, IX, X). The $PCAR_{stock}$ for three years are respectively -0.09%, -0.65%, -0.69% and -0.70%. The $PCAR_{stock}$ for one-year are respectively 0.1%, -0.28%, -0.91% and -0.19%. There seems to be no apparent trend for the PCAR across the years either. Only the three years univariate comparison for $PCAR_{stock}$ shows a consistent negative PCAR pattern across all models. For the multivariate regression, few indicate a significant result and most have small magnitudes.

In conclusion, similar to Golubov et al. (2015), this paper provides limited evidence to conclude that the method of payment explains the cross-section of recent-IPO acquirer's returns, assuming that this sample is more susceptible to Jensen's overvalued equity agency cost. Even with the removal of implied equity price effects and other determinants of acquirer returns, there is little significant evidence pointing to stock-financed acquisitions being a negative NPV investment decision.

Alternative corporate governance theory further suggests that post-IPO stock-financed acquisitions are subjected to stringent public market rules and pressures, hence leaving little room for value-destructive motives to take place (Jensen and Meckling, 1976; Grossman and Hart, 1988; Zingales, 1995). The effect is especially positive for post-IPO firms with relatively higher institutional holdings, which creates another checkpoint for any potential misuse of equity investments (Anderson and Huang, 2016). For now, this might sufficiently reconcile the disparity between overvalued equity motivation and the lack of evidence for value-destructive investments.

5. Conclusion

Is the motivation to engage in a post-IPO stock-financed acquisition a value-destructive decision, especially given the abundance of cash and favorable financing position? Apart from the desire to answer this question, this paper primarily aims to identify and to deter against any potential value-

destructive decisions, such as described by Jensen (2005) – first being enticed by the abundance and availability of cheap and overvalued equity, then engaging in "excessive internal spending" and "risky negative net present value investments", and eventually turning to various fraudulent practices such as "accounting manipulation to continue the appearance of growth and value creation". This paper referenced closely the research by Golubov, Petmezas, and Travlos (2015), with the expectation of finding greater presence of Jensen's overvalued equity hypothesis, induced by overconfidence and post-IPO enthusiasm (Brau, Couch and Sutton, 2012).

This paper uses a targeted sample of recent post-IPO M&A rather than a broad M&A sample. The paper also employs the methodology by Golubov, Petmezas, and Travlos (2015) – a linear prediction and various propensity matching methods to isolate the equity financing effect from the stock-financed announcement effect. These methods critically assess the true value effect found in takeover announcements.

Following univariate and multivariate analysis, similar to the results by Golubov et al. (2015), there is no evidence to conclude for the presence of overvalued equity agency costs. This means that under tempting conditions of using cheap equity to justify high valuations, overconfident post-IPO managers are not shown to pursue negative net present value investments. Even with the analysis of post-one-year and three-year data, there is no evidence to conclude otherwise. It is possible that a stringent public market regulation landscape and institutional holdings discourage any potential motivation to engage in value-destructive investments.

5.1 Limitations and potential future research

Several limitations in this paper could affect the results presented in this paper. In no particular rank of priority, the main limitations are (i) the insufficient SEO sample to perform a 10 nearest-neighbor matching, (ii) the potential difference between characteristics of mature SEO sample and recent-SEO sample affecting HCAR, and (iii) the potential influence of third joint effect from a lingering recent IPO announcement effect.

The 10-nearest neighbor matching (without replacement) require a sample greater than 1,092 SEO. When the matching conducted is "with replacement", the control group selected is recycled and matched more than once, which potentially overweight a given HCAR, affecting the $PCAR_{stock}$ results in this paper.

In this paper, the SEO sample is indifferent of whether the firm performs an SEO within the year of IPO or the next n-years post-IPO. The differences in underpricing, size, volatility and run-up prices can affect the probit model in Table IV, as well as the subsequent estimation for HCAR and $PCAR_{stock}$ (Intintoli, Jagadeesh, and Kahle, 2013; Jegadeesh, Weinstein, and Welch, 1993). Therefore, future research can use different SEO samples based on n-years post-IPO to perform matching with the treatment group.

By considering a third effect – $HCAR_{IPO}$, future research can also draw more critical conclusions regarding Jensen's agency effect. Since many IPO-related research show evidences of lingering long-term performance post-IPO (Ibbotson, 1975; Aggarwal & Rivoli, 1990), future research should consider the presence and if necessary, the removal of any lingering IPO announcement effect.

Given the argument for opportunistic overvaluation tendencies by recent-IPO firms, future research could include related variables, such as VC-backed, high-tech dummy variable and other underpricing metrics, directly analyzing the relationship of overconfidence and PCAR. Lastly, to reconcile the lack of evidence in this paper, future research can examine the level of institutional holdings and degree of stringent regulations, following the research by Jensen and Meckling (1976), Grossman and Hart (1988) and Anderson and Huang (2016). The expected hypothesis for these tests would be higher institutional holdings and stricter regulations resulting in higher value-driven post-IPO stock acquisitions.

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7. Appendix

7.1 Variable descriptions

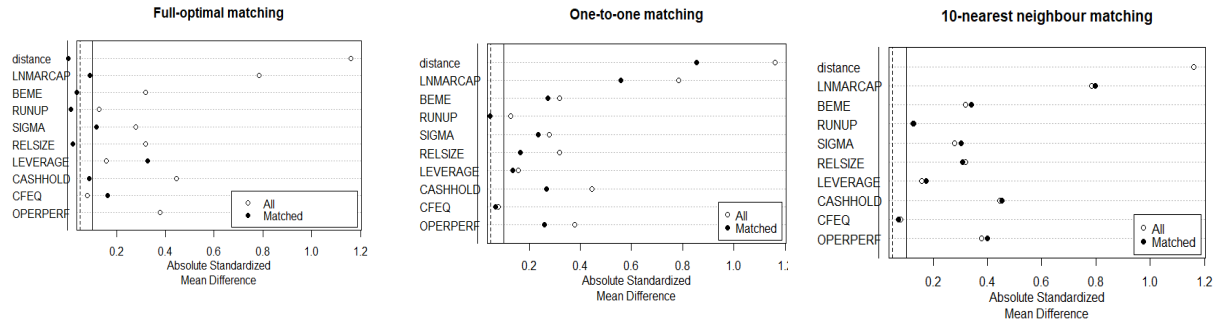
Most variables descriptions follow closely the definitions by Golubov, Petmezas and Travlos (2015).

Variable	Definition
Panel A: Dependent variables and the method of payment	
ICAR	Cumulative abnormal return of the IPO issuer in the 5-day event window (-2, +2) centered on the announcement (filing) day reported by Thomson Financial SDC. The expected returns are from a market model with the parameters estimated over 200 trading days ending 41 days prior to the announcement. The market return is proxied by CRSP value-weighted index return.
HCAR	Hypothetical stock price reaction in an event of an IPO by the stock acquirer calculated as a linear prediction (obtained by multiplying the stock acquirer characteristics by the coefficient estimates from a regression of ICAR on the corresponding issuer characteristics) or as returns of propensity-score matched IPO issuers.
ACAR	Cumulative abnormal return of the acquiring firm in the 5-day event window (-2, +2) centered on the announcement day reported by Thomson Financial SDC. The expected returns are from a market model with the parameters estimated over 200 trading days ending 41 days prior to the announcement. The market return is proxied by CRSP value-weighted index return.
PCAR	ACAR - HCAR when the acquisition is stock-financed (STOCK = 1), ACAR when the acquisitions is cash-financed (STOCK = 0).
STOCK	Indicator variable: 1 for deals where consideration is 100% stock, 0 for deals where consideration is 100% cash, as reported by Thomson Financial SDC.
Panel B: Acquirer/issuer characteristics	
MARCAP	Market capitalization 4 weeks prior to the acquisition/issue announcement from CRSP (in $ mil. inflation adjusted to 2009 using the US GDP deflator).
BEME	Book value of equity divided by market value of equity (shares outstanding times the closing price) at the fiscal year-end immediately prior to the announcement, all numbers are from Compustat.
RUN-UP	Buy-and-hold excess (market-adjusted) return of the firm's common stock over the period starting 205 days and ending 6 days prior to the announcement date from CRSP.
SIGMA	Idiosyncratic volatility of the firm's common stock measured as the standard deviation of daily excess (market-adjusted) returns from WRDS Beta Suite over the period starting 205 and ending 6 days before the announcement.

LEVERAGE	Total financial debt (long-term debt plus debt in current liabilities) divided by the book value of total assets for the fiscal year prior to acquisition announcement from Compustat.
CF/EQ	Income before extraordinary items plus depreciation minus dividends on common and preferred stock divided by the number of shares outstanding times the closing stock price at the fiscal year-end immediately prior to the announcement from Compustat.
CASH HOLD	Cash and cash equivalents divided by the book value of total assets for the fiscal year-end immediately prior to the announcement from Compustat.
OPER PERFORM	Operating income before depreciation divided by the book value of total assets for the fiscal year-end immediately prior to the announcement from Compustat.
Panel C: Deal/issue characteristics	
DEAL VALUE	Value of the deal/issue as reported by Thomson Financial SDC (in $ mil. inflation-adjusted to 2009 using the US GDP deflator).
RELSIZE	Value of the deal/issue from Thomson Financial SDC divided by the acquirer/issuer market value of equity 4 weeks prior to the announcement from CRSP.
HOSTILE	Indicator variable: 1 for deals labeled as "hostile" or "unsolicited" by Thomson Financial SDC, 0 otherwise
TENDER	Indicator variable: 1 for tender offers identified as such by Thomson Financial SDC, 0 otherwise.
MULTIBID	Indicator variable: 1 for deals involving competing bidders as reported by Thomson Financial SDC, 0 otherwise.
COMBINED	Indicator variable: 1 for equity offers which include secondary shares as reported by Thomson Financial SDC, 0 otherwise.

7.2 Propensity score matching

Figure I. Absolute Standardized Mean Difference for full-optimal, 1-nearest, and 10-nearest neighbor matching.



7.3 Other specifications and tests

Table VII. Comparisons of ACARs, HCARs, and PCARs for 317 M&As conducted within one-year of IPO.

The table shows the univariate comparisons of mean ACARs, HCARs, and PCARs. All variables are defined in Appendix 7.1. The different columns present five types of cumulative abnormal returns (CAR from the market model). The ACAR and PCAR for cash acquisitions reported are unchanged. For conventional ACAR, stock acquirer's CARs are not adjusted for financing effect. For linear PCAR, the HCAR financing effects are hypothetical CARs generated from a regression between SEO ICAR and firm characteristics (Equation 3). For the one-nearest and 10-nearest models, the HCAR financing effects are based on the one or ten-matched SEO ICAR. For full-optimal CAR, the HCAR financing effect is based on the n-matched SEO ICAR, individually customized n to minimize the absolute standardized mean difference (Appendix 7.2). Numbers in parentheses are p-values (significance tests are two-tailed). N denotes the number of observations for all deals, cash deals and stock deals.

	Conventional	Linear		Full Optimal		1 nearest		10 nearest	
	ACAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR
All (1)									
Mean	1.68%	0.07%	1.61%	0.44%	1.24%	1.07%	0.61%	0.35%	1.33%
	0.014	0.958	0.000	0.730	0.001	0.954	0.000	0.839	0.000
$N_{M\&A, all}$	317	317	317	317	317	317	317	317	317
Cash (2)									
Mean	2.76%	.	2.76%	.	2.76%	.	2.76%	.	2.76%
	0.000	.	0.000	.	0.000	.	0.000	.	0.000
$N_{M\&A, cash}$	185	.	185	.	185	.	185	.	185
Stock (3)									
Mean	0.16%	0.07%	0.10%	0.44%	-0.28%	1.07%	-0.91%	0.35%	-0.19%
	0.899	0.958	0.660	0.730	0.710	0.954	0.676	0.839	0.620
$N_{M\&A, stock}$	132	132	132	132	132	132	132	132	132
Difference (2) - (3)									
Mean	2.60%	.	2.67%	.	3.04%	.	3.67%	.	2.95%
	0.077	.	0.959	.	0.728	.	0.955	.	0.837

Table VIII. Cross-sectional regressions of PCARs and ACARs for 317 M&As conducted within one-year of IPO.

The table presents the results of cross-sectional regression analysis of PCARs and ACARs. PCARs are pure takeover abnormal returns, adjusted for financing effects (Equation 4). ACARs are raw announcement effects post-M&A. All variables are defined in Appendix 7.1. The p-values are reported with symbols ***, **, and * denote statistical significance at the 0%, 1%, and 5% level, respectively. N denotes the number of observations for cash and stock-financed M&A. Year and industry fixed effects (coefficients suppressed) are based on calendar year and Fama-French 48 industry classification dummies.

	Coventional	Linear	Full Optimal	1 nearest	10 nearest
	ACAR	PCAR	PCAR	PCAR	PCAR
STOCK	-0.003	-0.028 *	-0.027 **	-0.007	-0.005
	(0.452)	*(0.012)*	*(0.005)*	*(0.524)*	*(0.195)*
LMNARCAP	0.001	0.004	0.003	-0.004	0.001
	(0.576)	*(0.252)*	*(0.369)*	*(0.212)*	*(0.616)*
BEME	0.000	-0.012	-0.005	0.004	0.004
	(0.946)	*(0.606)*	*(0.805)*	*(0.846)*	*(0.577)*
RUN-UP	0.999 ***	0.378 ***	0.389 ***	1.008 ***	0.978 ***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
SIGMA	-0.186	0.623	0.704 *	-0.707	-0.155
	(0.106)	*(0.102)*	*(0.039)*	*(0.056)*	*(0.245)*
RELSIZE	0.002	0.002	-0.001	0.005	0.001
	(0.590)	*(0.867)*	*(0.895)*	*(0.607)*	*(0.675)*
TENDER	-0.002	0.002	0.032	0.004	0.002
	(0.808)	*(0.929)*	*(0.121)*	*(0.842)*	*(0.853)*
HOSTILE	-0.001	0.025	-0.007	0.018	0.001
	(0.965)	*(0.723)*	*(0.908)*	*(0.802)*	*(0.962)*
MULTIBID	0.004	-0.054	-0.088	0.045	-0.006
	(0.854)	*(0.474)*	*(0.175)*	*(0.525)*	*(0.818)*
LEVERAGE	0.029 *	0.058	0.031	0.118 **	0.034 *
	(0.021)	*(0.157)*	*(0.386)*	*(0.002)*	*(0.015)*
CASH HOLD	0.006	-0.008	-0.011	-0.021	0.004
	(0.300)	*(0.673)*	*(0.514)*	*(0.247)*	*(0.491)*
CF/EQ	0.005	0.010	0.004	0.002	0.004
	(0.106)	*(0.364)*	*(0.670)*	*(0.856)*	*(0.233)*
OPERPERF	-0.001	-0.022	-0.028	-0.070 *	-0.006
	(0.939)	*(0.462)*	*(0.294)*	*(0.014)*	*(0.550)*
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
$N_{M\&A,\ all}$	317	317	317	317	317
R2 (Adjusted R2)	0.981 (0.976)	0.516 (0.384)	0.483 (0.420)	0.809 (0.786)	0.967 (0.963)

Table IX. Comparisons of ACARs, HCARs, and PCARs for 1,242 M&As conducted within three-year of IPO.

The table shows the univariate comparisons of mean ACARs, HCARs, and PCARs. All variables are defined in Appendix 7.1. The different columns present five types of cumulative abnormal returns (CAR from the market model). The ACAR and PCAR for cash acquisitions reported are unchanged. For conventional ACAR, stock acquirer's CARs are not adjusted for financing effect. For linear PCAR, the HCAR financing effects are hypothetical CARs generated from a regression between SEO ICAR and firm characteristics (Equation 3). For the one-nearest and 10-nearest models, the HCAR financing effects are based on the one or ten-matched SEO ICAR. For full-optimal CAR, the HCAR financing effect is based on the n-matched SEO ICAR, individually customized n to minimize the absolute standardized mean difference (Appendix 7.2). Numbers in parentheses are p-values (significance tests are two-tailed). N denotes the number of observations for all deals, cash deals and stock deals.

	Conventional	Linear		Full Optimal		1 nearest		10 nearest	
	ACAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR	HCAR	PCAR
All (1)									
Mean	0.50%	-0.69%	1.19%	-0.13%	0.63%	-0.09%	0.59%	-0.08%	0.58%
	0.143	0.239	0.000	0.246	0.000	0.274	0.000	0.281	0.000
$N_{M\&A, all}$	1242	1242	1242	1242	1242	1242	1242	1242	1242
Cash (2)									
Mean	1.51%	.	1.51%	.	1.51%	.	1.51%	.	1.51%
	0.000	.	0.000	.	0.000	.	0.000	.	0.000
$N_{M\&A, cash}$	693	.	693	.	693	.	693	.	693
Stock (3)									
Mean	-0.78%	-0.69%	-0.09%	-0.13%	-0.65%	-0.09%	-0.69%	-0.08%	-0.70%
	0.189	0.239	0.406	0.246	0.121	0.274	0.100	0.281	0.096
$N_{M\&A, stock}$	549	549	549	549	549	549	549	549	549
Difference (2) - (3)									
Mean	2.30%	.	1.60%	.	2.17%	.	2.21%	.	2.22%
	0.001	.	0.252	.	0.000	.	0.000	.	0.000

Table X. Cross-sectional regressions of PCARs and ACARs for 1,242 M&As conducted within three-year of IPO.

The table presents the results of cross-sectional regression analysis of PCARs and ACARs. PCARs are pure takeover abnormal returns, adjusted for financing effects (Equation 4). ACARs are raw announcement effects post-M&A. All variables are defined in Appendix 7.1. The p-values are reported with symbols ***, **, and * denote statistical significance at the 0%, 1%, and 5% level, respectively. N denotes the number of observations for cash and stock-financed M&A. Year and industry fixed effects (coefficients suppressed) are based on calendar year and Fama-French 48 industry classification dummies.

	Coventional ACAR	Linear PCAR	Full Optimal PCAR	1 nearest PCAR	10 nearest PCAR
STOCK	0.000	-0.008	-0.007	0.012 *	0.022 ***
	(0.798)	*(0.096)*	*(0.121)*	*(0.032)*	*(0.000)*
LMNARCAP	0.000	0.002	0.002	0.007 ***	0.002 ***
	(0.752)	*(0.121)*	*(0.070)*	*(0.000)*	*(0.000)*
BEME	-0.005	0.008	0.031 ***	0.026 *	-0.005
	(0.133)	*(0.472)*	*(0.001)*	*(0.032)*	*(0.217)*
RUN-UP	1.008 ***	0.377 ***	0.395 ***	1.003 ***	1.022 ***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
SIGMA	0.077	0.525 **	0.446 **	0.044	0.103 **
	(0.145)	*(0.001)*	*(0.003)*	*(0.821)*	*(0.109)*
RELSIZE	0.002	0.006	0.005	-0.001	0.001
	(0.118)	*(0.154)*	*(0.264)*	*(0.857)*	*(0.653)*
TENDER	-0.002	0.007	0.015	-0.019	-0.003
	(0.599)	*(0.430)*	*(0.078)*	*(0.090)*	*(0.373)*
HOSTILE	-0.001	0.020	0.016	-0.003	-0.002
	(0.977)	*(0.744)*	*(0.791)*	*(0.973)*	*(0.943)*
MULTIBID	0.011	-0.022	-0.043 *	0.005	0.002
	(0.159)	*(0.350)*	*(0.049)*	*(0.849)*	*(0.861)*
LEVERAGE	0.000	0.000	0.003	0.024	0.002
	(0.975)	*(0.988)*	*(0.856)*	*(0.203)*	*(0.751)*
CASH HOLD	-0.002	-0.018	-0.014	0.008	-0.005
	(0.478)	*(0.056)*	*(0.089)*	*(0.438)*	*(0.163)*
CF/EQ	0.001	-0.003	-0.005	0.001	0.003
	(0.472)	*(0.519)*	*(0.305)*	*(0.807)*	*(0.097)*
OPERPERF	0.001	0.008	-0.003	-0.021	-0.017 **
	(0.758)	*(0.573)*	*(0.841)*	*(0.201)*	*(0.002)*
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
$N_{M\&A, all}$	1242	1242	1242	1242	1242
R2 (Adjusted R2)	0.975 (0.973)	0.428 (0.389)	0.419 (0.400)	0.713 (0.704)	0.959 (0.957)