Firm-level uncertainty and corporate events

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Abstract

This thesis aims to investigate the real effect of firm-level uncertainty on the outcomes of major corporate events, namely, corporate acquisitions and equity issuance. Uncertainty has long been an important topic in empirical finance, yet the majority of the research has focused on the effect of aggregated level of uncertainty, in other words, the market or at least the industry level. Few studies have considered how firm-level uncertainty affects corporate decisions regarding significant corporate events and the subsequent outcomes. Even fewer studies have examined the uncertainty inherent in tax variables. Using a sample over an extended period (1985-2017), this thesis investigates how firm-level uncertainty exerts real effects on corporate decisions as well as the associated impact on shareholder wealth.

Overall, this thesis finds that the acquirer's pre-announcement cash flow uncertainty and tax expense uncertainty are both related to a lower probability of initiating an acquisition, greater short-run abnormal financial return around the announcement, and elevated long-run post-acquisition operating performance. In addition, the secondary equity issuer's pre-issuance valuation uncertainty is negatively associated with the issuer's short-run abnormal gain and long-run post-issuance stock and operating performance.

The findings suggest that in the context of mergers and acquisitions, the precautionary motive triggered by firm-level uncertainty is crucial in determining the acquirer's takeover activity and subsequent performance. In terms of equity issuance, adverse selection is the main underlying determinant of seasoned equity offering under-pricing. Furthermore, the issuer's overpricing resolution of the new issues puzzle is supported.

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Declaration

No part of this thesis has been submitted elsewhere for any other degree or qualification in this or any other university. It is all the author's own work unless otherwise specified in the text.

Statement of copyright

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Gratitude to all.

Overview

Mergers and acquisitions (M&As) are among the most significant corporate events a firm may experience, and both the magnitude and number of such deals have increased dramatically over time. For instance, over the sample period of this thesis, the worldwide transaction value of M&A activity rose from $347.28 billion in 1985 to $3776.46 billion in 2017, and the corresponding number of transactions increased from 2,676 to 52,740[1]. In North America, the number of deals amounted to 18,628 by the end of 2017, with a total value of $1,931.18 billion. On the academic front, it is widely agreed that M&As create shareholder value, and most of the gain is reaped by the target company's shareholders (Jarrell *et al.* 1988; Andrade *et al.* 2001; Gupta & Gerchak 2002). For acquirers, the overall return is negative but non-significant and is driven by stock acquirers (Jensen & Ruback 1983). However, the underlying reasons for the occurrence of M&As are controversial. The mainstream economic theories provide explanations such as efficiency-related synergy creation, market power acquisition, removal of incompetent management through market discipline, and self-serving behaviour of the management reflecting agency costs (Andrade *et al.* 2001). More recently, behavioural explanations have emerged, such as market-timing theory, in which the acquirer's managers take advantage of overvalued stock to purchase hard assets at an effective discount (Shleifer & Vishny 2003); the acquirer's irrational

[1] Source: Institute for Mergers, Acquisitions and Alliances.

expansion through value-destroying acquisitions due to managers' hubris (Roll 1986) or narcissism (Aktas *et al.* 2016); and the target's reference point effect, which is anchored by the recent 52-week peak price (Baker *et al.* 2012). Further investigation is needed to identify factors explaining the variance, which is not accounted for by conventional determinants, in the acquirer's post-acquisition performance (King *et al.* 2004).

Equity offering, as a means of approaching external financing, is another critical corporate event for a firm. Although equity offerings account for a smaller part of the economy than M&As, they still have a significant impact. For example, there were 160 initial public offering (IPO) deals in the U.S. in 2017, raising $35.5 billion in proceeds for the issuers, following a recent peak in 2014 (275 IPOs raising $85.3 billion)[2]. In comparison with IPOs, seasoned equity offerings (SEOs) are more flexible for the issuers in practice and are more applicable in empirical research given greater data availability. For instance, SEOs of common stock are sold through a wider array of flotation methods than IPOs and enjoy an active secondary market where the current share price is available (Eckbo & Masulis 1995). Empirically, a number of issues remain undiscovered. The most prominent issue is probably the *new issues puzzle*, referring to the fact that the issuers of both IPOs and SEOs experience 44% lower returns in the 5-year period after the issuance than non-issuers matched by firm size (Loughran & Ritter 1995). Therefore, it further investigating the determinants of equity issuers'

[2] Source: Renaissance Capital 2019 Annual Review.

post-issuance performance is worthwhile.

This thesis aims to examine the relation between firm-level uncertainty and firm performance subsequent to a significant corporate event. In the context of M&As, this thesis serves as an extension to the literature on how uncertainty affects M&A activities and characteristics, albeit from the firm-level perspective. Specifically, the prior literature documents that market-wide uncertainty has a significant impact on total merger volumes involving public firms (Bhagwat *et al.* 2016) and merger waves (Duchin & Schmidt 2013), and industry-level operational uncertainty is related to the probability of the start of merger waves and vertical integration (Garfinkel & Hankins 2011). However, the previous studies have focused mainly on how general uncertainty affects M&A activities, namely, how market- and industry-level uncertainty have effects on macro-level M&A activities such as merger waves. The lack of a specific type of firm-level uncertainty calls for further investigation motivated by the need, mentioned above, to identify more undiscovered determinants of M&A characteristics, specifically, the acquirer's performance.

The question then becomes what firm-specific uncertainty should be selected to make the aforementioned idea applicable? As described in the behavioural finance literature, firms reserve cash for precautionary purposes (Keynes 1937) to fund future profitable investment projects or hedge against adverse cash flow situations. Furthermore, researchers have modelled and reported that uncertainty in operational cash flow (hereafter cash flow uncertainty) is positively related to the corporate cash reserve (Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009). Hence, this thesis chooses cash flow uncertainty as the specific uncertainty to study how firm-level uncertainty affects M&A characteristics after identifying the channel through which the relation between cash flow uncertainty and the acquirer's performance could possibly be reasonable. Specifically, as a mirror of firm idiosyncratic risk (Irvine & Pontiff 2008), greater cash flow uncertainty forces the acquirer's managers to accumulate more cash holdings due to precautionary motives, and the precautionary cash-rich acquirer invests more efficiently by undertaking only acquisition deals that are positively valued by the market (Gao & Mohamed 2018). Thus, the acquirer reaps higher announcement abnormal returns and increases shareholder value via the acquisition.

Consequently, Chapter 1 examines the direct relation between the acquirer's pre-announcement cash flow uncertainty and its acquisition performance by employing a sample consisting of 10,827 M&A deals in the U.S. over the period of 1985 to 2017. In Chapter 1, the major cash flow uncertainty measurement is the volatility of stock prices and stock returns, following previous studies (Bradley *et al.* 1998; Chay & Suh 2009). As a result, Chapter 1 finds that the probability of the acquirer initiating an acquisition in any given year is negatively related to its own cash flow uncertainty; the abnormal gain of the acquirer surrounding the announcement date is positively and significantly related to the acquirer's pre-announcement cash flow uncertainty; and the acquirer's long-run post-announcement operating performance is also positively associated with its cash flow uncertainty prior to the announcement. The results are robust to various alternative measures of cash flow uncertainty. The overall suggestion proposed by Chapter 1 is that more volatile cash flow makes the acquirer take more precautionary measures and invest more prudently and efficiently. As a result, such an acquirer chooses only value-enhancing acquisitions to increase shareholder value, and this choice is manifested through the following long-run elevated operating performance in comparison to their low cash flow uncertainty peers.

In addition, Chapter 1 examines the combined effect of cash flow uncertainty and the acquirer's cash reserve on the acquirer's abnormal gain, which is significantly negative at a very small magnitude, suggesting that the documented positive effect of cash flow uncertainty is offset by the corporate cash reserve per se. In conjuncture with the finding that the cash reserve per se has no negative effect (and even a statistically significant positive effect, though economically non-significant, in a number of model specifications) on the acquirer's shareholder wealth dynamics over the acquisition announcement, Chapter 1 suggests that while precautionary theory is supported as dominant in the context of the acquisition decision-making process, the competing theory, namely, the free cash flow hypothesis (Jensen 1986), is not rejected.

Since Chapter 1 confirms the argument that pre-event firm-level uncertainty does have a significant effect on corporate events from the aspect of M&As, Chapter 2 extends the examination to a different context, namely, equity offering. To make the formulation of pre-event uncertainty feasible, only seasoned equity offerings are considered due to the lack of any pre-issuance public data for initial public offering companies.

This thesis identifies three main opportunities yielded by studies of SEO. First, while most studies pertaining to the SEO short-run valuation effect report negative issuance returns, the majority of them explain the underlying course by aligning the observed negative return pattern with empirical predictions generated by various theories, among which adverse selection theory (Myers & Majluf 1984) and signalling theory (Leland & Pyle 1977) are the most widely supported. However, the SEO issuance return predictions of these two theories are the same since they are both based on the rationale that investors discount reservation price due to the belief that managers possess and exploit private information; hence, it is difficult to distinguish the two theories empirically. Second, although in terms of the *new issues puzzle*, it is widely accepted that SEO equity issuers underperform in the long term subsequent to the issuance (Loughran & Ritter 1995; Spiess & Affleck-Graves 1995), this underperformance relative to firms matched only by size has been criticized as merely a reflection of lower risk exposures brought by the equity offering (Eckbo *et al.* 2000), the greater investment undertaken by the issuers (Lyandres *et al.* 2008), or the issuer's hedge against aggregated market volatility (Barinov 2012). Third, some have argued that the long-run operating underperformance of the SEO issuer confirms the issuer's overvaluation at the time of issuance (Loughran & Ritter 1997). As a result, it faces the same matching-firm technical failure in controlling the risk exposure.

Consequently, this thesis argues that the issuer’s pre-issuance valuation uncertainty (hereafter *ex ante* uncertainty) serves as a proper and ideal instrument to respond to the aforementioned gaps in the literature for a number of reasons. First, the formation of *ex ante* uncertainty in this thesis (as well as in the previous literature) is based solely on public information, which means the signalling explanation is sidestepped since this thesis focuses only on how the investor behaves after analysing pre-issuance publicly available uncertainty. Second, following the framework of Beatty and Ritter (1986), uninformed investors can purchase the equity offering only when informed investors perceive it as overpriced (Rock 1986); hence, the uninformed investors face a ‘winner’s curse’ situation, and they would impose a discount on the equity offer price to justify it. This adverse selection problem is magnified by the valuation uncertainty (Beatty & Ritter 1986); therefore, the greater the *ex ante* uncertainty of the issuer, the lower the short-run issuance abnormal returns reaped by the issuer. Third, valuation uncertainty is consensually documented as the indicator of overvaluation in the asset pricing literature (Miller 1977; Mayshar 1983; Scheinkman & Xiong 2003); as a result, this thesis sheds new light on the SEO overvaluation hypothesis by exploring the relation between *ex ante* uncertainty and the issuer’s long-run post-announcement stock and operating performance while avoiding the employment of the potentially flawed matching-firm technique (Eckbo *et al.* 2000).

Therefore, Chapter 2 examines the relation between the SEO issuer's *ex ante* uncertainty and its various post-issuance performances based on a sample of 3,183 U.S. SEC-registered underwritten common stock secondary offerings over the period of 1985 to 2017. Chapter 2 measures *ex ante* uncertainty using a variety of proxies following prior studies (Ritter 1985; Masulis & Korwar 1986; Schwert 1989; Eckbo & Masulis 1992) and finds that the SEO issuer's *ex ante* uncertainty has a negative and statistically significant effect on the issuer's short-run announcement abnormal gains, long-run post-issuance stock performance, and long-run post-issuance operating performance. The results are robust to the alternative measurement periods of both short-run and long-run issuer performance. The findings of Chapter 2 lend support to the adverse selection explanation of the SEO short-run valuation effect (Leland & Pyle 1977), and the overvaluation explanation of the issuer's long-run post-announcement underperformance advanced in the *new issues puzzle* (Loughran & Ritter 1995).

Having confirmed that pre-event firm-level uncertainty has a significant effect on a firm's performance in two of the most influential corporate events, namely, M&As and equity offerings, the thesis then steps outside the restricted scope of pure empirical finance. To this end, Chapter 3 selects a special sub-field in finance, namely, financial tax research, which studies financial research questions by leveraging the comparative advantage of accounting studies, meaning the knowledge of financial accounting rules and the institutional details of financial reporting. Therefore, Chapter 3 is designed to study how the informational content implied in tax-related variables affects corporate decisions.

Specifically, since the main research subject of this thesis is firm-level uncertainty, Chapter 3 focuses on the relation between tax uncertainty and corporate events, which is argued to be appropriate since tax uncertainty per se is largely veiled even in the pure accounting literature, as is evident in the fact that no consensus definition of tax uncertainty even exists (Guenther *et al.* 2017; Hanlon *et al.* 2017; Saavedra 2019). Hence, even though research has examined how taxes affect real corporate decisions from a variety of perspectives (Dhaliwal *et al.* 1992; Mackie-Mason & Gordon 1997; Poterba 2004; Brown & Krull 2008), little attention has been paid to how tax uncertainty can affect firm value.

On the other hand, M&As are chosen as the proxy of corporate events in Chapter 3 for the following reasons. First, current M&A studies involving tax considerations all pertain to the target's shareholder tax conditions (Landsman & Shackelford 1995; Erickson 1998; Erickson & Wang 2007), and the effect of the acquirer's tax-related issues on acquisition outcomes remains undiscovered. Second, tax uncertainty is argued to reflect firm risk (Drake *et al.* 2019); thus, it is reasonable to expect the market to justify the acquirer's value for the risk it bears via abnormal returns surrounding the announcement. Third, from the perspective of behavioural finance, tax uncertainty triggers management's precautionary motive since it is inherently related to potential future cash outflows. A plausible channel through which tax uncertainty can affect acquisition outcomes is corporate cash reserves. High tax uncertainty makes the management perform more precautionary behaviour (Jacob *et al.* 2019) and reserve a high volume of cash in fear of future cash outflows due to tax charges (Hanlon *et al.* 2017), and the cash raised because of precautionary motives will be invested more carefully and prudently by selecting value-enhancing acquisitions (Gao & Mohamed 2018).

Consequently, Chapter 3 examines the relation between the acquirer's pre-announcement tax uncertainty and its performance through the acquisition process. The sample consists of 8,995 completed U.S. acquisition deals during the period from 1985 to 2017. The specific tax uncertainty measurement constructed in Chapter 3 is based on several income tax expense variables, which are argued to capture the management's earnings management capability. It is found that the probability of the acquirer initiating an acquisition in any given year is negatively associated with its tax uncertainty; the acquirer's abnormal returns over the announcement date are positively and significantly related to the acquirer's pre-announcement tax uncertainty; and the acquirer's long-run post-announcement operating performance is also positively associated with its tax uncertainty before the announcement. The results remain robust over different tax uncertainty measures. The conclusion of Chapter 3 is twofold. First, the acquirer is rewarded for taking greater risks (Hutchens & Rego 2015) or for bearing the opportunity cost of large capital expenditure (Jacob *et al.* 2019).

Second, the positive relation between the acquirer's gain and pre-announcement tax uncertainty represents the manager's precautionary consideration and active earnings management.

Overall, this thesis reports that in the context of M&As, both the acquirer's pre-announcement cash flow uncertainty and tax expense uncertainty are related to a reduced probability of engaging in an acquisition, greater abnormal gain surrounding an announcement, and better long-run post-acquisition operating performance; in the context of equity issuance, the secondary equity issuer's valuation uncertainty is negatively associated with the issuer's short-run abnormal gain and long-run post-issuance stock and operating performance.

This thesis makes a number of contributions to the existing literature. First and foremost, it fills a significant gap in the uncertainty literature by examining the effect of firm-level uncertainty on real corporate decisions. In contrast to prior studies, all three separate chapters document significant real effects of certain types of firm-level uncertainty on firm value and shareholder wealth in two different influential corporate events. Although it could be argued that the uncertainty and corporate events considered in this work are not exhaustive, it serves as a pioneering study by highlighting important informational content and the associated effects of firm-level uncertainties.

Second, the thesis makes contributions to the M&A literature. For instance, Chapter 1 finds evidence contradictory to the prevailing free cash flow hypothesis in acquisitions (Harford 1999), which is that a cash reserve does not destroy firm value through acquisitions. Furthermore, Chapter 3 studies the acquisitions outcome from a new perspective, namely, the tax position of the acquirer's shareholders. The results suggest that, similar to the target's tax condition, the acquirer's tax-related variable provides meaningful explanatory power in relation to acquisition outcomes. In addition, both chapters regarding M&As report that the acquirer's long-run post-announcement operating performance reacts to the respective uncertainty variables in the same direction as the short-run announcement returns do, implying that the market correctly re-values the acquiring firm since the positive abnormal returns surrounding the announcement are realized through the subsequent operating performance.

Third, this thesis also contributes to the equity offering literature. For example, this thesis supports an adverse selection (Leland & Pyle 1977) explanation for negative short-run issuance valuation. In addition, it supports the overvaluation explanation of the equity issuer's long-run underperformance by using *ex ante* uncertainty as an overvaluation indicator and hence sidesteps the potentially flawed matching-firm technique. Thus, to a certain extent, it provides an overvaluation resolution to the *new issues puzzle* (Loughran & Ritter 1995).

Fourth, from an elevated perspective, this thesis contributes to the field of behavioural finance, whose aim is to explain the demand for securities by leveraging psychological phenomena (Shleifer 2000). Current behavioural research in the context of M&As (Baker *et al.* 2012; Ma *et al.* 2019) focuses mainly (if not only) on the anchoring phenomenon (Tversky & Kahneman 1974), which is utilized in conjuncture with prospect theory (Tversky & Kahneman 1979), to explain acquisition outcomes. However, this thesis contributes to the behavioural research by documenting another psychological consideration that could significantly affect acquisition and equity offering outcomes, namely, the management reaction to *ex ante* uncertainty. In contrast to the anchoring effect, where managers or shareholders focus on a point benchmark (e.g., the 52-week peak price), the reaction to uncertainty documented in this thesis suggests that participants in the transaction also react to continuous indicators prior to the corporate event.

Fifth, more broadly, this thesis contributes to the literature regarding how people make decisions under uncertainty. Despite the difference from prospect theory (Tversky & Kahneman 1979), which takes a point anchor, whereas this thesis considers a continuous indicator, this thesis adds evidence to the argument that people make decisions when facing uncertainty by evaluating historical benchmarks *ex ante*. In contrast, theories competing with the prospect argument, such as regret theory (Bell 1982; Loomes & Sugden 1982, 1987) and disappointment theory (Bell 1985), suggest taking future benchmarks *ex post* when making decisions under uncertainty.

Finally, this thesis makes other contributions. For example, Chapter 3 answers the call for further investigation of the interaction of tax research by aligning accounting and applied economics (Gentry 2007; Shevlin 2007). Additionally, Chapter 2 updates precautionary theory studies by confirming the concept that cash flow uncertainty has a direct positive effect on corporate cash holdings (Opler *et al.* 1999; Bates *et al.* 2009). In addition, Chapter 3 reports that tax expense contains information that yields useful implications regarding firm value.

The remainder of this thesis is organized as follows: Chapter 1 studies the effect of the acquirer's pre-announcement cash flow uncertainty on the acquirer's acquisition characteristics; Chapter 2 examines how the equity issuer's pre-issuance valuation uncertainty affects issuance outcomes; and Chapter 3 investigates the role of the acquirer's pre-announcement tax expense uncertainty in determining the acquirer's performance. Finally, the general conclusion chapter presents the conclusions together with implications, limitations, and proposals for future studies.

Chapter 1

1.1. Introduction

Rooted in the asset pricing literature is a well-documented positive relation between the degree of uncertainty in opinions and the security price (Miller 1977; Mayshar 1983; Morris 1996). While this predicted relation is widely supported by the empirical evidence (Diether *et al.* 2002; Jones & Lamont 2002), in particular to the main interest of this chapter, it is manifested in the context of M&As. For example, a divergence of opinion about the acquirer's equity value is negatively related to the acquirer's return (Moeller *et al.* 2007), the target's information uncertainty is positively related to the bidder's gain (Li & Tong 2018), and opinion dispersion regarding the target's equity value leads to a higher takeover premium (Chatterjee *et al.* 2012). On the other hand, many researchers emphasize the important role played by market-wide uncertainty in determining acquisition characteristics (Asquith 1983; Duchin & Schmidt 2013; Bhagwat *et al.* 2016).

In terms of the impact of corporate cash holdings on acquisition outcomes, the prior literature mainly lends support to the free cash flow hypothesis in that a cash reserve causes problems in corporate investment activities. For example, Lang *et al.* (1991) document that the low Tobin's q bidder's return is negatively associated with its pre-announcement free cash flow, and consistent evidence is found for all cash deals for bidders facing poor investment opportunities (Schlingemann 2004). Using a more comprehensive sample, Harford (1999) confirms the negative relation between corporate cash holdings and announcement returns. Consistent evidence is also reported by Smith and Kim (1994) and Oler (2008). Other studies support the free cash flow hypothesis in terms of corporate cash reserves less directly. For example, entrenched managers (Harford *et al.* 2012) and managers of weakly governed firms (Harford 2005) are more likely to spend free cash flow inefficiently.

However, agency theory cannot fully explain why managers hold high cash reserves. Another explanation, namely, precautionary theory (Keynes 1937), posits that managers reserve cash in response to uncertainty in business operations. Empirically, Opler *et al.* (1999) develop the first fundamental framework for the determinants of corporate cash holdings and report that a cash reserve is positively related to the cash flow volatility that the firm experiences. By extending the model, Bates *et al.* (2009) provide consistent evidence. Other studies supporting the precautionary explanation of the cash reserve include Gao *et al.* (2013), Chen *et al.* (2015), and Almeida *et al.* (2004).

This chapter identifies the following opportunities in the literature. First, most studies regarding the impact of uncertainty on acquisition characteristics pertain to market-level uncertainty, and little attention has been paid to firm-level uncertainties. However, idiosyncratic risk can also have a significant effect on firm performance. Since cash flow uncertainty captures this firm-specific volatility (Irvine & Pontiff 2008) and the present value of deadweight costs of financial distress (Smith & Stulz 1985; Froot *et al.* 1993; Minton & Schrand 1999), it is a good proxy for studying the effect of a bidder's specific risk on its acquisition performance. Given the significant effect of firm-level cash flow uncertainty in determining the corporate cash reserve, which in turn has been documented as a significant factor in explaining the acquirer's announcement returns, this chapter directly tests whether the acquirer's cash flow uncertainty has a significant impact on the acquirer's announcement return.

Second, a debate has recently emerged regarding the effect of corporate cash reserves on acquisition outcomes (Gao & Mohamed 2018). According to the free cash flow hypothesis, the acquirer's cash reserve should have a negative effect on its announcement due to the agency cost; on the other hand, precautionary theory posits that managers perceiving high volatility in operating cash flow will be more careful and save more cash against adverse cash flow movement; consequently, they will invest the reserved cash more efficiently, implying a positive relation between the cash reserve and the announcement returns. Therefore, this study also studies the role played by the cash reserve in determining the bidder's announcement returns to distinguish the free cash flow hypothesis and precautionary hypothesis in the context of M&As.

This chapter focuses on three hypotheses concerning the acquirer's pre-announcement cash flow uncertainty effect on the likelihood of initiating an acquisition, acquisition characteristics in terms of the announcement returns, and long-term operating performance. In a comprehensive sample consisting of 10,827 U.S. deals from 1985 to 2017, announcement returns are evaluated by 3-day cumulative abnormal returns around the announcement against both short-run and long-run pre-announcement cash flow uncertainty. Operating performance is examined by three various measurements for each of the two cash flow risk proxies. The acquisition probability is studied by both logit and probit models.

The first hypothesis concerns the probability of initiating an acquisition and the acquirer's pre-announcement cash flow uncertainty. According to precautionary theory, firms experiencing high cash flow risk will be more careful and less likely to engage in acquisitions. The results support the hypothesis in that all coefficient estimates for long-term cash flow uncertainty proxies in the logit model are negative and significant at the 1% level, suggesting that firms with high cash flow volatility are less likely to initiate acquisitions, which is in line with the precautionary hypothesis. The results remain robust when the probit model is employed.

The second hypothesis is developed to directly test the impact of the acquirer's pre-announcement cash flow uncertainty on its announcement returns. Short-run preannouncement cash flow uncertainty is positively and significantly related to the acquirer's announcement returns. The estimated coefficients on four short-term cash flow uncertainty measurements range from 0.0015 to 0.0154 and are all significant at the 1% level. Furthermore, the cash reserve is also positively related to the acquirer’s announcement returns. These findings are in line with precautionary theory in that managers of firms experiencing high cash flow risk will invest more efficiently, as reflected in the positive announcement returns. In addition, the cash reserve itself does not destroy firm value through acquisitions. The results remain robust when cash flow uncertainty is measured by long-term proxies and after the interaction between cash flow uncertainty and the cash reserve is considered. Notably, the strength of the relation between pre-announcement cash flow uncertainty and the acquirer’s announcement returns is weakened when the cash reserve level is high, although it remains positive and significant, suggesting that there is still room for the free cash flow hypothesis since managers invest part of the cash holdings unwisely when they conduct value-enhancing acquisitions in aggregate. All the results remain solid after accounting for the potential endogeneity concern.

The third hypothesis concerns whether the effect of cash flow uncertainty on the announcement returns is manifested in long-term post-announcement operating performance. The results show that 12-month post-announcement operating performance is positively related to two measures of long-term cash flow uncertainty. The results are robust to three measurements of operating performance for each of the cash flow uncertainty proxies used, and the coefficient estimates of the dummy variable accounting for high cash flow uncertainty are all highly significant. In addition, the constant terms accounting for the abnormal operating performance subsequent to the announcement are all positive and significant at the 1% level, implying an increase in operating performance due to the acquisition. These findings further support the precautionary hypothesis, in conjunction with the results obtained for the first hypothesis, in that the positive announcement returns reaped by the acquirer facing high cash flow risk are manifested by enhanced operating performance in the long run.

This chapter contributes to and updates the literature mainly in the following ways. First, it directly tests the relation between firm-level uncertainty, namely, cash flow uncertainty, which has been ignored in the prior M&A literature, and acquisition returns. It has been documented that cash flow uncertainty has a significant and positive effect on the acquirer's announcement returns, which is also manifested by enhanced post-announcement operating performance in the long run. In addition, high pre-announcement cash flow risk significantly reduces a firm's probability of initiating acquisitions. Second, the results of this chapter contrast with the implication of the free cash flow hypothesis in the context of M&As. While the free cash flow hypothesis suggests that acquirers with high cash reserves earn negative announcement returns, this chapter's findings are in line with the precautionary hypothesis in that a high level of cash reserved in response to high cash flow risk allows the acquirer to earn positive announcement returns and at least does not destroy value through the acquisition. Finally, a by-product of the main finding is that the effect of free cash flow theory is not completely ruled out. Although the acquirer's high pre-announcement cash flow uncertainty significantly increases the announcement returns, and the corporate cash holdings do not decrease the shareholders' value in aggregate, the positive effect of pre-announcement cash flow uncertainty on the announcement returns is weakened by a high cash reserve, suggesting the existence, though not the dominance, of agency cost in acquisitions.

The remainder of this chapter is organized as follows. Section 2 reviews the literature on acquisition outcome, uncertainty, and corporate cash holdings. Section 3 highlights the literature opportunities and develops three hypotheses. Section 4 describes the data and outlines the methodological approach. Section 5 discusses the empirical results. Finally, Section 6 concludes the chapter.

1.2. Literature review

1.2.1. Post-announcement returns

1.2.1.1. Bidder's post-announcement returns

The debate around the outcome of M&As agrees that mergers create value for combined firms, and most of the gain is reaped by the target. Although some argue that acquirers suffer from significant negative announcement returns, Andrade et al. (2001) argue that the acquirer's overall negative return is not significant and is driven by the significant loss of stock acquirers, which is consistent with a previous view that bidders earn non-negative returns from mergers (Jensen & Ruback 1983). More recently, however, Golubov et al. (2016) separate the information effect associated with equity issuance from the total effect reflected in announcement returns and find that stock acquisitions are not systematically value destructive and that the announcement returns of such acquisitions do not significantly differ from those of their cash-based peers.

The prior literature also documents positive announcement returns for bidders. Loughran and Vijh (1997) explore the relation between the payment medium and a bidder's five-year long-term performance. They find that acquirer stock returns earned in tender offers funded by cash (61.7%) significantly outperform those earned through stock-financed mergers (-25.0%). Massa and Zhang (2009) find that acquirers earn significant positive returns through cosmetic mergers, which reduce the popularity difference between the acquirer and the target, and positive post-announcement returns focus mainly on 6- and 12-month holding periods, as suggested by a calendar-time portfolio approach. In terms of chief executive officer (CEO) compensation, while target shareholders lose \$62 for every \$1 increase in unscheduled option grants to target CEOs, acquirer shareholders earn 2% higher three-day cumulative abnormal returns around the announcement, suggesting a wealth transfer from target shareholders to acquirer shareholders due to the issuance of unscheduled option grants (Fich *et al.* 2011). Another study focusing on the pay-for-performance sensitivity (PPS) of acquirer CEOs finds that PPS is positively associated with announcement returns and that a one-unit increase in the logarithm of the PPS results in 0.50% higher announcement returns, which are justified by enhanced post-announcement operating performance (Minnick *et al.* 2011). Finally, in response to the statement that stock acquisitions suffer significant loss, Savor and Lu (2009) address the endogeneity problem by creating a sample of acquisitions failing for exogenous reasons as a benchmark and report that although successful stock acquisitions experience an absolute loss following the announcement, they significantly outperform the benchmark sample. Their results suggest that using overvalued equity as a payment medium increases the acquirer's shareholder value.

More specifically, comparing various acquirer specifications, Rau and Vermaelen (1998) report that glamour acquirers underperform relative to value acquirers and that acquirers earn significantly lower abnormal returns in mergers than in tender offers. In a later study focusing on successful mergers and tender offers in which the bidding party makes five or more bids within three years, Fuller et al. (2002) find that bidders earn significant positive returns in acquisitions of private and subsidiary targets but experience losses when acquiring public targets.

1.2.1.2. Other stakeholders' post-announcement returns

First, it is well documented in the literature that managers play an important role in acquisitions. As summarized in Jensen and Ruback (1983), managerial opposition increases target shareholder wealth, which is consistent with the shareholder interest hypothesis. Issues related to managers also affect acquisitions in other respects. First, in terms of CEO compensation, Grinstein and Hribar (2004) support the managerial incentive hypothesis, stating that more powerful managers can bargain for higher compensation for themselves, while a 1% decline in announcement returns is associated with a $51.1 increase in CEO compensation. Fich *et al.* (2011) argue that the unscheduled option granted to the target manager decreases the target shareholders' wealth while increasing the acquirer shareholders' wealth. While the authors confirm that target companies that grant such options are not of low quality, they conclude that there is a wealth transfer from target to acquirer because of the issuance of unscheduled options. Second, regarding the effect of managerial incentives on acquisitions, Harford and Li (2007) find evidence against the incentive alignment hypothesis in that managers are rewarded for outperforming acquisitions, while they are sheltered from underperformance. The authors explain this as the compensation contract being designed to encourage risk-taking behaviours. Consistently, in bank holding companies, managerial incentives are found to be positively related to announcement returns and the probability of initiating value-enhancing acquisitions (Minnick *et al.* 2011).

Other stakeholders are also important in acquisitions. For example, in a theoretical study, Fulghieri and Sevilir (2011) demonstrate that employees' innovation incentives decrease following mergers between horizontal competitors. Another study suggests that firms are more likely to merge with those that have the same unionization status, and when merging with non-unionized firms, union firms are more likely to be acquirers (Fallick & Hassett 1996).

Regarding creditors, target (acquirer) bond holders earn 1.09% (-0.17%) excess returns, below investment grade bonds earn 4.03% and investment grade bonds experience a loss of 0.80% (Billett *et al.* 2004), supporting the coinsurance effect for target bonds, meaning that riskier bonds benefit more from mergers. Subject to the Japanese market, the involvement of common banks in mergers deteriorates the announcement returns by combining a firm in financial distress with another, financially strong firm, and such mergers serve mainly to protect the interest, which is the collateral of loans, of the common bank (Mehrotra *et al.* 2011).

Regarding suppliers, Fee and Thomas (2004) test four competing hypotheses regarding the motive of horizontal mergers. Supporting the countervailing power hypothesis and productive efficiency hypothesis, they find that suppliers do not experience significantly negative stock market returns; however, they suffer from negative operating performance, which is significant only in the first year subsequent to a downstream horizontal merger. Furthermore, terminated suppliers experience both negative and significant financial and operating performance, while reliant suppliers suffer significantly lower cash flow margins (Fee & Thomas 2004). Consistent with this, Bhattacharyya and Nain (2011) lend support to the buying power hypothesis for horizontal mergers by reporting that dependent suppliers perform 3% worse in terms of abnormal cash flow margin after downstream consolidation.

Regarding competitors, it is well documented that rivals of the target also earn significant positive returns around the announcement date; however, the collusion hypothesis is rejected on academic grounds. Song and Walkling (2000) propose the acquisition probability hypothesis and find supporting empirical evidence. Using estimated probability derived from the logistic model, they find that the probability of being a future target can significantly improve the abnormal returns received in the initial bid. Consistent evidence is found in Shahrur (2005).

There are other stakeholders involved in the acquisition process. For example, Haushalter and Lowry (2011) find that asset managers adjust their holdings of the acquirer significantly according to analysts' recommendation changes during the post-merger period; however, such a positive association is not detected prior to the merger. The authors explain this as the asset management viewing the recommendation from analysts as informative since the merger contains or creates valuable information that is captured by the analysts and shared with the asset management division. In terms of arbitrageurs, Hsieh and Walkling (2005) find support for both the active and the passive arbitrageur hypothesis given the finding that the probability of the deal success and the change in the arbitrageur holdings significantly explain each other. From the society perspective, Garmaise and Moskowitz (2006) report that declining bank competition leads to reduced real economic activities and consequently gives rise to higher property crime.

1.2.2. Uncertainty

1.2.2.1. Divergence of opinions

Miller (1977) develops a model with short selling constraints in which investors are assumed to have heterogeneous beliefs but aim to maximize the present value of investment. The author demonstrates that securities are then held by the most optimistic investors, and the price is determined by the degree of divergence in investor opinions, reflecting the opinions shared by the most optimistic investors. In a dynamic setting under a framework of heterogeneous beliefs and short selling restrictions, a speculation-based mechanism arises that makes investors buy a security at a price above its intrinsic value and hope to sell it later to even more optimistic investors (Harrison & Kreps 1978; Scheinkman & Xiong 2003). To account for idiosyncratic misperceptions, given a divergence of opinions, transaction costs, and a limited universe of stock holdings, Mayshar (1983) argues that the equilibrium price is jointly determined by average and marginal investors. Other price optimism models, such as that of Morris (1996), are also based on the argument that optimistic investors hold stocks because they hold the highest valuations. Overall, a cross-sectional asset pricing prediction is obtained that there is an upwards bias in security prices; the wider the divergence of opinions, the higher the security price, and the lower the future returns. However, the literature also notes that this upwards bias in security prices disappears after the introduction of rational agents (Diamond & Verrecchia 1987; Hong & Stein 2003).

The aforementioned prediction has gained favour on the empirical front. Using the dispersion of analyst forecasts of the current year's earnings from I/B/E/S as a proxy for divergence of opinion, Diether et al. (2002) sort all sample stocks into quintiles and find that the portfolios of stocks with the highest dispersion earn lower returns than those with the lowest dispersion. Based on the idea that fewer mutual funds hold stocks with higher divergences of opinion, Chen et al. (2002) employ breadth of ownership as an indicator of divergence of opinion and confirm that stocks experiencing a decline in breadth of ownership have lower subsequent returns than those enjoying an increase in breadth. Due to the convenience of obtaining daily data from *The Wall Street Journal* about lending fees from 1926 to 1933, when there was a central counter for stock borrowing (Barberis & Thaler 2003), Jones and Lamont (2002) use the cost of selling short as a measure of divergence of opinion and find that stocks associated with higher lending fees have larger price-to-earnings ratios and lower subsequent returns.

More specifically, in the context of M&As, a number of studies explore the relation between divergence of opinions about merger parties and post-announcement returns or deal characteristics. Focusing on pure cash and pure equity acquisitions between 1980 and 2002, Moeller et al. (2007) define two measures of divergence of opinion rooted in I/B/E/S analyst forecasts of long-term earnings growth. The first measure is the dispersion of these forecasts in the month prior to the announcement. The second measure defines high-dispersion firms as those in the top decile of forecast dispersion among firms with the same number of analysts. The authors find that diversity of opinion about the acquirer's equity value is negatively associated with the acquirer's returns in stock acquisitions. Using idiosyncratic volatility, defined as the standard deviation of a target's daily abnormal returns over three months prior to day -63, as a proxy for divergence of opinion, Chatterjee et al. (2012) document a significant positive relation between a return-based takeover premium—the cumulative abnormal returns (CARs) for [-63, +126]—and divergence of opinion about the target's equity.

In terms of information uncertainty, using the dispersion and error of analyst forecasts about a target's earnings, (Li & Tong 2018) find that the target's information uncertainty is positively related to the bidder's gain because the market heavily discounts targets with a high degree of information uncertainty. They also report that opaque targets are associated with a higher premium, consistent with previous studies (e.g., Chatterjee *et al.* (2012). However, two explanations exist. First, bidders tend to negotiate with opaque targets and then pay a higher premium after obtaining more information (Raman *et al.* 2013). Second, the high premium merely reflects the discount imposed by the market on these opaque targets (Cheng *et al.* 2016).

Others also highlight the involvement of uncertainty in M&As. Focusing on public deals, macro-level interim uncertainty as measured by a volatility index is found to be negatively associated with the volume of public acquisitions (Bhagwat *et al.* 2016). In addition, merger waves are found to occur during periods of greater market uncertainty (Duchin & Schmidt 2013). At the micro-level, probabilistic information about merger outcomes is gradually incorporated into market price behaviour over the entire merger process (Asquith 1983).

1.2.2.2. Uncertainty in parameter estimation

Investor judgement about a security is affected by uncertainty in another way: substantial uncertainty is involved when investors estimate parameters characterized in a pricing model, whereas conventional pricing models assume that these parameters are known to investors. Kandel and Stambaugh (1996) highlight the effect of parameter uncertainty on asset allocation in a short-horizon framework in a Bayesian setting. In a long-run framework that augments the conventional capital asset pricing model with heterogeneous beliefs and a lognormal security price distribution, Williams (1977) notes a 'learning-based hedging demand'. The author argues that the security return's variance is rapidly learned by investors, whereas the return's mean is gradually learned. Consequently, the stock price is positively related to the expected returns and follows a non-mean-reverting process. Overall, this parameter uncertainty produces the security's price predictability and highlights the learning process of investors.

Empirically, Barberis (2000) employs the sensitivity of optimal portfolio allocation to the investor's investment horizon to account for the predictability effect and finds, even after controlling for parameter uncertainty, that investors will invest in more stock if the horizons are longer. In addition, future learning about the average returns of risky assets makes investors vary their positions, with the direction depending on their risk tolerance compared with investors whose portfolios are unaffected by the possibility of future learning (Brennan 1998).

1.2.3. Corporate cash holdings

1.2.3.1. Agency cost explanation

According to the free cash flow hypothesis advanced by Jensen (1986), managers have a tendency to invest free cash flow in increasing firm size beyond the optimal size and in value-destroying acquisitions or capital expenditures to enhance their power and compensation. Stulz (1990) lends support to this proposition, arguing that managers choose to overinvest when they have sufficient free cash flow and that a financing policy is needed to mitigate this agency problem. Following this proposition, a number of empirical studies provide evidence that large cash reserves are not desirable, supporting the agency cost explanation of corporate cash holdings.

While the studies pertaining to U.S. firms find less support for the agency cost explanation, some argue that the underlying reason is that U.S. shareholders are well protected. Dittmar *et al.* (2003) employ international data consisting of 11,000 companies from 45 countries to shed light on the importance of corporate governance in determining corporate cash holdings and, after controlling for the industry effect, find that firms in countries with the poorest shareholder protection reserve 25% more cash than those in countries with the highest level of shareholder protection. This difference increases to 70% after controlling for capital market development and further increases to above 200% when other firm characteristics affecting cash holdings are taken into account. Later, using various specifications of Fama and French (1998) for valuation regressions to study the cross-section variation in cash holdings of a sample across 35 countries, Pinkowitz *et al.* (2006) support agency theory in that controlling shareholders in countries with poorer shareholder protection value cash holdings less. Another study focusing on U.S. firms also supports the agency cost explanation. Harford *et al.* (2008) construct governance metrics based on insider ownership and G-Index subject for a sample of 11,645 firm-year observations from Compustat and find that firms with stronger shareholder rights (lower G-Index) and higher insider ownership have larger cash holdings. In addition, they present the spending hypothesis as an explanation of the difference in cash holdings. They argue that for firms with large cash holdings, all else being equal, poorly governed firms spend cash more quickly and mainly on capital expenditures and acquisitions (Harford *et al.* 2008). Firms also hold less cash as a result of increased cash flow when investor protection is stronger (Kusnadi & Wei 2011). From the perspective of employees, focusing on China's labour-intensive firms, it is argued that labour protection laws increase the cost of labour adjustment and hence increase a firm's likelihood of being in financial distress; thus, the firm accumulates a higher level of cash holdings in response (Cui *et al.* 2018). A study based on U.S. firms provides similar evidence that firms conserve more cash to mitigate employees' perception of unemployment given the negative relation between corporate cash holdings and the unemployment insurance benefit (Devos & Rahman 2018).

Another strand of research examines this issue less directly. Instead of considering cross-sectional variations in cash holdings, these researchers study the market value of firms associated with the change in their cash position. This methodology has two major advantages over the traditional Fama and French (1998) methodology. First, it addresses the drawback of Fama and French (1998) methodology, which is the inability to capture time-series variations in sensitivity to risk factors, by adding a stock's benchmark return to control both time-series variation in risk factors and cross-sectional variation in exposure to those factors (Faulkender & Wang 2006). Second, equity returns are easier to measure and interpret than the market-to-book ratio as the dependent variable. Faulkender and Wang (2006) first find that the marginal value of cash is negatively related to corporate cash holdings. Later, in a more detailed study of the agency factor, Dittmar and Mahrt-Smith (2007) highlight the importance of corporate governance in the relation between cash holdings and firm value. The authors first employ Faulkender and Wang (2006) methodology, which estimates the additional value incorporated into equity value by the market as a result of changes in a firm's cash holdings and find that the marginal value of every $1 in cash holdings for a poorly governed firm ranges between $0.42 and $0.88 across various measures of corporate governance, while this value almost doubles in a well-governed firm

(Dittmar & Mahrt-Smith 2007). The authors also perform conventional cross-sectional regression to examine how cash holdings affect the value of excess cash held by firms and find consistent evidence that the marginal value of every $1 in cash doubles for firms in the highest tercile of corporate governance compared to those in the lowest tercile. Furthermore, they report that poorly governed firms dissipate cash in ways that reduce operating performance; however, this negative impact of large cash holdings on operating performance is cancelled for well-governed firms (Dittmar & Mahrt-Smith 2007). Another international study also finds consistent evidence that larger cash holdings decrease firm value when country-level shareholder protection is weaker, namely, a valuation discount exists for a firm with a high cash balance (Kalcheva & Lins 2007).

The aforementioned studies of the agency cost explanation of cash holdings have limitations. For example, they are based on shareholder rights law on paper rather than actual enforcement, and they generally fail to render good control of firm-level agency problems. In an empirical study investigating how government quality interacts with the firm-level agency problem to affect the level of cash holdings, the authors choose an intra-country dataset outside the U.S. in order to have a constant level of law on paper and to directly test the interaction between the twin agency problem and firm policies. Thus, they choose China due to its diversity and disparity in economic and institutional development levels to mitigate the potential limitation, which is the lack of variation in government quality (Chen *et al.* 2014). The authors find that corporate cash reserves are negatively associated with the quality of local government, and they explain that good government reduces the sensitivity of investment and cash to cash flow and helps firms access bank loans and trade credit (Chen *et al.* 2014). In addition, the negative relation is more pronounced in private firms than in state-owned firms since the former face heavier financial constraints.

1.2.3.2. Precautionary motive

In contrast with the agency problem associated with corporate cash reserves, the precautionary motive for holding cash suggests that firms can benefit from free cash flow by undertaking positive net present value projects as they arise and increasing shareholder value ex ante (Keynes 1937). Myers and Majluf (1984) also stress the benefits of internal cash in enabling firms to take advantage of profitable investment opportunities.

A number of studies formally analyse the precautionary motive for cash holdings. Assuming that cash flow risk generated by current assets can be fully hedged, Almeida *et al.* (2004) develop a model of liquidity demand that formalizes Keynes's intuition. Financially constrained firms respond to the constraints by hoarding more cash at a cost, while financially unconstrained firms do not hold cash but are able to fund all positive net present value (NPV) projects. Most importantly, the authors point out that, if the concavity of the production function remains constant, the propensity to save cash is positively associated with the value expected from future projects. In contrast, assuming that cash flow risk can be only partially hedged, Han and Qiu (2007) develop a model that suggests that the underlying reason managers save cash is to increase marginal returns on future projects, which is positively related to cash flow volatility. This model is consistent with a previous general framework of corporate risk management (Froot *et al.* 1993) in which the authors argue that corporations reserve cash for cash flow hedging purposes when external funds are costly. Riddick and Whited (2009) also model corporate cash holdings as a response to risky cash flows.

On the empirical front, Opler *et al.* (1999) provide the first fundamental framework for the determinants of corporate cash holdings. Focusing on U.S. firms from 1971 to 1994, the authors first test static trade-off theory by examining the mean-reverting property of cash holdings and then follow the method of Fama and MacBeth (1973) to study the determinants of cash holdings in cross section. They document that cash holdings are negatively associated with firm size, net working capital, leverage, and dividend pay-out and are positively related to cash flow-to-assets ratio, capital expenditure-to-assets ratio, industry cash flow volatility, and R&D-to-sales ratio. Overall, firms with stronger growth opportunities, smaller size, and riskier activities hold more cash than their peers. The authors explain this finding as consistent with the view that firms hold cash against adverse cash flow movement and expensive access to external funds, thus supporting the precautionary motive of holding cash. Later, updating the sample to U.S. firms except those from the financial and utility industries between 1980 and 2006, Bates *et al.* (2009) extend the regression model developed by (Opler *et al.* 1999) by allowing the intercepts and slopes of estimated regressions (obtained from 1980s data) to change to see whether these changes are helpful in explaining the cross-sectional variation in cash holdings during the 1990s and 2000s. They report that corporate cash holdings are positively related to cash flow volatility and R&D expenditures and are negatively related to working capital and capital expenditures. The authors also conduct a formal analysis of the free cash flow hypothesis and argue that the precautionary motive dominates the agency explanation since the most entrenched firms implied by the GIM index experience the smallest increase in cash holdings (Bates *et al.* 2009). Using private firms as cross-validation of those studies and focusing only on public firms, Gao *et al.* (2013) find consistent evidence in an extended sample period (1995-2011) that cash reserves are positively associated with cash flow volatility, among other factors that are well documented in the literature. Chen *et al.* (2015) find a positive relation between corporate cash holdings and cash flow volatility in an international setting.

Another strand of the literature focusing on the cash flow sensitivity of cash, which is the propensity of corporations to save cash from cash inflows, also supports the precautionary motive explanation. By partitioning U.S. manufacturing firms from 1971 to 2000 according to various measures of financial constraints, Almeida *et al.* (2004) find that the cash flow sensitivity of financially unconstrained firms is not significantly different from zero, while the sensitivity of financially constrained firms is positive and significantly different from zero. This is consistent with the precautionary motive intuition in that firms facing financial constraints have a propensity to save cash for future use from current cash inflows. A similar result is found for a sample of U.K. firms in that cash flow has a positive and significant effect on cash holdings, while cash flow volatility has a positive impact but is non-significant (Ozkan & Ozkan 2004). Later, another study provides more benign evidence that the cash flow sensitivity of cash is negatively related to the degree of a country's financial development (Khurana *et al.* 2006), and the effect is more pronounced for small firms. The authors explain that firms from financially underdeveloped countries are more motivated to save cash from cash inflows for precautionary purposes. However, a more recent study argues that firms are more likely to save cash from share issuance than from internal cash (McLean 2011). The authors find that for firms with high precautionary motives, as captured by high cash flow volatility and high R&D expenditures, cash saved from share issuance increased by 7% per year on average over the period of 1971 to 2006, while cash saved from operating cash flow decreased by 6% per year on average.

1.2.3.3. Other explanations of corporate cash holdings

A large body of studies also examines how firm structure affects corporate cash policies; one of the most important factors is firm diversification. Employing U.S. data over the period of 1988-2006, Subramaniam *et al.* (2011) test three competing hypotheses, namely, the complementary growth hypothesis, asset sales hypothesis, and influence cost hypothesis. The authors find that diversified firms have significantly lower cash holdings, and their explanation is that diversified firms have an efficient internal capital market; thus, they can sell non-core segments to raise funds, and they suffer a higher degree of the agency problem, which makes the marginal cost of holding cash and liquid assets higher (Subramaniam *et al.* 2011). More importantly, according to the authors, investment opportunities for different segments are not perfectly correlated in time, so the total cash need for diversified firms is less volatile, and the cash of one segment could be used as capital for another segment (Subramaniam *et al.* 2011). While most studies of the effect of diversification on cash holdings are concerned primarily with the relation between cash position and cash flow uncertainty, Duchin (2010) introduces investment opportunity uncertainty and studies its impact (jointly with cash flow uncertainty) on cash holdings. The author reports that diversified firms hold less precautionary cash because diversified firms have well-smoothed investment opportunities and cash flow due to both the low correlation of opportunities and the outcomes among their divisions. Specifically, a one-standard-deviation increase in the cross-divisional correlation in investment opportunity is associated with a 4.4% increase in the cash holdings of the average firm (Duchin 2010). In addition, diversified firms benefit from the internal capital market. The author finds a positive relation between diversification in investment opportunities and transfers across divisions and a negative relation between cross-divisional transfers and cash positions. The author suggests that less cash held due to diversification results in efficient fund flows to more productive divisions (Duchin 2010). In an international study, Fernandes and Gonenc (2016) identify two types of diversification, namely, geographical and industrial diversification, and find a negative relation between both types of diversification and cash holdings at the firm level. Because multinational firms diversify across industries, the authors further study the impact of diversification in product segment on cash holdings. They find that multinational firms selling multiple products hold more cash. More importantly, they discover a trade-off in that the impact of industrial diversification on cash holdings decreases once the firm is geographically diversified (Fernandes & Gonenc 2016). Finally, they document that the association between diversification and cash holdings is weakened by the presence of a territorial tax system and stronger protection of investors and strengthened by higher GDP growth and uncertainty avoidance (Fernandes & Gonenc 2016). From the perspective of the value of cash holdings in diversified firms, based on a sample consisting of 28,563 firm-year observations over the period of 1998-2005, Tong (2011) documents that the marginal value of every $1 in corporate cash holdings in diversified firms is $0.92, while the value in stand-alone firms is $1.08, and the difference is statistically significant. Further, this difference is robust in sub-samples of both financially constrained and unconstrained firms. In addition, by dividing the whole sample according to the level of corporate governance, the author finds that firm diversification has a negative impact on poorly governed firms but has no significant impact on well-governed firms. The author explains that diversified firms are more likely to have more agency problems, such as empire building; as a result, the value of their cash holdings decreases (Tong 2011). In a more recent study examining the underlying economic reasons driving the differential cash holdings between multinational and domestic U.S. firms, the author develops a model with quantitative measures of both direct and endogenous effects of differential cash holdings and finds that multinational U.S. firms maintain 5.31% higher cash holdings than their domestic counterparts (Gu 2017). Specifically, the author reports that repatriation cost due to differential cross-country taxes accounts for 42% of the difference in cash holdings. Furthermore, firms that choose to become multinational hold 4.03% higher cash reserves *ex ante* than those that remain domestic, suggesting that multinational and domestic U.S. firms are systematically different and that endogenous self-selection accounts for 59% of the difference in cash holdings (Gu 2017).

A number of recent studies identify a few factors that significantly affect corporate cash policy, and a selection of these factors is reviewed below. Qiu and Wan (2015) report that corporate cash holdings are positively related to both technology spillovers and product market rivalry, and the impact of technology spillover on corporate cash holdings is more pronounced for firms with higher profitability, better growth prospects, and younger patent ages. The authors suggest that these findings are consistent with the precautionary motive of holding cash and that financially constrained firms build more cash reserves to fund future investment in technology and product markets (Qiu & Wan 2015). A study of U.S. public industrial firms over the period of 1980-2012, during which the cash holdings and cash-to-asset ratios both increased dramatically, finds that the increase in mean cash-to-asset ratio was driven almost entirely by R&D-intensive companies, the sensitivity of corporate cash holdings to R&D was fifteen times higher in 2012 than in 1980, and R&D itself could explain 20% of the increase in cash holdings over the sample period (He & Wintoki 2016). The authors explain that for R&D-intensive firms, the operating, financing, and competitive landscape have become more challenging, as increasing competitiveness has magnified the marginal impact of financial constraints on corporate cash policy (He & Wintoki 2016). In an international sample consisting of 27,801 firms from 41 countries from 1989 to 2009, Chen *et al.* (2015) link corporate cash holdings with cross-cultural psychology and behavioural finance. They find that cash position is negatively associated with individualism and positively related to uncertainty avoidance. The authors further demonstrate that in low-individualism and high-uncertainty-avoidance cultures, uncertainty avoidance and individualism affect a firm's precautionary motive in that those firms facing greater uncertainty are likely to hold more precautionary cash (Chen *et al.* 2015). Another study investigates the relation between corporate social responsibility and corporate cash holdings while identifying three channels through which corporate social responsibility may affect cash position (Cheung 2016). The author finds that corporate social responsibility relates to corporate cash reserves positively and mainly through the systematic risk channel. The author explains that corporate social responsibility firms experience lower systematic risk due to inelastic demand because of customer loyalty and investor preference, which creates a shorter debt maturity structure followed by a higher refinancing risk that requires a higher level of cash reserve (Cheung 2016). The importance of corporate social responsibility is also highlighted in another study. From the investor perspective, the value of cash holdings is positively dependent on corporate social responsibility performance (Arouri & Pijourlet 2017). Using a sample drawn from 54 countries covering the period of 1992 to 2012, Dudley and Zhang (2016) obtain the country-level measure of trust based on each country's citizens' average response regarding their perception of the trust level and find that firms in countries with higher levels of trust hold more cash, which lends support to the agency explanation because shareholders in countries with lower levels of trust force managers to distribute cash instead of holding it for potential investment. In addition, the authors investigate how the marginal value of cash is affected by societal trust level. Following Faulkender and Wang's (2006) method, they regress a firm's marginal market values as a result of changes in cash position on societal trust and discover a positive relation, the result of which is also consistent with the agency explanation (Dudley & Zhang 2016). To study the way that corporate cash holdings are affected by the agency conflict between controlling families and minority shareholders, Liu *et al.* (2015) focus on China's family firms while using non-family firms as a control sample to account for the variation in the relation between excess control rights and cash holdings in two types of firms. They note the endogeneity problem of the corporate cash holdings probably being jointly determined with other financial policies, such as leverage and dividend pay-out; as a result, they employ a three-stage least square simultaneous regression model. The authors find that corporate cash holdings in family firms are positively related to the excess control rights of controlling shareholders and consider this to be consistent with the expropriation explanation in that controlling shareholders are more likely to tunnel resources from listed firms through cash holdings in family firms (Liu *et al.* 2015). Furthermore, the corporate cash holding policies in the sample firms are significantly influenced by the unique characteristics of China's family firms, such as the one-child policy; therefore, the authors argue that the family succession problem negatively affects firm performance through corporate cash holdings (Liu *et al.* 2015). From the perspective of how corporate cash reserve is affected by country-level economic conditions, focusing on state deregulation in the 1970s and the completion of the deregulation process in 1994 (Riegle-Neal Act), Francis *et al.* (2014) construct a sample of U.S. non-banking firms over 1971-1994, establish a link between banking deregulation and corporate cash policy, and find that corporate cash holdings are negatively related to intra-state banking deregulation, with the results being driven mainly by financially constrained firms. The authors argue that increased openness and competition in the U.S. banking market provide easier and deeper access to the capital market and therefore are beneficial to non-banking companies (Francis *et al.* 2014). Finally, they highlight the importance of considering the link between firm-level financial policy and the wider economic environment for future research.

1.2.3.4. Corporate cash holdings in M&As

Empirical studies mainly consider cash reserves to be negatively associated with the bidder's post-announcement performance. In a study of successful tender offers from 1968 to 1990, Lang et al. (1991) provide evidence favouring the free cash flow hypothesis in the context of M&As. They document that bidders' returns are negatively associated with their pre-announcement free cash flow; however, this is evident only for firms with a low Tobin's q (Lang *et al.* 1991). Consistent evidence is found for all cash deals from 1984 to 1998, and a negative relation between the bidder's cash flow and the bidder's post-announcement returns is confirmed for firms with poor investment opportunities (Schlingemann 2004). Using a more comprehensive dataset, Harford (1999) finds that cash-rich companies are more likely to initiate acquisitions and to experience negative post-announcement stock market returns and operating performance. Based on this study, Oler (2008) extends the sample period to 1972 to 2003 and argues that the announcement response does not entirely explain the effect of cash reserves. The author therefore focuses on long-term stock returns and accounting information and confirms a negative relation between corporate cash reserves and acquirer gains. Smith and Kim (1994) also find consistent evidence that bidders with high free cash flows experience a -1.37% announcement returns, on average, an indication of overpayment.

Another strand of the literature sheds light on the negative effect of corporate cash reserves, but less directly. For example, Harford et al. (2008) find that firms with weaker governance are more likely to spend their cash reserves inefficiently on capital expenditures and acquisitions. Later, focusing on entrenched managers, Harford et al. (2012) report that entrenched managers destroy firm value by overpaying for targets while tending to choose targets that generate low synergy. Furthermore, these entrenched managers tend to use excess cash reserves for fear of losing control subsequent to stock payments. From a market disciplinary perspective, it is found that proxy fight targets hold 23% more cash than non-targets, a significant difference, and the probability of contests is positively associated with the amount of excess cash (Faleye 2004). The author argues that this finding lends support to the agency theory since cash holdings significantly decrease subsequent to a proxy fight through cash distribution to shareholders.

The aforementioned studies are realizations of free cash flow theory in the context of M&As; namely, the bidder's post-announcement performance is negatively related to its pre-announcement cash holdings. However, rooted in the precautionary motive of corporate cash reserves and employing the latest data, the argument that cash-rich bidders do not necessarily make value-destroying acquisitions has recently emerged. Gao and Mohamed (2018) explore the effect of cash reserves in the context of M&As. From 1984 to 2012, although excess cash was negatively related to acquirer announcement returns, cash reserves exerted a positive effect on acquirer returns within a sub-sample of unpredicted acquisitions. Specifically, a one-standard-deviation increase in the excess cash ratio leads to acquirer announcement returns that are 0.44 percentage point higher, an effect that is more pronounced for financially constrained firms. In addition, in terms of operating performance, cash-rich financially constrained firms significantly outperform other firms by 16.9% (Gao & Mohamed 2018). The authors conclude that the precautionary motive for holding excess cash dominates. As a result, the effect of the bidder's cash reserve on its post-announcement performance remains a fruitful field for further investigation.

1.2.3.5. M&A incidence

Harford (1999) studies the likelihood of the acquirer initiating an acquisition by employing a probit model, in which the dependent variable is a dummy who takes the value of one if the firm makes a bid and zero otherwise, while the main explanatory variable is cash deviation which measures the degree of cash reserve. The author documents that the coefficient estimate on cash deviation is 1.061 (significant at 1% level), suggesting that the probability of initiating acquisitions is positively associated with the acquirer's cash reserve. In terms of control variables, firm size, sales growth and average abnormal returns are all positively and significantly (at 1% level) related to the likelihood of engaging into acquisitions. In addition, the author finds that the probability of engaging into acquisitions is positively related to the agency conflict which is measured by the insider ownership in all model specifications, however, the estimated coefficient (1.470) is only significant for insider ownership no more than 5% (significant at 5% level), and firm size, average abnormal return as well as sales growth all loss significance (Harford 1999). The author explains this may be due to the inactive nature of takeover activities during 1991-1993, over which period he has complete data of insider ownership.

Rooted from the bankruptcy avoidance rationale for takeovers advanced by Shrieves and Stevens (1979) and Pastena and Ruland (1986), which argues that a firm prefers to be sold as a going concern rather than a fire sale so that it can preserve value and resolve uncertainty faster, the financial weakness explanation for target-initiated deals is developed. For example, Masulis and Simsir (2018) report that the underlying reason for a deal initiated by target firms is financial and competitive weakness, as a result, the acquirers would infer targets who initiate the deal are more likely to be overvalued, therefore, the deal is associated with lower premiums as a compensation for this adverse selection effect. Similarly, the documented lower premiums associated with target-initiated deals is linked with both weak selling-firm bargaining power and target overvaluation (Xie 2010).

Considering the fact that many M&As take place after one-on-one negotiations, some scholars suspect there is a lack of competition. In order to determine if acquirers in such friendly takeovers are truly insulated from competitions, Aktas *et al.* (2010) investigate the influence of potential but unobserved latent competition and anticipated auction costs when negotiations fail by employing 1774 completed U.S. deals over the period of 1994-2007, and document that the existence of potential rival bidders significantly increases the bid premia in negotiated deals, while the anticipated auction costs render the opposite effect. Fidrmuc *et al.* (2012) study the relation between the deal initiation and the whole selling process and argue that the primary decision made by the target firm is that whether to sell itself in formal auctions, controlled sales, and private negotiations. The authors find that targets owning more tangible assets, lower market-to-book ratios, and lower research and development expenses are more likely to attract private equity acquirers (Fidrmuc *et al.* 2012). De Bodt *et al.* (2014) study the effect of target shareholders' willingness to sell (WTS) on deal incidence, they find that WTS is negatively associated with bid premium, while it is positively related to the probability of deal success. Other findings regarding the determinants of deal initiation include CEO ownership (Fidrmuc & Xia 2019) and disciplinary CEO replacement (Brav *et al.* 2008).

1.3. Literature opportunities and hypothesis development

1.3.1. Opportunities from prior research

Prior literature highlights the relation between uncertainty and merger activities. For example, market-wide uncertainty decreases mergers involving public firms through interim risk (Bhagwat *et al.* 2016), and merger waves are associated with greater total uncertainty (Duchin & Schmidt 2013). Asquith (1983) documents that the uncertainty is resolved during the entire merger process, while the probability of the deal's success is anticipated, at least partly, by the market. More specifically, another study argues that acquisitions are a tool to hedge operational uncertainty, which is positively associated with the probability of the beginning of a merger wave and vertical integration at both the industry and firm levels (Garfinkel & Hankins 2011).

However, the uncertainties that are considered to have a significant impact on M&As are all in a general form, which means they are all at the market or at least the industry level, while the effect of firm-specific risk on acquisition performance remains unexplored. This chapter studies the effect of firm-level cash flow uncertainty on the bidder's acquisitions performance because cash flow uncertainty is argued to mirror firm idiosyncratic risk (Irvine & Pontiff 2008). This chapter aims to fill this gap by combining two strands of the literature that help to identify a specific type of firm-level uncertainty that has a potential significant impact on M&As.

First, a number of studies document that corporate cash reserves significantly affect acquisition characteristics such as financial and operating performance and the probability of being the acquirer or the target (Harford 1999; Gao & Mohamed 2018). Second, a relation between cash flow uncertainty and corporate cash reserves is widely reported (Froot *et al.* 1993; Opler *et al.* 1999; Bates *et al.* 2009). Consequently, this chapter is designed to directly test the impact of the firm's prior cash flow uncertainty on the following acquisition characteristics: announcement returns, operating performance, and the probability of being the acquirer. These studies are analysed in more detail in the next section.

1.3.2. Hypothesis development

First, according to economic theory, similar to individuals, corporations hold cash reserves for tax motives (Baumol 1952), transaction motives (Foley *et al.* 2007), agency motives (Jensen 1986), and precautionary purposes (Keynes 1937). Theoretical studies have been conducted to support the precautionary motive of corporations to reserve cash to fund future profitable investment or hedge against adverse future cash flows. In the two-period investment model advanced by (Han & Qiu 2007), because financially constrained firms are sensitive to cash flow uncertainty, a trade-off exists between current and future investments. The authors therefore argue that firms facing financial constraints are likely to increase their internal cash reserves when facing cash flow volatility and that the impact on cash holdings depends on the degree of financial constraint. This model is consistent with a previous general framework of corporate risk management (Froot *et al.* 1993) in which the authors argue that corporations reserve cash for cash flow hedging purposes when external funds are costly.

On the empirical front, for U.S. firms over the period from 1971 to 1994 and using the standard deviation of industry cash flow as a proxy of cash flow riskiness, Opler et al. (1999) find support for the trade-off model and assert that firms with greater growth opportunities and higher cash flow uncertainty are likely to hold more cash, with operating loss as the main reason for changes in excess cash reserves. Later, Han and Qiu (2007) use quarterly U.S. market data from 1972 to 2002 and support a trade-off model in which financially constrained firms hold more cash against greater cash flow volatility. Furthermore, Bates et al. (2009) argue that the underlying cause for the increase in the average cash-to-assets ratio of U.S. industrial firms from 10.5% in 1980 to 23.2% in 2006 is that cash flow became riskier over this period. They demonstrate that the precautionary motive dominates the agency explanation. A number of other studies also support the precautionary motive for cash holding by focusing on the sensitivity of cash holdings to cash flows, subject to various cash flow measures and different markets (Almeida *et al.* 2004; Ozkan & Ozkan 2004; Khurana *et al.* 2006). Overall, empirical studies suggest a positive relation between corporate cash reserves and cash flow uncertainty due to the precautionary motive (Gryglewicz 2011).

Second, in terms of the relation between corporate cash reserves and M&As, there is debate over the effect of corporate cash reserves on bidders' acquisition performance. Prior studies generally consistent with the free cash flow hypothesis advanced by Jensen (1986). In other words, most researchers document a negative relation between free cash flow and bidder gains from acquisitions. According to Harford (1999), the coefficient estimates of the cash deviation (degree of cash reserves) of unexpected bidders are all negative, ranging from -11.1% to -20.8%, and significant at least at the 5% level. However, for expected bidders, the corresponding coefficients are also negative but non-significant. This finding suggests that the effect of large cash reserves for expected bidders has been incorporated into stock prices. This finding is consistent with a previous study on successful tender offers from 1968 to 1980 that reports a significant negative relation between the bidder's returns and free cash flow for low-q firms (Lang *et al.* 1991). This result is also robust to 10 alternative proxies of cash flow derived from working capital, operating income, and net income plus depreciation. Employing the same proxies of cash flow, McCabe and Yook (1997) find that cash bidders from 1976 to 1986 with a low Tobin's q and a large free cash flow that reinvest a high percentage of that cash flow earn positive abnormal returns around announcements. On the other hand, cash bidders without such a free cash flow are indistinguishable from stock bidders in terms of announcement returns. These findings are consistent with Jensen (1986) prediction that cash bidders using excess cash flow and slack to invest will earn positive abnormal returns. Schlingemann (2004), also focusing on cash transactions, confirms the negative relation between bidder gains and free cash flow over the period from 1984 to 1998, particularly for firms with poor investment opportunities. Freund et al. (2003) document similar results.

However, cash reserves are argued to be beneficial for firms, at least under certain circumstances. Smith and Kim (1994) find that acquisitions in which high-free cash flow bidders acquire targets with poor financial slack provide the highest return to bidders, targets, and the combined firm. Most recently, over an extended sample period, cash-rich acquirers are found to significantly outperform cash-poor acquirers in unpredicted acquisitions (Gao & Mohamed 2018), although an agency cost explanation is argued to be dominant during the early sample period, as in Harford's (1999) model. These findings imply that firms that hold high cash reserves because of precautionary motives make more efficient acquisitions.

The aforementioned discussion highlights the positive association between cash flow uncertainty and corporate cash reserves motivated by precautionary considerations. Since the aim of this chapter is to investigate the link between the bidder's cash flow uncertainty and subsequent acquisition performance, it is reasonable to expect firms perceiving high cash flow risk to hold more cash due to precautionary motives and to invest cash holdings with greater efficiency. In the context of M&As, this chapter proposes that managers facing higher cash flow uncertainty will become more precautionary and reserve more cash; consequently, they will choose to invest in value-enhancing deals if they ever engage in M&As.

Agency theory suggests a positive relation between the probability of engaging in acquisitions and cash reserves. According to Harford (1999), in a probit model used to study the determinants of a firm's probability of engaging in an acquisition, the coefficient estimate of cash deviation is 1.061 and significant at the 1% level, suggesting that the probability of initiating acquisitions is significantly positively associated with cash reserves. In addition, firm size, sales growth, and average abnormal returns are all positively related to the likelihood of engaging in acquisitions, all significant at the 1% level. This finding is a validation of the free cash flow hypothesis, which is that the bidder's management invests a high volume of reserved cash in acquisitions as a form of agency cost instead of an increase in shareholder wealth. Since this chapter proposes that firms with higher cash flow risk will reserve more cash for precautionary purposes and invest more efficiently and prudently, the following hypothesis is proposed.

H1: The probability of initiating an acquisition is negatively related to the firm's pre-announcement cash uncertainty.

Most past evidence on whether M&As create value for shareholders relies on short-term event studies (Andrade *et al.* 2001; Hackbarth & Morellec 2008), in which the examination of abnormal returns around M&A announcement dates is employed as the indicator of value creation or destruction, regardless the magnitude and statistical significance of the bidder's gain. For example, Jarrell *et al.* (1988) find that bidders realize small but statistically significant gains of approximately 1% to 2%, while Hackbarth and Morellec (2008) report that the average value of 3-day cumulative abnormal return to bidder firm shareholders is -0.52%. Therefore, if the precautionary theory can be validated in the context of M&As, in other words, managers facing higher cash flow uncertainty choose value-enhancing acquisitions, then such M&As should earn positive announcement returns. Consequently, the second hypothesis is proposed.

H2: The bidder's announcement abnormal returns are positively related to its pre-announcement cash flow uncertainty.

In addition, it has been extensively documented that the bidder's announcement returns in either direction are manifested in subsequent operating performance. For example, abnormal operating performance increases after merger announcements for high-value deals (Healy *et al.* 1992). According to Harford (1999), the coefficient accounting for improvement in abnormal operating performance is -2.0% (significant at the 1% level) for cash-rich firms when firm performance is matched on both industry and prior cash positions. This coefficient decreases in magnitude to -0.9% and loses significance when the firms are matched only on industry average performance. This finding suggests that the market's realization of poor acquisitions by cash-rich firms is made at least partially through post-merger operating performance. Later, given asset purchase data from 1984 to 1996, Freund *et al.* (2003) use operating free cash flow scaled by the book value of assets in the year preceding the announcement as a proxy for free cash flow and pre-tax operating cash flow over the book value of total assets as a proxy for operating performance. They find changes in operating performance to be negatively associated with the amount of free cash flow, with a more pronounced effect for asset purchasers with poor growth opportunities (Freund *et al.* 2003). On the other hand, the increase in combined value after bank mergers is realized mainly through cost savings (Houston *et al.* 2001). The positive announcement returns to financially constrained unpredicted acquirers are manifested by positive post-announcement operating performance (Gao & Mohamed 2018). Because H2 proposes that cash flow uncertainty has a positive effect on the bidder's announcement returns, the third hypothesis is developed.

H3: The bidder's post-announcement operating performance is positively related to its pre-announcement cash flow uncertainty.

1.4. Data and Methodology

1.4.1. Sample selection

In this chapter, the U.S. M&As data will be obtained from the Thomson One database for the period from 1 January 1985 to 31 December 2017. In addition, the following criteria will be imposed:

1) The bidding company must be a publicly traded firm and be covered by the Center for Research in Security Prices (CRSP) and the Compustat database in order to obtain the financial and accounting information required for analysis in this chapter.
2) The status of the target firms is public, namely, government-owned, investor, joint venture, mutually owned, public, private, subsidiary, and unknown status.
3) The deal value must exceed $1 million.
4) The deal must be completed.
5) The bidder owns more than 50% of the target upon deal completion.
6) All acquisition techniques are considered, namely, going private, leveraged buyout, management buyout, management buy-in, liquidation, recapitalization, self-tender, spinoff, re-purchase, bankruptcy acquisition, exchange offer, and privatization.

7) Both acquirers and targets from the financial industry and energy and power industry are excluded.

There are a total of 28,758 deals over the sample period, and this amount decreases to 10,827 when the above filters are imposed. Table 1.1 summarizes descriptive statistics of the final sample.

[Insert Table 1.1 here]

Table 1.1 provides descriptive statistics about acquirer and deal characteristics. In terms of acquirer characteristics, it is evident that firms with high pre-announcement cash flow uncertainty hold higher corporate cash reserves. Specifically, in the present sample, acquirers with high pre-announcement cash flow uncertainty hold $0.74 million (significant at the 1% level) more cash and short-term investment than those with low pre-announcement cash flow uncertainty. This is consistent with the idea that firms facing high cash flow uncertainty reserve more cash for precautionary purposes to fund any future value-enhancing projects (Opler *et al.* 1999; Almeida *et al.* 2004; Bates *et al.* 2009; Gryglewicz 2011). In addition, Table 1.1 suggests that acquirers with high pre-announcement cash flow uncertainty have higher market-to-book ratios and higher pre-announcement operating performance. Under the framework of precautionary theory, firms facing more volatile cash flows are investing more efficiently to achieve higher market values and make higher operating incomes. There is no significant difference in terms of working capital, and acquirers with high cash flow uncertainty are generally larger firms.

Regarding deal characteristics, acquirers with high pre-announcement cash flow uncertainty are significantly less likely to use cash as the sole payment medium, while they are more likely to use 100% stock. They are also more likely to acquire public targets, initiate tender offers, and engage in deals with significantly higher values.

1.4.2. Univariate analysis

Following the M&A literature, a simple univariate analysis is carried out to compare cumulative abnormal returns (CARs) and other firm and deal characteristics between high- and low-cash flow uncertainty companies. The cash flow uncertainty level is defined relative to the sample median. For every variable, the difference between high- and low-cash flow uncertainty firms will be calculated, and a significance test will be conducted for the calculated difference.

1.4.3. Multivariate regression

To study the interaction between variables that can help explain the dependent variables and to study how these variables explain the dependent variables, which are ignored by univariate analysis, multivariate analysis is carried out in most empirical studies (Draper & Paudyal 2008). In the context of this chapter, logit regression is applied to the first hypothesis, while ordinary least square (OLS) regressions are performed to test H2 and H3.

1.4.3.1. Cumulative abnormal returns

There are three major variables in this empirical study, namely, CAR, proxy for cash flow uncertainty, and operating performance. They are defined as follows, while other variables are defined below with the regression model. As in most empirical studies of M&As, the CAR around the announcement date is derived as follows. The short-run normal returns R_{kt} of bidders are calculated by daily data as

$$R_{kt} = \ln\left(\frac{P_t}{P_{t-1}}\right) \tag{1.1}$$

where P_t is firm *k*'s share price at time t. The market-adjusted abnormal returns of firm *k* (Brown & Warner 1985) are determined within the three-day event window (-1, +1) as

$$AR_{kt} = R_{kt} - R_{mt} \tag{1.2}$$

where R_{mt} is the normal market returns, calculated by the daily Standard & Poor's 500 index, with the market parameters estimated from daily data over the window [-365, -28] relative to the announcement date. The CAR is the summation of abnormal returns over the event window:

$$CAR_{kt} = \sum_{k=1}^{n} AR_{kt} \tag{1.3}$$

In this study, the 3-day event window CAR [-1, +1] is used, specified as CAR3 in the rest of this chapter.

1.4.3.2. Cash flow uncertainty proxy

Several proxies of the cash flow uncertainty of the bidding firms are considered in this study. According to the previous literature, the general idea is to measure cash flow uncertainty directly by the standard deviation of cash flow of various kinds and at different levels. For example, cash flow risk is measured as the standard deviation of industry cash flow to book assets (Bates *et al.* 2009). Specifically, the standard deviation of cash flow to assets of the previous ten years is calculated for each firm-year in the sample, and the firm cash flow standard deviation of cash flow each year is then averaged across each two-digit SIC code. Similarly, Opler *et al.* (1999) introduce a variable, namely, industry sigma, to represent industry cash flow volatility. Specifically, the authors calculate the standard deviation of cash flow to net assets for each firm-year observation for the previous twenty-year period, and industry sigma is then calculated by averaging the firm's cash flow standard deviation across the two-digit SIC code. Notably, the cash flow in the above two studies is defined as earnings after interest, dividends, and taxes but before depreciation. In addition, Chay and Suh (2009) employ the standard deviation of the operating rate of return, which is defined as operating income scaled by total assets, in the most recent four fiscal years as a proxy of cash flow uncertainty.

Another method used in the literature to account for cash flow volatility is the coefficient of variation of a firm's cash flow in a past period. For example, Han and Qiu (2007) measure quarterly cash flow volatility as the coefficient of variation of the firm's operating cash flow in the previous 16 quarters (4 years), where the coefficient of variation of cash flow is calculated as the standard deviation of operating cash flow scaled by the absolute value of the mean over the same period. Kim and Sorensen (1986) use the same approach. Other studies also employ this method using quarterly data; see Albrecht and Richardson (1990); Minton and Schrand (1999).

Other measures used in the literature are also reviewed here. Bradley *et al.* (1984) and Stohs and Mauer (1996) use the standard deviation of the first difference in annual earnings scaled by the total assets value of the same period. Friend and Lang (1988) follow the same approach without calculating the first difference in earnings. Antoniou *et al.* (2008) and Dang (2013) calculate the difference between the first difference in annual earnings and its average value. Kane *et al.* (1985) use the standard deviation of the return of the market value of unlevered assets. Kester (1986) obtains ordinary least squares prediction of return on assets for each company and then uses the sum of squared residuals from these regressions as the volatility measure. Titman and Wessels (1988) employ the standard deviation of the percentage change in operating income over the whole sample period, which is nine years, to obtain an efficient measure. Lee and Moon (2011) calculate the standard deviation of return on sales with a minimum requirement on sales of as much as $2 million. The volatility of the past 10 years of profitability is also used (Strebulaev & Yang 2013). A more sophisticated estimation of operating cash flow volatility involves calculating the first difference in operating income deflated by net assets on a matrix of year dummies and then using the residual as the deviation of observed operating cash flow from its estimated value (De Veirman & Levin 2012; Keefe & Tate 2013; Keefe & Yaghoubi 2016; De Veirman & Levin 2018).

Notably, most methods employed in the previous literature all involve long-term cash flow uncertainty. Dating back to 2004, Campbell and Vuolteenaho (2004) decompose market return into the cash flow component and discount rate component and argue that cash flow shocks have significant covariance with stock returns. Following this rationale, asset price variation is also well explained by cash flow news (Garrett & Priestley 2012). Based on the same idea, the monthly standard deviation of stock return is employed to measure short-run cash flow uncertainty (Chay & Suh 2009). The authors argue that the stock price tends to fluctuate more when the firm is facing higher cash flow uncertainty.

In this chapter, the main objective of H2 is to study the impact of cash flow uncertainty on short-run announcement returns (CAR3), three long-run cash flow uncertainty proxies are constructed, following the method of Han and Qiu (2007), which is the coefficient of variation of the firm's operating cash flow. The rolling standard deviation of net cash flow from operating activities scaled by the absolute value of the mean over the same period is calculated. Specifically, 3-, 4-, and 5-year measurements are calculated and used to test H2. For H3, since the core variable of interest is operating performance, the method of Chay and Suh (2009) is followed; namely, the variation in operating rate of return is used to gauge cash flow uncertainty. Specifically, the operating rate of return is calculated as operating income scaled by total assets, while operating income after depreciation and operating income before depreciation are both employed. Then, the 3-year standard deviation in two measures of the operating rate of return is calculated. For H1, since the decision to initiate an acquisition should be determined by long-run cash flow uncertainty, all five long-term measurements used in H2 and H3 are tested in the logit model to predict the likelihood of a firm making at least one bid in a given year.

1.4.3.3. Operating performance measurement

Measures of operating performance documented in the literature are reviewed. In Harford (1999), operating performance is measured as cash flow return on assets, where cash flow is defined as operating cash flow net of proceeds from short-term investment and total assets value is market value of total assets, excluding cash and short-term investment. For either bidder or target, the cash flow return on assets is averaged over the pre-merger window [-4, -1], and the target's and bidder's operating performance numbers are then combined together with the weights based on their relative market values (Harford 1999). The regression used to study change in operating performance in the wake of a merger is

$$Postmerger\ Adj.CF/TA_i = b_0 + b_1 Premerger\ Adj.CF/TA_i + e_i \qquad (1.4)$$

The coefficient estimates of b_0 capture the improvement in the abnormal operating performance over the pre-merger to post-merger period, and coefficients of b_1 account for the continuation of the two firms' pre-merger operating performance. While Harford (1999) finds b_0 to be significantly negative, the same regression model indicates that b_0 is significantly positive for the highest 50 mergers over the period from 1979 to 1984, where the operating performance is measured by pre-tax operating cash flow scaled by the market value of assets (Healy *et al.* 1992). The authors define operating cash flow as sales minus cost of goods sold as well as selling and administrative expenses, plus goodwill expenses (Healy *et al.* 1992). Since cash flow is argued to be the actual economic benefit generated from assets, it has been widely used to measure operating performance in other studies. Notably, operating cash flow is argued to be optimal in measuring a firm's performance after a significant corporate event such as acquisition because it is not as easily manipulated as other accounting measurements, such as earnings (Erickson & Wang 1999; Lyon *et al.* 1999). Therefore, accruals of definitions of operating cash flow are employed (Ghosh 2001; Linn & Switzer 2001; Powell & Stark 2005).

In addition, there exists a discussion about the deflator used to scale operating cash flow. The deflator used most often in the literature is the market value of assets, which is argued to have two primary advantages: first, it reflects the productivity of a firm's assets in generating economic benefit more accurately than accounting measures, and second, it allows inter-temporal as well as cross-sectional comparison among firms. However, counter-arguments exist. Market value is a forward-looking measure, so it reflects the productivity of not only the assets in place but also the assets that the firm is expected to acquire (Barber & Lyon 1997). To modify this issue, some use the deflator in which estimates of the announcement period abnormal returns are subtracted from the market value of assets. The reason is that the announcement abnormal returns are the capitalization of any improvement in performance in an efficient market. However, this measure relies heavily on the efficient market assumption, which has been criticized, for example, investors always overestimate the potential gain from acquisitions (Jensen & Ruback 1983). Another modification is to use sales as a deflator (Ghosh 2001) since both sales and operating cash flow are income statement data (Barber & Lyon 1997). However, this measure is associated with another problem, which is that the asset's productivity is not directly tested since the firm can easily increase sales figures without expanding the asset base, for example, by performing a price reduction. The book value of assets seems to be a perfect solution to the above problems because it is the current value and is not affected by market perceptions; however, it is not applicable to U.S. data. The reason is that purchase accounting is used in the U.S. when a takeover is classified an as acquisition so that there is purchase goodwill representing a premium over the fair value in the balance sheet that is amortized over an extended period to the income statement. Goodwill has a negative effect on earnings but no effect on operating cash flow. Goodwill should not be reflected in the book value of assets when measuring the change in performance.

On the other hand, the operating cash flow measure could still be distorted by accounting rules adopted by firms. As a result, a pure cash flow measure, pre-depreciation profit adjusted for changes in working capital, is advanced so that the operating cash flow is not affected by interest, tax payments, the recognition of bad debts, and the accounting policies adopted on the valuation of inventories (Lawson 1985). Finally, measures other than operating cash flow include post-merger accounting profit represented by return on assets (ROA), return on equity (ROE), efficiency ratio, and operating costs per employee (Houston *et al.* 2001).

Five operating performance measurements are used in this study, namely, operating income before depreciation scaled by total assets, operating income before depreciation scaled by sales, operating income after depreciation scaled by total assets, operating income after depreciation scaled by sales, and ROA calculated as net income divided by total assets. Notably, because cash flow uncertainty proxies for H3 are standard deviations of two operating rates of return, which are derived from operating income before depreciation and operating income after depreciation, these two measures of cash flow uncertainty are matched with operating performance measures according to the operating income definitions in regressions of H3. Specifically, when the cash flow uncertainty is measured by the standard deviation of operating income before depreciation scaled by total assets, the operating performance measurement would be operating income before depreciation scaled by total assets, operating income before depreciation scaled by sales, and ROA. When the cash flow uncertainty is measured by the standard deviation of operating income after depreciation scaled by total assets, the operating performance measurement would be operating income after depreciation scaled by total assets, operating income after depreciation scaled by sales, and ROA.

1.4.3.4. Regression models

To test H1, the cumulative distribution function of the logit model used is

$$P(i,t) = 1/\left[1 + e^{-\beta \cdot x(i,t)}\right] \tag{1.5}$$

where $P(i,t)$ is the probability of firm i being an acquisition bidder in year t and $x(i,t)$ is the vector of control variables measured for firm i, which is identical to those used in the following OLS regressions for H2 and will be defined in the next section.

For the second hypothesis, the baseline model, which is used to test H2, is

$$CAR_i = \alpha + \beta_1 \cdot CFU_i + \lambda \cdot Controls_i + \varepsilon_i \tag{1.6}$$

where CFU_i represents the cash flow uncertainty of firm i and $Controls_i$ stands for control variables, which will be defined in the next section, for each sample firm.

To test H3, the methodology of Gao and Mohamed (2018) is followed:

$$OP_i^{Post} = \alpha + \beta_1 \cdot OP_i^{Pre} + \beta_2 \cdot HighCFU_i + \varepsilon_i \tag{1.7}$$

where OP_i^{Post} and OP_i^{Pre} are operating performance measures for firm i for the post- and pre-announcement periods, respectively. Specifically, OP_i^{Post} is the 12-month post-announcement operating performance measured by five operating performance variables defined as in the previous section. In addition, four different measurements of OP_i^{Pre} are employed. Due to the availability of data for target firms, the first two measurements concern the firm characteristics of acquirers incorporated into the pre-announcement operating performance. Specifically, OP_i^{Pre} is measured by the 12-month pre-announcement operating performance of the acquirers and the average of the first- and second-fiscal-year operating performance of the acquirers prior to the announcement. These two measurements of OP_i^{Pre} reduce the sample sizes to 10,460 deals and 9,199 deals, respectively. In addition, following Harford

(1999), pre-announcement operating performance is also calculated by averaging the bidder's and target's operating performance over the specific pre-announcement periods and then summing them up by the weights of their market values. In other words, OP_i^{Pre} is also calculated as the 12-month pre-announcement value-weighted operating performance of the acquirers and targets and the average of the first- and second-fiscal-year value-weighted operating performance of the acquirers and targets prior to the announcement. These two measurements, however, dramatically reduce the sample sizes to 1,164 deals and 1,014 deals, respectively. Considering the small sample size, they serve only as a robustness check. Considering that U.S. data is used, the year of merger, i.e., year 0, is excluded from the analysis to account for the difference between pooling and purchase accounting methods regarding the timing of consolidation as well as to mitigate the effect of inventory write-ups under the purchase method (Healy *et al.* 1992).

The dummy variable, $HighCFU_i$, takes the value of one if firm i's cash flow uncertainty is above the sample median and zero otherwise. Consequently, the coefficient β_2 represents the difference in operating performance between high- and low-cash flow volatility bidders. Notably, the inclusion of pre-announcement operating performance in the independent variables mitigates the potential endogeneity problem to a certain degree in that the operating performance is documented to be a function of firm characteristics, so regressing post-announcement operating performance on variables without controlling its pre-announcement counterpart could yield biased results.

1.4.3.5. Control variables

The following control variables are selected from the literature regarding their impact on the bidder's post-announcement returns. First, a set of variables accounting for acquirer characteristics is considered. Since corporate cash holdings are documented to have both a positive and a negative significant impact on the bidder's post-announcement performance (Smith & Kim 1994; Harford 1999; Gao & Mohamed 2018), *Cash reserve*, which is the cash holdings of the company plus any short-term investment, is included as a control variable. Maloney *et al.* (1993) find that the bidder's post-announcement returns are positively associated with the bidder's leverage and suggest that the reason is that the disciplining effect of debt mitigates the negative effect suggested by the free cash flow hypothesis. However, the cash effect is found to be different from the leverage effect since leverage has a positive but non-significant impact on the bidder's post-announcement returns (Harford 1999). On the other hand, some find that the acquirer's post-announcement returns are negatively related to leverage (Gao & Mohamed 2018). Consequently, *Leverage* is added to the regression as a control variable and is calculated as the ratio of total debt, which is long-term debt plus current debt, to total shareholder equity. In addition, *M/B*, which is the market-to-book value calculated four weeks before the announcement, is controlled to account for the valuation effect. Working capital, represented by

Working capital, is controlled for its potential effect on cash holdings and is calculated as working capital, as on a balance sheet, divided by total assets. Pre-announcement operating performance is also documented to have a significant impact on the acquirer's short-run post-announcement returns; therefore, *Operating profit*, which is calculated as operating income before depreciation scaled by total assets four weeks prior to the announcement, is taken into account. Following the argument that the acquirer's market value and deal value can explain a significant portion of post-announcement returns (Black *et al.* 2015), both *Bidder size*, which is the acquirer's market value measured four weeks before the deal announcement, and *Deal value* are included.

Second, along with *Deal value*, a series of deal characteristics are controlled. The form of payment is argued to have a significant effect on post-announcement returns; for example, Harford (1999) finds that the coefficients on the variable representing all cash payments are all significant and positive. Other studies find that stock payment has a significantly negative effect on long-run bidder performance (Andrade *et al.* 2001; Oler 2008), or at least in the conventional CAR, without purging the signalling effect of acquisitions (Golubov *et al.* 2016). Thus, two dummy variables, *Cash* and *Stock*, are examined. *Cash* takes the value of one if the deal is 100% paid in cash and zero otherwise. Similarly, *Stock* takes the value of one if the deal is 100% paid in stock and zero otherwise. The public status of the targets is reported to have a significant impact on determining the acquirer's post-announcement returns (Fuller *et al.* 2002; Moeller

2005); thus, the dummy variable *Public target* is assigned the value of one if the target firm is publicly listed. The dummy variable *Competing bid* takes the value of one if the deal has more than one bidder in the wake of its reported negative impact on CAR (Agrawal & Jaffe 2003). In terms of the significant role of acquisition attitudes (Mitchell & Lehn 1990; Servaes 1991), two dummy variables are constructed. *Friendly* and *Hostile* are assigned the value of one if a deal is classified as friendly or hostile, respectively. Given that a tender offer is documented to have a positive impact on the acquirer's post-announcement returns (Rau & Vermaelen 1998; Agrawal & Jaffe 2003), the dummy variable *Tender offer* takes the value of one if the deal is a tender offer and zero otherwise. Following the argument that diversifying acquisition provides the acquirer with negative abnormal returns (Gao & Mohamed 2018) that is outperformed by related acquisitions (Seth 1990), the dummy variable *Diversify* takes the value of one if the acquirer took over a target in a different industry.

1.4.3.6. Endogeneity

The potential endogeneity inherent in the main independent variable may cause biased estimates (Heij *et al.* 2004; Verbeek 2008; Wooldridge 2015); there is empirical support for the suggestion that two-stage least square (2SLS) can resolve this problem (Boudoukh & Richardson 1993). Therefore, this chapter follows the 2SLS method by identifying appropriate instrumental variables for proxies of cash flow uncertainty.

The literature notes that trading volume is positively associated with price volatility per se as well as the absolute value of price change (Karpoff 1987); therefore, trading volume in various forms is identified as a source of instrumental variables. First, the sequential arrival of information theory (Copeland 1976) asserts that the information shocks generated by the sequential arrival of new information cause an increase in both trading volume and stock price. This assertion is supported by numerous studies that find that new information is sequentially incorporated into the market, and uninformed traders cannot infer the existence of informed trading (Copeland 1977; Morse 1980; Jennings *et al.* 1981; Morse 1981; Jennings & Barry 1983). Second, according to the mixture of distribution hypothesis, price volatility and trading volume are positively correlated because they jointly depend on the rate of information flow to the market (Clark 1973). This theory is supported in a within-day trading context (Epps & Epps 1976) and in a cross-security framework that relaxes the assumption of a homogeneous process in which the rate of information flow prices securities (Harris 1986), among other studies such as Tauchen and Pitts (1983). Third, emphasizing trading generated by private information, the rational expectation asset pricing model suggests that risk-averse investors have heterogeneous beliefs in private information and investing opportunities; therefore, trading volume is accompanied by price changes because discounts are required against unknown private information (Wang 1994). Fourth, the difference of opinion model assumes that people holding common information have heterogeneous interpretations of the information; thus, trading occurs between responsive and unresponsive investors only when the accumulation of past information switches from favourable to unfavourable (Harris & Raviv 1993). Finally, other studies that find a correlation between trading volume and price changes argue that people are more likely to trade when trading volume is high (Admati & Pfleiderer 1988), that a dynamic relation exists between price volatility and volume (Campbell *et al.* 1993), and that including contemporaneous trading volume in technical analyses can explain stock price volatility significantly (Lamoureux & Lastrapes 1990). The relation between trading volumes and price changes is also confirmed in an international context consisting of nine major markets (Chen *et al.* 2001).

Overall, the injection of new information into the market while investors receive information and make their own interpretations generates trading and requires various rates of return, which in turn lead to price changes. The aforementioned studies suggest that the information change reflected in price volatility is correlated with the information associated with trading volume. Therefore, this chapter employs the rolling standard deviation of trading volume scaled by the average trading volume over the same period. This is contemporaneous to the period used to calculate the short-run cash flow uncertainty, which is measured as the rolling standard deviation of the stock price over various pre-announcement periods, as an instrumental variable. Specifically, to instrument 3-, 5-, and 10-day cash flow uncertainty, 3-, 5-, and 10-day rolling standard deviations of trading volume are employed and deflated by the mean value of the trading volume of each corresponding period.

In terms of the instrumental variables of long-term cash flow uncertainty proxies, *Current tax payable* and *Depreciation* are selected. *Current tax payable* is defined as the sum of the current income tax payable to the state and federal governments and foreign governments. *Depreciation* is defined as the sum of depreciation and amortization, as on the company's income statement. The rationale of choosing *Depreciation* is that both depreciation and amortization reflect a proportion of the historical cost for the acquiring company, and this past cost is negatively related to the disposable cash flow that the company could keep for operations, while the relation to the acquirer's announcement returns in the acquisition appears to be opaque. The reason for choosing *Current tax payable* is that this item reflects the tax policy that the acquiring company faces, and this policy could differ across states or depend on the acquirer's foreign operations. In addition, the income tax of the acquirer has not been found to have a significant impact on the announcement returns. For robustness, the average value of *Depreciation* and *Current tax payable* over the corresponding period used to calculate long-term cash flow uncertainty, namely, 3, 4, and 5 years prior to the announcement, are also used as instruments.

1.5. Results and Discussion

1.5.1. H1

The results of the logit estimation are given in Table 1.2. The dependent variable is a dummy variable that takes the value of one if the bidding firm announces at least one bid in a given year and zero otherwise. The core independent variable, namely*, cash flow uncertainty*, is five various long-term proxies defined in the previous section since the acquisition decision is argued to be related to long-term cash flow conditions rather than immediate short-term conditions prior to the announcement. Notably, when the cash flow uncertainty is measured by the standard deviation of the operating rate of returns over the 3 years prior to the announcement in Models (4) and (5), the operating profit is excluded from the control variables since it is calculated in the same way as the operating rate of return, i.e., operating income scaled by total assets.

[Insert Table 1.2 here]

The results indicated by the estimated coefficients of *Cash flow uncertainty* supports H1 in that the probability of initiating an acquisition is negatively related to the acquirer's pre-announcement cash uncertainty, given that all coefficient estimates are negative and highly significant (two at the 1% level and one at the 5% level). It is suggested that this result is consistent with precautionary theory, where managers of firms facing high cash flow uncertainty invest more carefully and are less likely to undertake major corporate investment activities such as acquisitions.

In addition, the estimated coefficients of *Cash reserve* are all positive across the five model specifications and are significant at 1%. The results are consistent with the free cash flow hypothesis that high cash reserve makes the firm more likely to initiate acquisitions (Harford 1999) and support the argument that cash reserve is positively related to a firm's subsequent acquisition spending (Opler *et al.* 1999).

In terms of control variables, the estimated coefficients of *Cash*, *Stock*, *Deal value*, and *Diversify* are all consistently positive and highly significant in the five model specifications. The results suggest that the payment methods (100% cash and 100% stock), and targets in an unrelated industry are positively associated with the probability of a firm initiating an acquisition. In addition, all the estimated coefficients on target performance measurement are positive and significant, and the estimated coefficients on target size proxy are all statistically insignificant. These findings is in line with the argument of Harford (1999) that the acquirer is more likely to make a bid on targets who own profitable operating performance, while the size of the target renders no significant effect on the acquirer's bidding decision. Finally, no leverage effect is detected in determining the likelihood of initiating a bid.

For robustness purposes, probit regressions are performed using the same set of dependent and independent variables as that used in the logit test, and the results are reported in Table 1.3.

[Insert Table 1.3 here]

The estimated coefficients of *Cash flow uncertainty* are all negative across the five model specifications; two are significant at the 1% level, and one is significant at the 5% level. The results are consistent with those obtained in logit regressions and lends support to H1 in that the acquirer's pre-announcement long-term cash flow uncertainty is negatively related to its probability of engaging in an acquisition bid.

The estimated coefficients of *Cash reserve* are similar to those in logit regressions in that they are all negative across all the model specifications. It is suggested here that although the free cash flow hypothesis in the context of M&As cannot be fully rejected from the perspective of cash reserve. The estimated coefficients of other independent variables remain unchanged from those in logit regressions.

1.5.2. H2

1.5.2.1. Univariate analysis

[Insert Table 1.4 here]

In Panel A, acquirers with high pre-announcement cash flow uncertainty earn CARs that are significantly higher, by as much as 1.5%, than those of their peers with low pre-announcement cash flow uncertainty. Panel B and Panel C provide consistent evidence that acquirers with high pre-announcement cash flow uncertainty significantly outperform others, although the magnitude of their superior CARs decreases. Overall, the univariate analysis is consistent with H2 in that the acquirer's pre-announcement cash flow uncertainty has a positive impact on its short-run announcement returns, at least when the full sample of acquirers is divided according to 3-, 5-, and 10-day pre-announcement cash flow uncertainty.

1.5.2.2. Multivariate analysis

The univariate analysis in the previous section appears to support H2; however, it is essential to assess the cross-sectional relation between the acquirer's short-term announcement returns and other deal and firm characteristics. Therefore, multivariate analysis is conducted to reveal these relations. Following the measurement derived by Han and Qiu (2007), which is the coefficient of variation of the firm's operating cash flow, three long-term proxies of cash flow uncertainty are adopted. Specifically, the rolling standard deviation of net cash flow from operating activities scaled by the absolute value of the mean over the same period is calculated for pre-announcement periods as long as 3, 4, and 5 years. Table 1.5 reports the results from OLS regressions, which are specified in Section 4.

[Insert Table 1.5 here]

The results indicate that the acquirer's pre-announcement cash flow uncertainty is positively associated with its short-run announcement returns, as is evident in the positive and significant estimates of coefficients across specifications (1) to (3). Specifically, Model (1) suggests that the average value of 3-year pre-announcement coefficient of variation of the firm's operating cash flow has a 13.92% effect on average 3-day cumulative abnormal returns[3]. Model (2) suggests that the average value of 4-year pre-announcement coefficient of variation of the firm's operating cash flow has a 10.10% effect on average CAR3. Model (3) implies that the average value of 5-year pre-announcement coefficient of variation of the firm's operating cash flow has a 15.00% effect on CAR3. Overall, a both statistically and economically significantly positive relation is confirmed. Furthermore, the estimated coefficients of *Cash reserve* are all positive in the three models and significant at 10% in the last two specifications, suggesting that high corporate holdings at least do not destroy value through acquisitions for the overall sample, which is contradictory to the findings of (Harford 1999). In conjunction, the above results lend direct support to H2 and are consistent with the precautionary hypothesis of corporate cash holdings in the context of M&As, which is that firms reserve more cash in response to high volatility in cash flows and then perform corporate investment more carefully and efficiently, as is evident in the high-CAR acquisitions they make.

In addition, the control variables also provide important findings. First, the use of 100% cash as the payment method is positively related to CAR3, given that the estimated coefficients of *Cash* are all positive and significant at the 1% level across the three specifications. This finding is consistent with a large body of literature demonstrating

[3] The economic significance is calculated following the mean value decomposition method proposed by Holgersson *et al.* (2014) for its additional power in explaining economic dynamics in comparison to individual regression parameters or *t*-tests and its greater applicability in comparison to other methods such as those of Green *et al.* (1978), Fabbris (1980), Budescu (1993), and Johnson (2000).

that cash payment increases the bidder's returns (Travlos 1987; Harford 1999, 2005) and total returns (Servaes 1991). One explanation is that using cash is a positive signal to the market that the bidding firm has a strong financial condition and high operating efficiency. On the other hand, the use of 100% stock as a payment medium is negatively related to CAR3 since the estimated coefficients of *Stock* are all negative in the three specifications, and one is significant at the 1% level, one at the 5% level, and one at the 10% level. This is also consistent with previous findings that stock payment is negatively related to the bidder's returns (Andrade *et al.* 2001), underperforms relative to cash-funded deals (Harford 2005), or at least is negative to the bidder's returns when the CAR is not purged from the acquisition's signalling effect (Golubov *et al.* 2016).

Second, the estimated coefficients of *Public target* are negative and significant at the 1% level across all three specifications, suggesting that acquiring a publicly listed target reduces the acquirer's announcement returns. This finding is consistent with Moeller *et al.* (2005) that buying public targets is significantly related to the bidder's negative returns in deals with large losses. Fuller *et al.* (2002) also document a negative relation between public targets and CAR, and the authors argue that this can be explained by the liquidity effect. Because public targets have greater attractiveness granted by open market trade, more feedback provided by professional arbitrageurs taking advantage of the disclosure requirement for public companies, and higher negotiation leverage entailed by larger firm size, acquirers can gain at best zero announcement returns for paying this ‘liquidity premium’ when acquiring public targets (Fuller *et al.* 2002).

Third, the estimated coefficients of *Tender offer* are all positive and significant at the 1% level in the three model specifications. This implies that deals in the form of tender offers provide acquirers with higher announcement returns, which is consistent with the prior literature demonstrating that tender offers provide higher bidder returns (Agrawal & Jaffe 2003) and outperform mergers regardless of whether the bidder is a glamour or value firm (Rau & Vermaelen 1998).

Fourth, the estimated coefficients of *Bidder size* are all negative and significant at the 1% level in the three model specifications. This suggests that larger bidders suffer from lower announcement returns, which is in line with the prior literature (Moeller *et al.* 2005; Minnick *et al.* 2011).

Finally, the results in Table 1.5 suggest that pre-announcement operating profit is positively related to announcement returns, and its coefficient estimates are significant at the 1% level in all model specifications. Working capital is negatively associated with announcement returns, and its estimated coefficients are significant at the 10% level. The coefficient estimates of *M/B* are statistically insignificant in all the specifications, suggesting that they are economically non-significant. The leverage effect is not detected in this study, given the non-significant coefficient estimates for

Leverage, which is consistent with (Harford 1999); however, it is inconsistent with other documented positive relations between leverage and announcement returns (Song & Walkling 2000; Moeller *et al.* 2005).

The aforementioned results support H2 in that the acquirer's pre-announcement cash flow uncertainty has a significant positive effect on the acquirer's short-run announcement returns. It is suggested that the management of high cash flow uncertainty companies is more precautionary so that they perform corporate investment more carefully and prudently, resulting in the selection of these positive CAR3 acquisitions. In addition, contradicting the free cash flow hypothesis that high cash reserve results in managers' value-destroying behaviour through acquisitions (Harford 1999), the estimated coefficients of *Cash reserve* show that corporate cash holdings are positively associated with the acquirer's short-run announcement returns, suggesting that the high cash reserve is at least not value-decreasing and even enhances shareholder value. While this is clear evidence that precautionary theory is dominant over agency theory for the overall sample in explaining the impact of corporate cash holdings on corporate investment in the form of acquisitions, whether there is absolutely no room for agency theory remains undiscovered. In other words, although acquirers facing high cash flow uncertainty choose value-enhancing acquisitions and cash reserve does not decrease firm value in these acquisitions, it is ambiguous whether managers display no agency behaviours in using the corporate cash reserve when performing investment. Consequently, while other variables remain unchanged, an interaction term, *CFU * Cash reserve*, which is defined as the multiple of *Cash flow uncertainty* and *Cash reserve*, is included in the regression to study whether the precautionary motive of the management in facing high cash flow uncertainty is reinforced or diluted by the corporate cash reserve. Table 1.6 presents the results.

[Insert Table 1.6 here]

In Table 1.6, the results of the estimated coefficients of *Cash flow uncertainty* are unchanged from those in Table 1.5. In other words, they are all positive and statistically significant at the 1% level, while the magnitude increases with the extension of the pre-announcement period used to calculate cash flow uncertainty. Further, after considering the interaction between cash reserve and cash flow uncertainty, the positive effect of corporate cash holdings on short-run announcement returns is reinforced in that coefficient estimates of cash reserve in Model (2) and Model (3) experience an increase in significance level from that shown in Table 1.5. In conjunction, these results suggest that the precautionary explanation proposed above is still supported.

The estimated coefficients of *CFU * Cash reserve* are all negative and significant at (or marginally at) the 1% level when cash flow uncertainty is calculated over three various periods prior to the announcement. Additionally, they display the same trend in magnitude as that of the coefficient estimates of *Cash flow uncertainty*; in other words, the longer the period before the announcement used to derive cash flow uncertainty, the greater the effect on short-run announcement returns. It is evident that the precautionary motive in the performance of corporate investment suggested above is still dominant; however, it decreases after considering the inter-relationship between cash flow uncertainty and cash reserve. Specifically, in Model (1), a one-unit increase in 3-year pre-announcement cash flow uncertainty results in a 0.26% increase in CAR3; however, this effect decreases by 0.06% with every unit increase in the log value of cash reserve. In Model (2), a one-unit increase in 4-year pre-announcement cash flow uncertainty results in a 0.27% increase in CAR3, while this effect decreases by 0.07% with every unit increase in the log value of cash reserve. The same pattern is displayed in Model (3), a one-unit increase in 5-year pre-announcement cash flow uncertainty results in a 0.30% increase in CAR3, while this effect decreases by 0.07% with every unit increase in the log value of cash reserve. Overall, the results in Table 1.6 demonstrate that although managers of firms facing high cash flow uncertainty are dominated by the precautionary motive in performing corporate investment, where they choose value-enhancing acquisitions, they still display a certain degree of agency behaviour in that the effect of the precautionary motive effect is weakened by the level of corporate cash holdings, even though cash reserve per se does not destroy value through acquisitions. This is partly consistent with the free cash flow hypothesis (Jensen 1986), especially in the context of M&As (Smith & Kim 1994; Harford 1999), in that firms would suffer from the agency problem if they had a high level of internal cash. However, it is not the dominant effect and does not waive the value-enhancing acquisition behaviour explained by the precautionary motive in general.

The results obtained from other control variables remain unchanged from those in Table 1.5; in other words, *Cash*, *Tender offer*, and *Operating profit* are positively related to CAR3, and *Stock*, *Public target*, *Working capital*, and *Bidder size* are negatively related to CAR3.

In summary, it is suggested that the precautionary motive encourages managers of firms facing volatile cash flows to choose value-increasing acquisitions, while corporate cash holdings per se do not destroy shareholder value. The aforementioned findings based on long-term pre-announcement cash flow uncertainty strongly support precautionary theory (Keynes 1937; Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009; Gao & Mohamed 2018) and contradict findings supporting free cash flow theory in the context of M&As (Smith & Kim 1994; Harford 1999). However, management agency behaviour is also detected, since the coefficient estimates of *CFU * Cash reserve* are all negative and highly significant. In line with the explanation provided above, it is argued here that while the precautionary principle is the dominant underlying motive of management when performing corporate investment, the agency problem still exists in the investment process since the effect of the precautionary motive on announcement is weakened by the level of cash reserve.

1.5.3. H3

As outlined in the methodology section, the pre-announcement operating performance is measured over two periods, namely, the 12-month period prior to the announcement and the 2-year period before the announcement. For each period, the main test concerns only the acquirer's pre-announcement operating performance, which serves as a function of the acquirer's pre-announcement firm characteristics. The target's pre-announcement operating performance is considered in robustness tests.

1.5.3.1. Univariate analysis

The data availability for two different acquirers' pre-announcement operating performance calculation periods reduces the total samples to 10,458 and 9,200 deals. Therefore, the univariate analysis results are presented separately in Tables 1.9 and 1.10 below.

[Insert Table 1.9 here]

In Panel A, when the full sample is divided according to the 3-year standard deviation of operating income after depreciation scaled by total assets, it is evident that acquirers with high pre-announcement cash flow uncertainty gain significantly higher 12-month post-announcement operating returns, regardless of the measurement of operating performance employed. In Panel B, where the full sample is split according to the 3-year standard deviation of operating income before depreciation scaled by total assets, acquirers with higher pre-announcement cash flow uncertainty outperform others when the operating performance is measured by *OP1* and *OP2*, which are calculated as operating income before depreciation divided by total assets and sales, respectively. However, when ROA is concerned, the outperformance loses significance. Overall, Table 1.9 suggests evidence in line with H3 in that the acquirer's preannouncement cash flow uncertainty is positively associated with its post-announcement operating performance.

[Insert Table 1.10 here]

The difference between Table 1.10 and Table 1.9 lies in the sample selection. Due to the stricter data requirement, which is two-year pre-announcement acquirer characteristics, the sample reflected by Table 1.10 is smaller. However, both Panel A and Panel B provide evidence consistent with H3. In terms of two measures of cash flow uncertainty and three corresponding measures of post-announcement operating performance for each proxy of cash flow uncertainty, acquirers with high cash flow uncertainty prior to the announcement significantly outperform their low cash flow uncertainty peers.

1.5.3.2. Multivariate analysis

Following the argument that operating performance itself is a function of firm characteristics and that the inclusion of firm characteristics as control variables can cause endogeneity problems (Healy *et al.* 1992), pre-announcement operating performance is inserted into the regression as the only control variable reflecting the impact of all firm-level factors. This method is consistent with the specifications used to study the evolution of operating performance around announcements (Healy *et al.* 1992; Harford 1999; Powell & Stark 2005; Gao & Mohamed 2018).

First, the acquirer's 12-month pre-announcement operating performance is controlled. The OLS regression results are presented in Table 1.11.

[Insert Table 1.11 here]

In Panel A, when cash flow uncertainty is measured by the 3-year standard deviation of operating income after depreciation scaled by total assets, the estimated coefficients of *High cash flow uncertainty* are all positive and significant at the 1% level across the three model specifications. Specifically, over the 12 months subsequent to announcement, in Model (1), acquirers with high pre-announcement cash flow uncertainty outperform their low cash flow uncertainty peers by 17.3 percentage points in terms of operating income after depreciation scaled by total assets; Model (2) suggests an outperformance of as much as 79.91 percentage points in terms of operating income after depreciation scaled by sales; and Model (3) implies an outperformance as high as 11.05 percentage points regarding ROA.

Furthermore, the estimated coefficients of *Pre-announcement 12-month acquirer OP* are all positive and highly significant (at the 1% level) in the three models, suggesting that the acquirer's pre-announcement operating performance can well account for variation in the acquirer's post-announcement operating performance, consistent with the prior literature (Healy *et al.* 1992; Gao & Mohamed 2018). Finally, the constant term in the regression function arguably represents the change in abnormal operating performance following announcement (Healy *et al.* 1992). Therefore, given that all constant terms in the three model specifications are significantly positive, it is argued that acquisitions in the present sample are value-enhancing investments. This finding is in line with previous studies (Andrade *et al.* 2001; Houston *et al.* 2001; Linn & Switzer 2001; Gao & Mohamed 2018); it is also contradictory to the free cash flow hypothesis (Jensen 1986; Herman & Lowenstein 1988; Harford 1999; Freund *et al.* 2003) and suggests that acquisitions are associated with negative post-announcement operating performance (Dickerson *et al.* 1997; Guest *et al.* 2010).

In Panel B, where the cash flow uncertainty is measured by the 3-year standard deviation of operating income before depreciation scaled by total assets, the results are largely consistent with the results shown in Panel A. Specifically, the estimated coefficient of the *High cash flow uncertainty dummy* in Model (1) is 0.1096 and is significant at the 1% level, suggesting an outperformance as large as 10.94 percentage points by acquirers with high pre-announcement cash flow uncertainty over their low cash flow uncertainty peers in terms of operating income after depreciation scaled by total assets. This coefficient estimate increases to 0.8618 and is still significant at the 1% level in Model (2), implying an 86.18 percentage point outperformance in terms of operating income after depreciation scaled by sales. Unlike the results shown in Panel A, however, the estimated coefficient loses significance when the operating performance is measured by ROA, even though it is positive.

In terms of *Pre-announcement 12-month acquirer OP* and the constant term, the results are similar to those shown in Panel A. Since the estimated coefficients of *Pre-announcement 12-month acquirer OP* and *Constant* are positive and significant at the 1% level in all model specifications, it is argued that the pre-announcement acquirer's operating performance captures the variation in post-announcement operating performance well, and acquisitions increase firm value through elevated operating performance subsequent to announcements.

Second, the acquirer's 2-year pre-announcement operating performance is controlled. The OLS regression results are presented in Table 1.12.

[Insert Table 1.12 here]

In Panel A, when the cash flow uncertainty is measured by the 3-year standard deviation of operating income after depreciation scaled by total assets, the coefficient estimates on the *High cash flow uncertainty dummy* are all positive and significant (two at the 1% level and one at the 5% level). The implied outperformance by acquirers with high pre-announcement cash flow uncertainty ranges from 23.31 to 59.03 percentage points across various measurements of operating performance. In Panel B, when the cash flow uncertainty is measured by the 3-year standard deviation of operating income before depreciation deflated by total assets, the estimated coefficients of the *High cash flow uncertainty dummy* are all positive and significant at the 1% level in the three model specifications. Economically, the outperformance of acquirers with high pre-announcement cash flow uncertainty ranges from 21.36 to 67.28 percentage points depending on different measurements of operating performance. Furthermore, the coefficient estimates on *Pre-announcement 2-year average acquirer OP* and *Constant* are consistent with the results when only the acquirer's 12-month pre-announcement characteristics are controlled; in other words, the pre-announcement operating performance can explain the post-announcement operating performance well, and the acquisition is a value-enhancing investment activity.

Overall, the regressions conducted above strongly support H3. A clear significant and positive relation between the acquirer's pre-announcement cash flow uncertainty and its post-announcement operating performance is documented. In conjunction with the results obtained for H2, in which the acquirer's pre-announcement cash flow uncertainty is positively associated with its short-run announcement returns, it is suggested here that managers of firms facing highly volatile operating cash flow invest more precautionarily and efficiently, which is reflected in the positive-CAR acquisitions they choose. Furthermore, these value-enhancing acquisitions not only provide positive financial performance in the short period subsequent to the announcement but also manifest managers' value-increasing choice of investment through long-run post-announcement operating performance.

1.5.3.3. Robustness tests

The aforementioned multivariate analysis regarding H3 controls only the acquirer's pre-announcement operating performance over two pre-announcement periods, namely, 12 months and 2 years. This section will perform the same multivariate tests over the same two periods; however, both the acquirer's and the target's pre-announcement operating performance will be controlled. Related firm characteristics are calculated as the market value-weighted sum of the acquirer and the target. These tests serve as a supplement to the main tests in the previous sections due to the dramatic reduction in the sample size, which is caused by the limited availability of target data.

First, the acquirer's and the target's 12-month pre-announcement operating performance is controlled. The OLS regression results are presented in Table 1.13.

[Insert Table 1.13 here]

In Panel A, when the cash flow uncertainty is measured by the 3-year standard deviation of operating income after depreciation scaled by total assets, the coefficient estimates on the *High cash flow uncertainty dummy* are positive when operating performance is measured by *OP3* and *OP4*; however, they are statistically non-significant. When the operating performance is represented by ROA, the coefficient estimate is even negative but still not significant (*p*-value=0.378). Therefore, the results from Panel A do not show any significant relation between high pre-announcement cash flow uncertainty and post-announcement operating performance.

In Panel B, where the cash flow uncertainty is measured by the 3-year standard deviation of operating income before depreciation scaled by total assets, the estimated coefficients of the *High cash flow uncertainty dummy* are positive across all three model specifications. Notably, the estimate coefficient is significant at the 10% level when the operating performance is represented by *OP1*, which is the operating income before depreciation scaled by total assets. The acquirer with high pre-announcement cash flow uncertainty outperforms its low cash flow uncertainty peers by 8.52 percentage points. This is arguably supportive, though weakly significant, evidence for H3.

Furthermore, in both Panels A and B, the results regarding pre-announcement value-weighted operating performance and constant term are consistent with those in the previous section.

Second, the acquirer's and the target's 2-year pre-announcement operating performance is controlled. The OLS regression results are presented in Table 1.14.

[Insert Table 1.14 here]

In both Panels A and B, the estimated coefficients of the *High cash flow uncertainty dummy* are statistically non-significant, which at best suggests that the high pre-announcement cash flow uncertainty is not value-destroying. Nevertheless, this argument presents no contradiction to H3. In addition, except for the case in which operating performance is measured by ROA, pre-announcement operating performance is still positively and significantly related to post-announcement operating performance. Finally, all six estimated coefficients of abnormal operating performance (represented by the constant term) are positive and highly significant (five at the 1% level and one at the 5% level), so the conclusion that the acquisition improves firm value is still not waived.

In summary, the robustness checks do not deteriorate the supportive conclusion regarding H3 drawn from the previous section and even provide consistent evidence in certain circumstances. In addition, the results regarding the value-enhancing nature of the acquisition are not altered. Considering the small sample size and low adjusted R square, it is argued that the robustness tests in this section serve merely as supplementary evidence.

1.5.4. Endogeneity tests

According to the analysis of endogeneity inherent in the cash flow uncertainty proxies and instrumental variables identified in the previous section, 2SLS regressions are performed to test the impact of cash flow uncertainty proxies, which are instrumented by (1) depreciation, (2) the average value of depreciation over the same period which is used to calculate long-run cash flow uncertainty, (3) income tax payable, and (4) the average value of income tax payable over the same period which is used to calculate cash flow uncertainty, on the acquirer's announcement returns. Tables 1.16 to 1.19 report these regression results in the sequence of the four instrumental variables used.

[Insert Table 1.16 here]

[Insert Table 1.17 here]

[Insert Table 1.18 here]

[Insert Table 1.19 here]

The results are consistent with those obtained in the previous section regarding long-term pre-announcement cash flow uncertainty. Specifically, the estimated coefficients of proxies of long-term cash flow uncertainty are positive in all models and significant in most of them. In addition, the estimated coefficients of *Cash reserve* provide consistent evidence that a high volume of corporate cash holdings does not destroy shareholder value, which contradicts prevailing views such as those of Harford (1999) and Smith and Kim (1994).

Overall, after considering the endogeneity problem of cash flow uncertainty, the main conclusion of this chapter, that the acquirer's pre-announcement cash flow uncertainty has a significant and positive effect on its announcement returns, remains robust. Higher cash flow uncertainty encourages managers to perform corporate investment more efficiently, which supports precautionary theory. In addition, contradictory evidence can be found regarding the corporate cash reserve effect on the acquirer's announcement returns, which is that high cash holdings do not decrease firm value through acquisitions and even help to enhance the acquisition returns because they are built due to the precautionary motive against high cash flow uncertainty.

1.6. Conclusion

This chapter examines three aspects of the relation between the acquirer's pre-announcement cash flow uncertainty and its post-announcement performance, namely, short-run announcement financial returns, long-run operating performance, and the probability of the firm engaging in the bid. On the basis of a comprehensive dataset, the empirical results indicate that the acquirer's pre-announcement cash flow uncertainty has a significantly positive effect on both the acquirer's short-run announcement stock returns and long-term post-announcement operating performance, which is consistent with precautionary theory (Keynes 1937) in that managers of firms facing highly volatile cash flow invest more carefully and efficiently, at least in the context of M&As. In addition, the likelihood of an acquirer initiating one or more bids in a year is negatively related to its pre-announcement long-term cash flow uncertainty, which is also supportive of precautionary theory.

H1 concerns the relation between the acquirer's pre-announcement cash flow uncertainty and its probability of engaging in an acquisition in a given year. The results lend support to H1, and the relation is significantly negative. Thus, precautionary theory is supported since precautionary managers who face volatile cash flow are more careful when performing large corporate investments such as acquisitions. Consequently, they are less likely to engage in an acquisition.

H2 proposes that acquirers facing higher pre-announcement cash flow uncertainty will earn greater abnormal returns around the announcement. The empirical results support this proposition for both short-run and long-run pre-announcement cash flow uncertainty measures. In particular, when considering the interaction between cash reserve and pre-announcement cash flow uncertainty, the results remain unchanged and even experience an increased significance level. Therefore, the results are consistent with precautionary theory in explaining management behaviour in performing corporate investment, i.e., managers facing more volatile cash flow will invest more efficiently and increase shareholder value. However, the positive relation between cash flow uncertainty and the announcement returns is weakened by the amount of corporate cash holdings, suggesting that the agency problem in investing cannot be completely ruled out.

H3 proposes that the acquirer's high pre-announcement cash flow uncertainty is related to its long-term post-announcement operating performance. This relation is also supported empirically in that 12-month post-announcement operating performance is significantly positively related to the pre-announcement bidder's cash flow uncertainty at the 1% level, regardless of the pre-announcement period chosen and the operating performance measurements selected. This further supports H2. The acquirer's increased CAR due to higher pre-announcement cash flow uncertainty is manifested by the operating performance in the long term subsequent to the announcement.

In addition, control variables provide meaningful implications in cross-sectional tests. *Cash* suggests that the use of 100% cash as an acquisition payment method can significantly improve the announcement acquirer's gain, which is consistent with many previous studies (Travlos 1987; Servaes 1991; Harford 1999, 2005). One explanation is that the use of cash signals to the market that the acquirer's financial and operational condition is good. *Stock* is negatively related to announcement, which may be explained as the market perceiving that the acquirer is exploiting the overvalued equity as a payment medium and consequently reacting negatively to the acquisition (Shleifer & Vishny 2003; Rhodes-Kropf & Viswanathan 2004). *Public target* is also negatively associated with the acquirer's announcement returns and can be justified by the liquidity effect since public targets enjoy higher leverage in acquisition negotiations due to their larger size granted by the open market (Fuller *et al.* 2002). *Tender offer* is positively associated with the acquirer's announcement returns, which is consistent with the prior literature (Rau & Vermaelen 1998; Agrawal & Jaffe 2003). *Bidder size*, in line with previous studies, is negatively related to the bidder's announcement returns (Minnick *et al.* 2011). Finally, *Operating profit* positively and significantly explains the acquirer's announcement returns, suggesting that the ability to generate operating income is positively valued by the market.

In conclusion, first, managers facing highly volatile cash flows are less likely to engage in acquisitions. While lending support to precautionary theory in that precautionary managers invest more carefully and prudently, this finding is contradictory to the hubris hypothesis (Roll 1986) and free cash flow hypothesis (Jensen 1986), which suggest that managers are overconfident in using cash reserves in value-decreasing projects. Second, the empirical study in this chapter finds that the acquirer's pre-announcement cash flow uncertainty is positively related to its short-run announcement returns. It is suggested that this finding supports precautionary theory, where managers facing highly volatile operating cash flows behave more precautionarily and perform corporate investment more efficiently, consequently choosing acquisitions that are positively valued by the market. In addition, corporate cash reserve is found to be positively related to the acquirer's short-run announcement returns. While this positive association is statistically significant in most cases, it is not reverted to in those non-significant specifications, suggesting that the corporate cash holdings are definitely not value-destroying in acquisitions and even enhance firm value in certain circumstances. This finding directly contradicts some previous studies reporting that corporate cash reserve is negatively related to the bidder's announcement returns (Lang *et al.* 1991; Smith & Kim 1994; Harford 1999), which is consistent with the free cash flow hypothesis in that managers holding high cash reserves engage in value-decreasing activities (Jensen 1986). In addition to the precautionary explanation, the results can be justified under the framework of risk and return. Firms facing high idiosyncratic risk are subject to a high degree of uncertainty in valuation (Pástor & Pietro 2003), and the result of this wide divergence in valuation opinions is that the firm will be highly valued by the market as long as the optimistic minority has enough absorption ability (Miller 1977). Since cash flow uncertainty captures the acquirer's idiosyncratic risk, consequently, in the context of acquisitions, the value of the bidder with higher cash flow uncertainty is justified by the market via the bidder's engagement in deals providing positive abnormal returns.

However, the positive impact of the acquirer's pre-announcement cash flow uncertainty on the acquirer's announcement returns is weakened after considering the interaction between the cash reserve and cash flow uncertainty. This suggests that the agency problem inherent in acquisitions is not completely ruled out. Although the cash reserve per se does not destroy shareholder value through acquisitions, it does have a negative impact on announcement returns by reducing the precautionary motive reflected in cash flow uncertainty's positive effect on the announcement returns. This chapter suggests that managers facing volatile operating cash flows are indeed encouraged by precautionary motives (Keynes 1937; Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009) when performing large corporate investments in the form of acquisitions; however, they also display a certain degree of agency behaviour, which is inefficient use of cash reserves (Harford 1999). Third, the positive effect of the acquirer's pre-announcement cash flow uncertainty on its short-term announcement returns is manifested through long-term post-announcement operating performance. This further supports the above explanation in that the combined firm is operated efficiently by managers encouraged by precautionary motives.

This chapter contributes to the literature in the following ways. First, the previous studies regarding the effect of uncertainty on acquisition characteristics focus on market-level divergence of opinion (Miller 1977; Asquith 1983; Chatterjee *et al.* 2012; Bhagwat *et al.* 2016; Li & Tong 2018). This chapter links a certain type of firm-level uncertainty to acquisition characteristics, namely, cash flow uncertainty and announcement returns. By documenting that managers facing a higher level of cash flow uncertainty invest more efficiently and choose value-enhancing acquisitions, this study yields meaningful implications for individual firms in analysing their forthcoming acquisitions or making decisions about large corporate investments in general. Second, this study finds evidence opposite to the prevailing agency theory in explaining managers' behaviour in acquisitions. Previous studies generally support the free cash flow hypothesis in that managers use high cash reserves unwisely and decrease shareholder value (Harford 1999). However, in line with the most recent emerging counter-argument, as in Gao and Mohamed (2018), this study finds direct evidence that cash reserves do not destroy firm value through acquisitions. Although it is noted that a high cash reserve still produces room for agency behaviour, as reported by studies supporting the free cash flow hypothesis, the precautionary motive generally dominates. In other words, the agency behaviour does not destroy shareholder value through acquisitions in aggregate.

1.7. Tables for Chapter 1

Table 1. 1 – Summary statistics

This table displays summary statistics on acquirer and deal characteristics. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. Acquirer characteristics include cash reserve, market-to-book ratio, leverage, working capital, operating profit, and acquirer size. Working capital and operating profit are deflated by total assets. Deal characteristics include payment method (cash and stock), public target, competing bid, deal attitude (friendly and hostile), tender offer, diversifying deal, and deal value. Cash reserve, working capital, and deal value are taken natural log. The sample is divided into two groups (Low and High) based on acquirer's pre-announcement cash flow uncertainty which is three-day standard deviation in stock price. All continuous variables are winsorized at the 1% and 99% levels. Student's t-tests are conducted to test differences between means for acquirers with high and low pre-announcement cash flow uncertainty. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	**Pre-announcement cash flow uncertainty**		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Acquirer Characteristics					
CASHRESERVE	mean	3.672	4.185	3.444	0.740***
	n	10746	3309	7437	
M/B	mean	3.978	5.459	3.32	2.139***
	n	10827	3328	7499	
Leverage	mean	0.268	0.256	0.273	-0.016***
	n	10827	3328	7499	
Working Capital	mean	-1.479	-1.463	-1.486	0.022
	n	10031	3099	6932	
Operating Profit	mean	0.126	0.139	0.121	0.019***
	n	10827	3328	7499	
Bidder Size	mean	6.687	7.457	6.345	1.111***
	n	10827	3328	7499	
Deal Characteristics					
Cash	mean	0.329	0.311	0.337	-0.026***
	n	10827	3328	7499	
Stock	mean	0.137	0.198	0.11	0.088***
	n	10827	3328	7499	
Public Target	mean	0.143	0.195	0.12	0.075***
	n	10827	3328	7499	
Competing Bid	mean	0.008	0.01	0.008	0.002
	n	10827	3328	7499	
Friendly	mean	0.994	0.993	0.994	0.000

	n	10827	3328	7499	
Hostile	mean	0.002	0.002	0.002	0.000
	n	10827	3328	7499	
Tender Offer	mean	0.04	0.047	0.037	0.010**
	n	10827	3328	7499	
Diversify	mean	0.393	0.398	0.391	0.007
	n	10827	3328	7499	
Deal Value	mean	3.762	4.439	3.462	0.978***
	n	10827	3328	7499	

Table 1. 2 – Logit regressions of acquirer's likelihood of engaging into acquisitions on long-term pre-announcement cash flow uncertainty

The table reports Logit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively; and is the standard deviation of operating rate of return, *sdORR1* and *sdORR2*, calculated as operating income after, and before depreciation deflated by total assets over 3-year prior announcement in specification (4) and (5), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
	OANCF	OANCF1	OANCF2	sdORR1	sdORR2
Cash flow uncertainty	-0.0217**	-0.0121	-0.0020	-1.7184***	-1.8280***
	(0.041)	(0.233)	(0.828)	(0.000)	(0.000)
Cash reserve	0.1094***	0.1105***	0.1121***	0.1245***	0.1244***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cash	0.3102***	0.3119***	0.3139***	0.2745***	0.2749***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock	0.1866**	0.1866**	0.1854**	0.1906**	0.1895**
	(0.032)	(0.032)	(0.033)	(0.022)	(0.022)
Public Target	0.0898	0.0937	0.0987	0.0845	0.0868
	(0.824)	(0.816)	(0.807)	(0.826)	(0.821)
Competing Bid	-0.0648	-0.0650	-0.0654	-0.0522	-0.0536
	(0.635)	(0.635)	(0.633)	(0.688)	(0.680)
Friendly	0.1410	0.1399	0.1382	0.1300	0.1323

	(0.675)	(0.677)	(0.682)	(0.684)	(0.678)
Hostile	0.5260	0.5236	0.5202	0.4788	0.4803
	(0.212)	(0.215)	(0.218)	(0.231)	(0.229)
Tender offer	0.0539	0.0553	0.0567	0.0507	0.0534
	(0.488)	(0.477)	(0.466)	(0.492)	(0.469)
Diversify	0.1858***	0.1864***	0.1859***	0.1526**	0.1525**
	(0.005)	(0.005)	(0.005)	(0.015)	(0.015)
Deal value	0.4500***	0.4492***	0.4474***	0.3441**	0.3437**
	(0.004)	(0.004)	(0.004)	(0.021)	(0.021)
M/B	0.0035	0.0035	0.0035	0.0097**	0.0099**
	(0.461)	(0.460)	(0.464)	(0.040)	(0.036)
Leverage	0.0524	0.0497	0.0456	0.0479	0.0483
	(0.541)	(0.562)	(0.594)	(0.562)	(0.559)
Target performance	0.0032*	0.0031*	0.0030*	0.0012**	0.0012**
	(0.065)	(0.070)	(0.074)	(0.046)	(0.045)
Target size	-0.0434	-0.0429	-0.0423	-0.0412	-0.0401
	(0.195)	(0.201)	(0.207)	(0.195)	(0.206)
Constant	-2.6510***	-2.6678***	-2.6874***	-2.4927***	-2.4982***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	10827	10827	10827	10827	10827

Table 1. 3 – Probit regressions of acquirer's likelihood of engaging into acquisitions on long-term pre-announcement cash flow uncertainty

The table reports Probit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively; and is the standard deviation of operating rate of return, *sdORR1* and *sdORR2*, calculated as operating income after, and before depreciation deflated by total assets over 3-year prior announcement in specification (4) and (5), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**
	OANCF	OANCF1	OANCF2	sdORR1	sdORR2
Cash flow uncertainty	-0.0125**	-0.0075	-0.0013	-1.0417***	-1.1067***
	(0.036)	(0.200)	(0.810)	(0.000)	(0.000)
Cash reserve	0.0658***	0.0664***	0.0673***	0.0741***	0.0740***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cash	0.1811***	0.1820***	0.1833***	0.1596***	0.1599***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock	0.1105**	0.1105**	0.1097**	0.1137**	0.1131**
	(0.030)	(0.030)	(0.032)	(0.019)	(0.020)
Public Target	0.0506	0.0524	0.0550	0.0476	0.0489
	(0.829)	(0.823)	(0.815)	(0.831)	(0.827)
Competing Bid	-0.0415	-0.0415	-0.0417	-0.0340	-0.0349
	(0.606)	(0.606)	(0.605)	(0.657)	(0.649)

Friendly	0.0828	0.0820	0.0808	0.0777	0.0789
	(0.673)	(0.677)	(0.682)	(0.677)	(0.672)
Hostile	0.3151	0.3138	0.3117	0.2878	0.2886
	(0.203)	(0.205)	(0.209)	(0.220)	(0.218)
Tender offer	0.0333	0.0340	0.0349	0.0315	0.0331
	(0.466)	(0.457)	(0.446)	(0.469)	(0.446)
Diversify	0.1116^{***}	0.1120^{***}	0.1117^{***}	0.0924^{**}	0.0925^{**}
	(0.004)	(0.004)	(0.004)	(0.012)	(0.012)
Deal value	0.2490^{***}	0.2484^{***}	0.2475^{***}	0.1874^{**}	0.1875^{**}
	(0.006)	(0.006)	(0.006)	(0.028)	(0.028)
M/B	0.0017	0.0017	0.0017	0.0053^{*}	0.0055^{*}
	(0.548)	(0.542)	(0.549)	(0.058)	(0.052)
Leverage	0.0275	0.0264	0.0238	0.0284	0.0284
	(0.584)	(0.600)	(0.636)	(0.557)	(0.556)
Target performance	0.0013^{***}	0.0012^{**}	0.0011^{**}	0.0001^{*}	0.0002^{*}
	(0.010)	(0.016)	(0.021)	(0.089)	(0.089)
Target size	-0.0237	-0.0233	-0.0230	-0.0226	-0.0220
	(0.223)	(0.230)	(0.237)	(0.221)	(0.233)
Constant	-1.5555^{***}	-1.5639^{***}	-1.5751^{***}	-1.4616^{***}	-1.4651^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	10827	10827	10827	10827	10827

Table 1. 4 – Univariate analysis

This table reports acquirer's value-related measures on the sample of 10827 deals. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on four short-run cash flow uncertainty measures. Specifically, 3-, 5-, and 10-day pre-announcement stock price volatility are employed in Panel A to Panel C, respectively. Market-adjusted model is employed to calculate cumulative abnormal returns, where the abnormal return is calculated as the difference between actual firm return and the Standard & Poor's 500 index return. CAR [-1, +1] represent cumulative abnormal returns (CARs) to acquirers during the 3-day event window around the announcement date. The 3-day CAR is winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Pre-announcement cash flow uncertainty		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A: 3-day					
3-day CAR	mean	0.007	0.017	0.002	0.015***
	n	10827	3328	7499	
Panel B: 5-day					
3-day CAR	mean	0.007	0.016	0.003	0.013***
	n	10827	3335	7492	
Panel C: 10-day					
3-day CAR	mean	0.007	0.009	0.005	0.004***
	n	10827	3275	7552	

Table 1. 5 – OLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty

The table reports OLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0012***	0.0008*	0.0011***
	(0.007)	(0.076)	(0.010)
Cash reserve	0.0004	0.0004	0.0004
	(0.448)	(0.483)	(0.489)
Cash	0.0043***	0.0043***	0.0043***
	(0.001)	(0.001)	(0.001)
Stock	-0.0022	-0.0022	-0.0021
	(0.230)	(0.242)	(0.246)
Public Target	-0.0178***	-0.0178***	-0.0178***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0014	-0.0014	-0.0014
	(0.830)	(0.836)	(0.831)
Friendly	-0.0155*	-0.0155*	-0.0155*
	(0.065)	(0.065)	(0.065)
Hostile	-0.0131	-0.0132	-0.0132
	(0.434)	(0.432)	(0.433)

Tender offer	0.0090***	0.0090***	0.0090***
	(0.009)	(0.009)	(0.009)
Diversify	-0.0001	0.0000	-0.0001
	(0.960)	(0.991)	(0.953)
Deal value	0.0016***	0.0016***	0.0016***
	(0.000)	(0.000)	(0.000)
M/B	0.0002	0.0002	0.0002
	(0.276)	(0.248)	(0.264)
Leverage	0.0019	0.0020	0.0021
	(0.488)	(0.459)	(0.443)
Working capital	-0.0013*	-0.0013*	-0.0013*
	(0.076)	(0.088)	(0.076)
Operating profit	0.0208***	0.0203***	0.0206***
	(0.000)	(0.000)	(0.000)
Bidder size	-0.0041***	-0.0041***	-0.0040***
	(0.000)	(0.000)	(0.000)
Constant	0.0360***	0.0366***	0.0358***
	(0.000)	(0.000)	(0.000)
Observations	9957	9957	9957
Adjusted R Square	0.022	0.021	0.022
Year fixed effect	Yes	Yes	Yes

Table 1. 6 – OLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty and interaction term

The table reports OLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. *CFU * Cash reserve* is calculated as the multiple of correspond *Cash flow uncertainty* in each model specification and the *Cash reserve*. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0026***	0.0027***	0.0030***
	(0.000)	(0.000)	(0.000)
Cash reserve	0.0009	0.0010*	0.0010*
	(0.106)	(0.068)	(0.064)
CFU * Cash reserve	-0.0006**	-0.0007***	-0.0007***
	(0.012)	(0.002)	(0.002)
Cash	0.0042***	0.0042***	0.0042***
	(0.001)	(0.002)	(0.001)
Stock	-0.0022	-0.0021	-0.0021
	(0.226)	(0.253)	(0.256)
Public Target	-0.0179***	-0.0180***	-0.0179***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0016	-0.0016	-0.0017
	(0.808)	(0.808)	(0.800)

Friendly	-0.0156*	-0.0155*	-0.0154*
	(0.063)	(0.065)	(0.066)
Hostile	-0.0133	-0.0133	-0.0133
	(0.429)	(0.430)	(0.429)
Tender offer	0.0090***	0.0089***	0.0089***
	(0.009)	(0.010)	(0.010)
Diversify	-0.0001	-0.0001	-0.0002
	(0.922)	(0.937)	(0.868)
Deal value	0.0017***	0.0017***	0.0017***
	(0.000)	(0.000)	(0.000)
M/B	0.0002	0.0002	0.0002
	(0.209)	(0.179)	(0.190)
Leverage	0.0018	0.0019	0.0019
	(0.509)	(0.478)	(0.470)
Working capital	-0.0013*	-0.0012*	-0.0013*
	(0.082)	(0.100)	(0.088)
Operating profit	0.0200***	0.0193***	0.0196***
	(0.000)	(0.000)	(0.000)
Bidder size	-0.0042***	-0.0043***	-0.0042***
	(0.000)	(0.000)	(0.000)
Constant	0.0357***	0.0358***	0.0348***
	(0.000)	(0.000)	(0.000)
Observations	9957	9957	9957
Adjusted R Square	0.022	0.022	0.023
Year fixed effect	Yes	Yes	Yes

Table 1. 7 – Univariate analysis of operating performance (12-month prior announcement)

This table reports acquirer's post-announcement operating profit on the sample of 10458 deals. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on two different long-run cash flow uncertainty measures. Specifically, the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). For each proxy of long-run cash flow uncertainty, three measurements of operating performance are used. *OP3* (*OP4*) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. All continuous variables are winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	**Pre-announcement cash flow uncertainty**		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A: sdORR1					
OP3	mean	0.690	0.888	0.641	0.246***
	n	10458	2084	8374	
OP4	mean	4.614	5.902	4.294	1.608***
	n	10458	2084	8374	
ROA	mean	0.972	1.069	0.891	0.178***
	n	10458	2084	8374	
Panel B: sdORR2					
OP1	mean	0.666	0.791	0.634	0.157***
	n	10458	2126	8332	
OP2	mean	4.424	5.713	4.096	1.617***
	n	10458	2126	8332	
ROA	mean	0.927	0.999	0.908	0.091
	n	10458	2126	8332	

Table 1. 8 – Univariate analysis of operating performance (2-year prior announcement average)

This table reports acquirer's post-announcement operating profit on the sample of 9200 deals. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on two different long-run cash flow uncertainty measures. Specifically, the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). For each proxy of long-run cash flow uncertainty, three measurements of operating performance are used. *OP3* (*OP4*) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. All continuous variables are winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Pre-announcement cash flow uncertainty		
			High (1)	Low (2)	Difference (1) - (2)
Panel A: sdORR1					
OP3	mean	0.721	0.956	0.641	0.315^{***}
	n	9200	2356	6844	
OP4	mean	4.750	5.715	4.417	1.298^{***}
	n	9200	2356	6844	
ROA	mean	0.984	1.119	0.915	0.271^{***}
	n	9200	2356	6844	
Panel B: sdORR2					
OP1	mean	0.700	0.887	0.633	0.254^{***}
	n	9200	2413	6787	
OP2	mean	4.545	5.521	4.198	1.323^{***}
	n	9200	2413	6787	
ROA	mean	0.984	1.137	0.930	0.207^{***}
	n	9200	2413	6787	

Table 1. 9 – OLS regressions of acquirer post-announcement operating performance on long-term pre-announcement cash flow uncertainty

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 10458 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in five various ways. Specifically, *OP3* (OP4) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement 12-month acquirer OP* is the correspond acquirer's operating performance in each model specification calculated over 12-month period prior announcement. *Cash flow uncertainty* which is the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). *High cash flow uncertainty dummy* takes the value of one if the cash flow uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: sdORR1	**Model (1)**	**Model (2)**	**Model (3)**
	OP3	**OP4**	**ROA**
Pre-announcement 12-month acquirer OP	0.4432***	0.5725***	0.3715***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.173***	0.7991***	0.1105**
	(0.000)	(0.001)	(0.044)
Constant	0.3743***	1.9568***	0.5754***
	(0.000)	(0.000)	(0.000)
Observations	10458	10458	10458
Adjusted R square	0.152	0.293	0.123
Panel B: sdORR2	**Model (4)**	**Model (5)**	**Model (6)**
	OP1	**OP2**	**ROA**

Pre-announcement 12-month acquirer OP	0.4589***	0.575***	0.3719***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.1096***	0.8618***	0.0546
	(0.001)	(0.000)	(0.316)
Constant	0.3637***	1.847***	0.5859***
	(0.000)	(0.000)	(0.000)
Observations	10458	10458	10458
Adjusted R square	0.158	0.298	0.123
Year fixed effect	Yes	Yes	Yes

Table 1. 10 – OLS regressions of acquirer post-announcement operating performance on long-term pre-announcement cash flow uncertainty

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 9199 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in five various ways. Specifically, *OP3* (OP4) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement 2-year average acquirer OP* is the correspond operating performance in each model specification calculated as the average of acquirer's operating performance over the first- and the second-year prior announcement. *Cash flow uncertainty* which is the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). *High cash flow uncertainty dummy* takes the value of one if the cash flow uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: sdORR1	**Model (1)**	**Model (2)**	**Model (3)**
	OP3	**OP4**	**ROA**
Pre-announcement 2-year average acquirer OP	0.4288***	0.6344***	0.2762***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.2331***	0.5903**	0.245***
	(0.000)	(0.014)	(0.000)
Constant	0.3662***	1.6977***	0.6431***
	(0.000)	(0.000)	(0.000)
Observations	9200	9200	9200
Adjusted R square	0.137	0.302	0.081
Panel B: sdORR2	**Model (4)**	**Model (5)**	**Model (6)**
	OP1	**OP2**	**ROA**

Pre-announcement 2-year average acquirer OP	0.4468***	0.6380***	0.2769***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.2136***	0.6728***	0.2098***
	(0.000)	(0.003)	(0.000)
Constant	0.3472***	1.5795***	0.6501***
	(0.000)	(0.000)	(0.000)
Observations	9200	9200	9200
Adjusted R square	0.141	0.309	0.080
Year fixed effect	Yes	Yes	Yes

Table 1. 11 – OLS regressions of acquirer post-announcement operating performance on long-term pre-announcement cash flow uncertainty

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 1161 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. In order to calculate target's operating performance, all target firms are required be covered by CRSP. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in five various ways. Specifically, *OP3* (OP4) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement 12-month value-weighted OP* is the correspond operating performance in each model specification calculated as the value-weighted sum of acquirer and target's operating performance over 12-month period prior announcement. *Cash flow uncertainty* which is the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). *High cash flow uncertainty dummy* takes the value of one if the cash flow uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 5% and 95% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: sdORR1	**Model (1)**	**Model (2)**	**Model (3)**
	OP3	**OP4**	**ROA**
Pre-announcement 12-month value-weighted OP	0.5010***	0.7760***	0.5174***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.0054	0.4606	-0.0734
	(0.910)	(0.356)	(0.378)
Constant	0.2745***	1.5419***	0.4163***
	(0.000)	(0.000)	(0.000)
Observations	1161	1161	1161
Adjusted R square	0.305	0.404	0.226
Panel B: sdORR2	**Model (4)**	**Model (5)**	**Model (6)**

	OP1	OP2	ROA
Pre-announcement 12-month value-weighted OP	0.5040***	0.7848***	0.5159***
	(0.000)	(0.000)	(0.000)
High cash flow uncertainty dummy	0.0852*	0.6031	0.0509
	(0.070)	(0.202)	(0.535)
Constant	0.2458***	1.4159***	0.3848***
	(0.000)	(0.000)	(0.000)
Observations	1161	1161	1161
Adjusted R square	0.303	0.402	0.225
Year fixed effect	Yes	Yes	Yes

Table 1. 12 – OLS regressions of acquirer post-announcement operating performance on long-term pre-announcement cash flow uncertainty

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 1013 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. In order to calculate target's operating performance, all target firms are required be covered by CRSP. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in five various ways. Specifically, *OP3* (OP4) is calculated as operating income after depreciation scaled by total assets (sales), *OP1* (*OP2*) is calculated as operating income before depreciation scaled by total assets (sales), and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement 2-year average value-weighted OP* is the correspond operating performance in each model specification calculated as the average of the value-weighted sum of acquirer and target's operating performance for the first- and the second-year prior announcement. *Cash flow uncertainty* which is the standard deviation of operating rate of return *sdORR1* (*sdORR2*) calculated as operating income after (before) depreciation deflated by total assets over 3-year prior announcement is employed in Panel A (Panel B). *High cash flow uncertainty dummy* takes the value of one if the cash flow uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 5% and 95% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: sdORR1	**Model (1)**	**Model (2)**	**Model (3)**
	OP3	**OP4**	**ROA**
Pre-announcement 2-year average value-weighted OP	0.3221**	0.8142***	0.0527
	(0.033)	(0.000)	(0.462)
High cash flow uncertainty dummy	-0.1065	0.8148	-1.111
	(0.852)	(0.529)	(0.156)
Constant	0.8596***	2.2764***	2.0982***
	(0.008)	(0.002)	(0.000)
Observations	1013	1013	1013
Adjusted R square	0.003	0.336	0.001

Panel B: sdORR2	**Model (4)**	**Model (5)**	**Model (6)**
	OP1	**OP2**	**ROA**
Pre-announcement 2-year average value-weighted OP	0.3274**	0.8214***	0.0523
	(0.030)	(0.000)	(0.466)
High cash flow uncertainty dummy	-0.0239	0.821	-1.0319
	(0.966)	(0.507)	(0.183)
Constant	0.8133**	2.1076***	2.0867***
	(0.012)	(0.003)	(0.000)
Observations	1013	1013	1013
Adjusted R square	0.003	0.342	0.000
Year fixed effect	Yes	Yes	Yes

Table 1. 13 – 2SLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty

The table reports 2SLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. All three cash flow uncertainty variables are instrumented by *Depreciation*, which is the total of depreciation and amortization as on company's income statement. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0238*	0.0258*	0.0259*
	(0.068)	(0.075)	(0.078)
Cash reserve	0.0010	0.0005	0.0003
	(0.134)	(0.441)	(0.612)
Cash	0.0061***	0.0068***	0.0066***
	(0.001)	(0.001)	(0.001)
Stock	-0.0048*	-0.0046*	-0.0035
	(0.060)	(0.072)	(0.130)
Public Target	-0.0175***	-0.0176***	-0.0173***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0035	-0.0033	-0.0037
	(0.643)	(0.669)	(0.636)
Friendly	-0.0182*	-0.0203**	-0.0185*
	(0.058)	(0.044)	(0.062)

Hostile	-0.0120	-0.0136	-0.0129
	(0.527)	(0.483)	(0.509)
Tender offer	0.0105***	0.0102**	0.0104**
	(0.008)	(0.012)	(0.011)
Diversify	-0.0018	-0.0015	-0.0024
	(0.274)	(0.351)	(0.214)
Deal value	0.0020***	0.0021***	0.0020***
	(0.000)	(0.000)	(0.000)
M/B	-0.0003	-0.0004	-0.0004
	(0.288)	(0.282)	(0.300)
Leverage	-0.0011	0.0012	0.0031
	(0.760)	(0.701)	(0.331)
Working capital	-0.0039**	-0.0038**	-0.0044**
	(0.022)	(0.026)	(0.029)
Operating profit	0.0464***	0.0487***	0.0474***
	(0.004)	(0.005)	(0.005)
Bidder size	-0.0016	-0.0008	-0.0004
	(0.310)	(0.713)	(0.862)
Constant	-0.0040	-0.0106	-0.0169
	(0.873)	(0.715)	(0.606)
Observations	9957	9957	9957
Year fixed effect	Yes	Yes	Yes
First stage result			
F statistic	13.8804	11.8172	10.8033
Prob. > F	0.0002	0.0006	0.001
Adj. R Square	0.082	0.086	0.086

Table 1. 14 – 2SLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty

The table reports 2SLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Cash flow uncertainty is instrumented by the 3-, 4-, and 5-year average of the sum of depreciation and amortization in specification (1) to (3), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0250*	0.0297*	0.0335
	(0.078)	(0.098)	(0.123)
Cash reserve	0.0011	0.0005	0.0003
	(0.134)	(0.445)	(0.658)
Cash	0.0062***	0.0071***	0.0073***
	(0.001)	(0.003)	(0.005)
Stock	-0.0050*	-0.0050*	-0.0039
	(0.063)	(0.078)	(0.139)
Public Target	-0.0175***	-0.0176***	-0.0172***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0036	-0.0036	-0.0044
	(0.636)	(0.656)	(0.610)
Friendly	-0.0183*	-0.0211**	-0.0195*
	(0.059)	(0.048)	(0.076)

Hostile	-0.0119	-0.0137	-0.0128
	(0.534)	(0.499)	(0.547)
Tender offer	0.0106***	0.0103**	0.0108**
	(0.009)	(0.015)	(0.017)
Diversify	-0.0019	-0.0017	-0.0032
	(0.268)	(0.328)	(0.216)
Deal value	0.0020***	0.0022***	0.0022***
	(0.000)	(0.001)	(0.001)
M/B	-0.0004	-0.0005	-0.0005
	(0.284)	(0.272)	(0.287)
Leverage	-0.0012	0.0011	0.0034
	(0.733)	(0.742)	(0.332)
Working capital	-0.0040**	-0.0042**	-0.0053*
	(0.027)	(0.038)	(0.061)
Operating profit	0.0479***	0.0531**	0.0556**
	(0.005)	(0.012)	(0.022)
Bidder size	-0.0015	-0.0002	0.0007
	(0.387)	(0.925)	(0.827)
Constant	-0.0062	-0.0181	-0.0330
	(0.817)	(0.610)	(0.486)
Observations	9957	9957	9957
Year fixed effect	Yes	Yes	Yes
First stage result			
F statistic	12.027	8.3725	5.8564
Prob. > F	0.0005	0.0038	0.0155
Adj. R Square	0.081	0.085	0.085

Table 1. 15 – 2SLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty

The table reports 2SLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. All three cash flow uncertainty variables are instrumented by *Current Tax*, which is the current amount of tax payable to government as on company's income statement. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0369**	0.0430*	0.0427*
	(0.036)	(0.053)	(0.057)
Cash reserve	0.0009	0.0003	0.0000
	(0.196)	(0.674)	(0.967)
Cash	0.0072***	0.0083***	0.0084***
	(0.002)	(0.004)	(0.005)
Stock	-0.0045*	-0.0056*	-0.0027
	(0.089)	(0.074)	(0.319)
Public Target	-0.0179***	-0.0185***	-0.0183***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0051	-0.0041	-0.0049
	(0.574)	(0.679)	(0.623)
Friendly	-0.0198*	-0.0237*	-0.0206*
	(0.075)	(0.060)	(0.097)

Hostile	-0.0149	-0.0181	-0.0168
	(0.501)	(0.450)	(0.490)
Tender offer	0.0137***	0.0132**	0.0139**
	(0.006)	(0.013)	(0.012)
Diversify	-0.0014	-0.0014	-0.0032
	(0.455)	(0.502)	(0.242)
Deal value	0.0022***	0.0027***	0.0025***
	(0.001)	(0.001)	(0.001)
M/B	-0.0007	-0.0007	-0.0007
	(0.130)	(0.145)	(0.154)
Leverage	-0.0013	0.0006	0.0046
	(0.724)	(0.870)	(0.299)
Working capital	-0.0051***	-0.0056**	-0.0062**
	(0.010)	(0.019)	(0.022)
Operating profit	0.0622***	0.0679***	0.0634***
	(0.003)	(0.007)	(0.007)
Bidder size	0.0000	0.0014	0.0022
	(0.989)	(0.656)	(0.544)
Constant	-0.0273	-0.0422	-0.0526
	(0.409)	(0.329)	(0.285)
Observations	9020	9020	9020
Year fixed effect	Yes	Yes	Yes

First stage result			
F statistic	10.4317	7.4385	6.8434
Prob. > F	0.0012	0.0064	0.0089
Adj. R Square	0.079	0.082	0.082

Table 1. 16 – 2SLS regressions of acquirer short-term performance on long-term pre-announcement cash flow uncertainty

The table reports 2SLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 10827 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Cash flow uncertainty* is the standard deviation in acquirer's net cash flow from operating activities 3-, 4-, and 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Cash flow uncertainty is instrumented by the 3-, 4-, and 5-year average of the current amount of tax payable in specification (1) to (3), respectively. *Cash reserve* is corporate cash holding plus any short-term investment. Control variables are defined as in section 1.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF	**OANCF1**	**OANCF2**
Cash flow uncertainty	0.0519**	0.0688*	0.0772
	(0.039)	(0.089)	(0.141)
Cash reserve	0.0011	0.0003	-0.0003
	(0.203)	(0.745)	(0.829)
Cash	0.0088***	0.0114**	0.0123**
	(0.003)	(0.020)	(0.045)
Stock	-0.0068*	-0.0086*	-0.0047
	(0.055)	(0.093)	(0.271)
Public Target	-0.0179***	-0.0185***	-0.0174***
	(0.000)	(0.000)	(0.000)
Competing Bid	-0.0084	-0.0099	-0.0108
	(0.438)	(0.462)	(0.485)
Friendly	-0.0221*	-0.0290*	-0.0255
	(0.096)	(0.100)	(0.179)

Hostile	-0.0136	-0.0176	-0.0132
	(0.604)	(0.583)	(0.709)
Tender offer	0.0145**	0.0143**	0.0155*
	(0.012)	(0.040)	(0.060)
Diversify	-0.0033	-0.0034	-0.0070
	(0.206)	(0.288)	(0.211)
Deal value	0.0024***	0.0032***	0.0030**
	(0.002)	(0.010)	(0.024)
M/B	-0.0009	-0.0013	-0.0014
	(0.112)	(0.156)	(0.210)
Leverage	-0.0015	0.0014	0.0082
	(0.736)	(0.786)	(0.265)
Working capital	-0.0066**	-0.0084*	-0.0106
	(0.020)	(0.055)	(0.102)
Operating profit	0.0784***	0.0938**	0.0982*
	(0.007)	(0.034)	(0.072)
Bidder size	0.0018	0.0047	0.0072
	(0.570)	(0.390)	(0.365)
Constant	-0.0533	-0.0898	-0.1245
	(0.251)	(0.244)	(0.266)
Observations	9339	9399	9452
Year fixed effect	Yes	Yes	Yes
First stage result			
F statistic	7.1177	3.9918	2.7280
Prob. > F	0.0076	0.0458	0.0986
Adj. R Square	0.080	0.083	0.082

Chapter 2

2.1. Introduction

Firm-level uncertainty has been documented to have a direct relation with firm overvaluation. Theoretically, Miller (1977) develops a model with short selling constraints in which investors are assumed to have heterogeneous beliefs but aim to maximize the present value of investment. The author demonstrates that securities are held by the most optimistic investors and that the price is determined by the degree of divergence in investor opinions (Miller 1977). In a dynamic setting under a framework of heterogeneous beliefs and short selling restrictions, a speculation-based mechanism arises that makes investors buy a security at a price above its intrinsic value and hope to sell it later to even more optimistic investors (Harrison & Kreps 1978; Scheinkman & Xiong 2003). On the empirical front, the above argument gains favour (Chen *et al.* 2002; Diether *et al.* 2002). Specifically, it is evident that the overvaluation reflected by firm-level uncertainty has a significant impact on corporate events. The stock acquirer's return is negatively related to firm-level uncertainty (Moeller *et al.* 2007), and the takeover premium is positively related to uncertainty regarding the target's equity (Chatterjee *et al.* 2012).

In addition, in the equity-issuing market, firm-level uncertainty is found to exert an impact on the issuer's valuation through the mechanism of adverse selection. Specifically, in the initial public offering (IPO) market, because investors have different information, the informed investor imposes an adverse selection cost on the uninformed investor, who is ultimately allocated a disproportionately small proportion of underpriced offers (Ritter 1987). Furthermore, the difference between these two conditional returns is an increase function of the uncertainty regarding the issuer's value (Beatty & Ritter 1986; Rock 1986). In other words, the higher the *ex ante* uncertainty regarding the issuer's value is, the more severe the adverse selection problem faced by the uninformed investor; thus, a greater discount is required.

This chapter is designed to test the impact of firm-level uncertainty on the issuer's valuation in the context of seasoned equity offering (SEO). As a means of changing the firm's capital structure via equity offering, SEO provides a wider array of flotation methods in comparison to IPO since it is associated with an active secondary market and a greater number of investors who can engage in the transaction (Eckbo & Masulis 1995). Additionally, both the pre-event firm-level data and the post-event performance are available for SEO. Since SEO performance is a barometer of how the market evaluates the firm, the test of the relation between pre-issue firm-level uncertainty and post-issue firm performance provides insight into market perception regarding the role uncertainty plays in the major corporate event.

Towards this end, this chapter identifies a firm-level uncertainty variable, namely, the issuer's *ex ante* uncertainty for two reasons, based on its documented relation with the adverse selection process and firm overvaluation. First, due to the institutional nature of the capital market, SEO issuance faces the same adverse selection problem as IPO. In the context of SEO issuance, the 'underpriced offers' are those discounted from the SEO offer price, which is commonly perceived as overly high in relation to the issuer's intrinsic value. Therefore, the uninformed investor faces the fact that the expected return conditional on receiving shares is lower than the expected return conditional on placing a purchase order. Consequently, the uninformed investor would purchase the SEO offers only if a greater discount is awarded, which then becomes the issuer's negative price adjustment upon the issue announcement. Again, this adverse selection effect is magnified by the uncertainty regarding the issuer's asset value. In terms of the existing SEO literature, although agreement on the short-run price downturn is reached (unless the sample is further restricted to private placements), it fails to explicitly distinguish between adverse selection explanation (Myers & Majluf 1984) and signalling explanation based on asymmetric information (Leland & Pyle 1977) as the underlying cause since the two theories share the same directional implication regarding the SEO issuer's short-run price effect. Thus, the employment of firm-level uncertainty to test the SEO issuer's aftermarket performance can yield meaningful implications regarding the underlying driving force of the well-documented SEO discount.

Second, in terms of long-run performance following the issue date, prior studies have reached a consensus that SEO issuers underperform relative to non-issuers. For example, Loughran and Ritter (1995) find that 44% more money is needed to invest in an issuer portfolio to achieve the same wealth as investing in a portfolio consisting of non-issuers. Spiess and Affleck-Graves (1995) also find issuers' underperformance over 3- and 5-year periods subsequent to the issuance. One explanation is that the equity offering transfers the wealth partially to the bond holders (Eberhart & Siddique 2002); however, the overwhelming evidence supports the *new issues puzzle* hypothesis (Loughran & Ritter 1995) in that the issuer's manager takes 'windows of opportunity' to sell overvalued equity in the interest of existing shareholders (Spiess & Affleck-Graves 1995; Clarke *et al.* 2001; Clarke *et al.* 2004). However, this widely supported explanation is subject to the criticism of the problematic matching-firm technique employed, as this technique does not properly account for the dynamics of risk exposures (Eckbo *et al.* 2000).

This chapter argues that the nature of SEO issuers' long-run underperformance suggested by 'windows of opportunity' is that negative information conveyed in the offering is not fully incorporated into the market price in the short run upon the issue announcement. In other words, pre-issue market uncertainty regarding the value of the issuer is not fully resolved. Hence, one can argue that the information contained in the equity offering is gradually reflected in the market price as long as the pre-issue firm-level valuation uncertainty has a significant effect on the issuer's long-run performance. Given the empirical consensus that uncertainty is a proxy of firm overvaluation (Miller 1977; Scheinkman & Xiong 2003), this significant effect must carry a negative sign in order to reflect the initial overvaluation of the issuer should the ‘windows of opportunity’ explanation (Loughran & Ritter 1995) be supported. In addition, the direct test of the issuer’s pre-issue uncertainty and its long-run performance sidesteps the abovementioned criticism regarding the conventional matching-firm technique (Eckbo *et al.* 2000). Consequently, this chapter also yields insights to explain the underlying motive of SEO issuance from the perspective of the issuer’s management.

H1 proposes a negative relation between the SEO issuer’s ex ante uncertainty and its short-run price effect. The results support H1 across various measures of ex ante uncertainty and model specifications; for example, a one-standard-deviation higher daily stock return over a 60-day period prior to the announcement results in 15.07% lower 2-day cumulative abnormal returns upon the issue date. This finding supports the adverse selection explanation of the SEO discount.

H2 proposes a negative relation between the SEO issuer’s ex ante uncertainty and its long-run stock performance. A significant negative relation is reported across different measures of pre-issue uncertainty and periods over which the buy-and-hold abnormal returns are gauged. It is suggested that the result lends support to the ‘windows of opportunity’ rationale (Loughran & Ritter 1995) since the negative information, which is the initial overvaluation of the issuer, conveyed in the issuance of an SEO is only gradually incorporated into the stock price over a long post-issue period. In addition, the finding also rejects the signalling hypothesis (Leland & Pyle 1977).

H3 proposes a negative and significant relation between the SEO issuer's *ex ante* uncertainty and its long-run operating performance. Supportive evidence is also found that is consistent with the 'windows of opportunity' explanation (Loughran & Ritter 1995) that the market does not correctly re-value the issuer at the time of SEO announcement and corrects this mistake over time through the realization of operating performance until all valuation uncertainty is resolved.

This chapter contributes to the literature mainly in the following two ways. First, adverse selection is directly tested by using a unique proxy that is independent from signalling theories and receives empirical support as the underlying reason for the widely documented SEO discount phenomenon. Second, in terms of explaining the SEO long-run post-issue performance, the traditional and controversial matching-firm technique is avoided. Instead of making comparisons between firms, this chapter conducts tests on firm-level characteristics and confirms the 'windows of opportunity' explanation of SEO issuance, which can be explained as the primary motive of why the issuer chooses to raise capital through equity offerings. Other contributions along with the main achievements will be discussed later in this chapter.

The remainder of this chapter is organized as follows. Section 2 reviews the literature on SEO performance from the perspectives of the short-run valuation effect, long-run stock return, and long-run post-issue operating performance. Section 3 highlights the literature opportunities and develops three hypotheses. Section 4 describes the data and outlines the methodological approach. Section 5 discusses the empirical results. Finally, Section 6 concludes.

2.2. Literature review

This section reviews the literature regarding SEO issues from three aspects, namely, the issuer's announcement effect, the issuer's long-term post-announcement stock performance, and the issuer's long-term post-announcement operating performance. Important studies in this field are analysed in detail, and studies providing incremental contributions to the literature on leading journals are then discussed, while other studies that mention SEO effects are briefly outlined at the end of each sub-section.

2.2.1. SEO short-run post-announcement returns

2.2.1.1. Negative SEO announcement return evidence

Masulis and Korwar (1986) use a sample containing 972 primary stock offerings, 242 combination offerings, and 182 dual offerings over the period of 1963 to 1980 and examine the common stock price adjustment of underwritten common stock offerings. First, the authors observe that the cumulative abnormal returns of the announcement, which are defined as the returns of the day prior to the announcement and the announcement day, are -3.25% and are significant at the 1% level for industrial issuers. The counterpart for utility firms is -0.68% and is also significant at the 1% level. The authors explain this as being consistent with the market's anticipation that public utility offerings will take place at a greater frequency and with the smaller change in leverage for utility firms through equity issues. Second, applying the 'comparison period approach' developed by (Masulis 1980), the authors examine the return pattern over more extended periods around the announcement. They report that the mean daily portfolio returns are 0.31% and 0.05% for industrial and public utilities, respectively, over the 60-day period prior to the announcement. In contrast, the values for the post-announcement 'comparison period', which is the 60-day period subsequent to the announcement, are 0.06% and 0.02% for industrial and public utilities, respectively. The authors attribute this sizable runup preceding the announcement largely to the high market average daily return over the same period. Finally, the authors study the potential determinants of the stock price reactions to stock offering announcements by performing linear regression. The estimated coefficients of leverage change are 9.81 (significant at the 10% level) and 21.30 (significant at the 5% level) for industrial and public utilities, respectively, in explaining the announcement period returns. The estimated coefficient of stock return variance over the 60-day period prior to the announcement is negative but is significant only in the public utilities sample. The estimated coefficient of the indicator of management share sales is negative and significant in both the industrial and public utilities samples.

Asquith and Mullins Jr (1986) investigate the nature and magnitude of the impact of equity offerings based on a comprehensive sample of large primary and secondary offerings and attempt to create a certain measure of discrimination on the basis of several explanations proposed in the literature. The sample consists of 531 registered common stock offerings by both industrial and public utilities during the period of 1963 to 1981. First, the authors observe that the average two-day abnormal returns are -3.0%, -2.0%, and -3.2% for primary, secondary, and combination offerings, respectively. Second, they examine the cumulative abnormal returns over the long term prior to and after the equity offering announcement. They report that the average cumulative excess returns from two years until ten days prior to the announcement are 40.4%, 21.4%, and 41.8% for primary, secondary, and combination offerings, respectively. In contrast, the counterparts during the 2-year period subsequent to the announcement are slightly positive and then negative for all sub-samples. Thus, the authors conclude that the issuers and secondary sellers sell equity following a period in which the stock outperforms the market. Third, to provide better insights into the previous argument regarding the prior-announcement price effect and to test the size effect, the authors regress the two-day abnormal returns on issue size and the cumulative abnormal returns over the one-year period before announcement. Within the industrial sub-sample, the estimated coefficient of issue size is -0.07721 and is significant at the 5% level, while the estimated coefficient of past performance is 0.01466 and is significant at the 5% level. This suggests an additional $7.7 million reduction in firm value for every $100 million increase in the equity issue size and a 7.5% increase in announcement returns because of a 50% increase in one-year pre-announcement cumulative abnormal returns. In addition, by inserting net debt ratio change into the regression, the authors exclude the possibility of leverage ratio because of the non-significant coefficient estimate of it. Finally, the authors conclude that the evidence is consistent with both the hypothesis that equity is perceived by the market as an unfavourable signal and the hypothesis that there exists a downwards-sloping demand curve for firm shares.

To study the nature of the information that an SEO conveys to the market, Mikkelson and Partch (1986) investigate the valuation effect over the whole issuance process and attempt to explain the cross-sectional determinants of the two-day announcement prediction error by employing a sample consisting of all security offerings of 360 randomly selected industrial firms listed on the New York Stock Exchange (NYSE) and American Stock Exchange (Amex) over the period of 1972 to 1982. Beyond significant -3.44% announcement returns for common stock issuance, the authors find that completed offerings are associated with positive returns between announcement and issuance and negative returns upon issuance, while cancelled offerings experience negative returns between announcement and cancellation and positive returns at cancellation. The authors explain this as the existence of a divergence of opinion about the issuer’s stock price at the outcome of the offering. Furthermore, in the cross-sectional weighted least squares regression on the two-day announcement period prediction errors, the authors report significant estimated coefficients of index variables and constant terms across various regressions classified by types of securities offered, while the offering characteristics such as the offering size and the net change in the firm’s assets due to the offering are all statistically non-significant, suggesting that the market responds negatively to the news of equity offerings regardless of the issuer's stated reason, the net change in assets, and the offering size and that the type of security is the only significant determinant of the price response. The authors explain that this is because the market has formed an accurate forecast of the issuer's financing requirements so that the financing type, rather than other features of the financing, is the most pertinent information contained in the announcement. Finally, the authors also note the potential imprecise measurement of the new financing, which is assumed to be constant across the financing events and comparable among firms.

Motivated by the fact that the flotation cost of security issues is a significant determinant of the issuance proceeding, Lee and Masulis (2009) study the explanatory power of the issuer's accounting information quality concerning the flotation cost based on the argument that accounting information quality causes outside investors uncertainty only about the issuer's value, while it does not affect opinions regarding the firm value of insider managers who process private information. The authors hypothesize that accounting information quality is negatively related to flotation cost. Specifically, they test whether the issuer's accounting information quality is negatively related to two components of flotation cost, namely, underwriter gross spreads and the frequency of SEO withdrawals, and is positively related to the third component, which is the cumulative abnormal returns to the issuer around the announcement. Based on a sample containing 963 completed SEOs and 89 withdrawn SEO filings, using the inverse accruals quality measures, the authors find support for all three hypotheses. First, the estimated coefficients of accruals quality range from 1.703 to 6.706 in explaining the gross spread paid to the underwriter and are all significant at the 1% or 5% level. Second, after documenting the descriptive evidence that the cumulative abnormal returns over various windows around the announcement are all negative, ranging from -2.67% to -2.82%, and significant at the 1% level, the authors report coefficient estimates of accruals quality ranging from -0.0085 to -0.100 (all significant at the 1% level) in explaining two-day announcement returns. Third, with the probit model fixed from the endogeneity problem inherent in the offer size, the authors find that higher inverse accruals quality (more deteriorated accounting information quality) is significantly related to a higher probability of offer withdrawals. Finally, after decomposing the accruals quality measure to innate and management discretionary parts, the authors argue that both parts per se are also associated with significantly higher flotation costs in SEO offerings.

Korajczyk *et al.* (1991) incorporate time-varying information asymmetry into the adverse selection framework and test the impact of information release on the valuation effect of equity issues. Based on a sample of 1,247 equity issues by industrial firms over the period from 1978 though 1983, the authors find significant -2.26% abnormal returns to the issuer on the day preceding the announcement and further -0.43% abnormal returns to the issuers on the announcement day. Next, the authors test three hypotheses regarding the impact of informative events on the market response to equity issues. First, the information release is more likely to precede than to follow the equity issue, which is consistent with the argument that management is more likely to delay an equity issue if there is a pending informative earning release. Second, the information release prior to the equity issue conveys more positive news than those subsequent to the equity issue. This is not only consistent with the argument of equity-offering timing but also coincides with the previously documented evidence that equity issuers are more likely to follow a price runup, which is reflected in the positive news released in pre-issue informative events. Third, the authors perform weighted least square analysis by regressing the two-day SEO announcement price decline on the interval between issue announcement and previous earning release and the interval between the actual issue day and the previous earning release. The estimated coefficients are -0.147 (significant at the 10% level) and -0.513 (significant at the 1% level), suggesting that the decrease in stock price is positively related to the time to the last information release; in other words, the information asymmetry increases as time passes from the last informative event. Overall, the authors provide evidence that time-varying information asymmetry significantly affects the timing and pricing of an equity offering.

Based on the largely agreed-upon discounting in seasoned equity offerings, Altınkılıç and Hansen (2003) develop a model that partitions the discounting into two parts, namely, the expected discounting and the surprise component. The first part accounts for the predictable component at the close of trading prior to the offer, while the second part is the eleventh-hour surprise that is revealed when the offer is made public. The authors argue that the discount surprise and the eleventh-hour unanticipated underpricing are zero on average; however, they are not equal if the discount surprise is informative and affects the announcement returns to the issuer. The authors empirically investigate this impact to assess the lead bank's advantage with respect to collecting private information immediately before the offer. Using a sample containing 1,703 firm-underwritten SEOs made by industrial firms, the authors report an estimated coefficient of -0.62 (significant at the 1% level) on the variable accounting for surprise in explaining announcement returns. The authors explain this as unanticipated underpricing being used mainly to pass through eleventh-hour price changes and meet unanticipated placement costs. In addition, the authors find that the discounting is greater for issuers with lower stock prices and higher stock return volatility since the expected discounting is intended to compensate for investor uncertainty about firm value and to cover the placement cost.

Slovin and Sushka (1997) study the implications of seasoned equity offerings on the parent-subsidiary corporate structure. Based on an SEO sample of 37 offerings made by parents and 38 offerings made by subsidiaries over the period of 1975 to 1993, they find that when the subsidiary makes an offering announcement, there is an associated -4.06% significant abnormal return; however, there is also a significant increase of as much as 1.9% abnormal returns to the parent. Similarly, in the case of the offering announcement being made by the parent, the subsidiary experiences 1.6% abnormal returns, while the parent loses 2.7% in announcement returns. Further, to test whether the observed patterns of returns to the parents and the subsidiaries can be explained by the characteristics of parents, subsidiaries, and offerings, the authors perform cross-sectional weighted least squares analysis where the dependent variable is two-day abnormal returns to either issuing subsidiaries or their parents. The authors find no significant relation between the stock price effect and the offering or affiliated units; thus, it is suggested that it is the decision to issue equity in parent entities versus subsidiaries that serves as an important valuation signal. Finally, in the logit regression, the estimated coefficient of the pre-announcement subsidiary's return is 1.2785 and is significant at the 1% level, suggesting that the choice of the unit to issue equity depends on the prior stock performance of the unit. The finding is consistent with the model of Nanda (1991) predicting that the equity offering contains different information regarding the valuation of the parent and the subsidiary and that a parent-subsidiary corporate structure enhances corporate financing flexibility and can mitigate underinvestment problems.

Aggarwal and Zhao (2008) provide two new explanations of the valuation effect, namely, the option-based resolution of the new issues puzzle and the market liquidity explanation. Following the argument of Merton (1977), the authors point out that holding a company's equity is equivalent to holding a call option with the value of the company's debt as the strike price. To test this proposition in the context of SEO issuing, the authors focus on the change in asset volatility around the SEO announcement since the underlying volatility is a key determinant in the option value. On the other hand, equity issue may create a supply surplus of equity, which in turn decreases the stock price of the issuer. Following this rationale, the authors hypothesize that a larger issue size and lower market liquidity are related to a more negative issuance effect. Using a sample containing 2,166 SEO observations from 1983 to 2003, the authors observe a 1.7% decline in equity value on the announcement and a 1% further decline on the issuance date. In addition, the cumulative excess returns are -2.6% and -1.9% around the announcement date and issuance date, respectively. In the cross-sectional regression analysis, the estimated coefficient of the variable accounting for the change in asset volatility around the announcement is 5.085 and is significant at the 1% level, suggesting that a larger reduction in asset volatility leads to a more negative stock price. The estimated coefficient of offer size is -3.12 and is significant at the 1% level, while the estimated coefficient of turnover is 5.148 and is significant at the 5% level. Both findings support the market liquidity hypothesis in that the reason for negative returns around the SEO announcement is the equity supply surplus generated by the offering. In addition, the authors reject an asymmetric information explanation of the SEO valuation effect because of the negative or non-significant relation between SEO issuance return and variables representing information asymmetry, namely, analyst coverage and forecast dispersion. Finally, it is noted that neither the option- nor liquidity-based explanation is successful in interpreting returns around the announcement date. The authors' explanation of this phenomenon is that not all equity offering announcements are followed through, and the actual issue can be different from what was announced.

Barclay and Litzenberger (1988) employ intra-day data to examine the within-day return pattern of the equity offering. The authors argue that there are several advantages of using intra-day data: first, they can filter the variability attributable to extraneous factors unrelated to the equity offering event, which is a common problem in studies using a long measurement period; second, they can increase the statistical power of the study; and third, they permit the examination of immediate market response to the equity offering event by viewing the within-day return pattern. The sample is constructed to include 218 new issues of common equity and 85 new issues of long-term debt by industrial firms over the period of January 1981 through December 1983. The authors find that the issuer's stock price declined by 1.34% during the 15-minute period subsequent to the announcement, on average, and this loss increased to -2.44% over a three-hour time period. The significant drop in the issuer's price suggests that the market reacts immediately to the new information contained in the equity offering. In addition, the authors report the return pattern around the issue day. They find that the issuer's abnormal returns are -0.33%; however, there is a price recovery of as much as 1.47% during the 20-day period after the issuance. The authors explain this as evidence that the transaction cost is at least partly accountable for the issuer's negative post-announcement returns. The authors note that even though the price recovery is smaller than the price drop at announcement, the difference is not significant at the 5% level. It is reasonable to suggest that the investor requires compensation for bearing the transaction cost to adjust their portfolio to absorb the new issue.

Bhagat *et al.* (1985) use a sample of 344 equity offerings over the period of 1982 to 1983 and document that shelf-registered offerings experience announcement returns of -1.17%, which are significantly higher than those of non-registered offerings (-1.53%). The authors explain this difference by the lower issuing cost of shelf offerings, which is 13% (51%) lower than the cost of syndicated (non-syndicated) issues. Moore *et al.* (1986) study the difference in valuation effect between traditional SEOs and shelf-registered equity offerings. The authors find that industrial firms experience -2.43% and -2.48% announcement returns for shelf and traditional registrations, respectively. In contrast, utility firms earn -0.8% and -0.98% for shelf and traditional registrations over a three-day window around the announcement, respectively. However, the authors note no significant difference between shelf-registered and traditional equity offerings for either type of firm. Schipper and Smith (1986) study 122 initial subsidiary equity offerings and report an average 1.83% cumulative abnormal returns over the (-4, 0) window relative to the announcement; in contrast, the abnormal returns of offerings made by parents are -3.5%. The authors argue that the explanation is that the separation of growth opportunities by the carve-out avoids the negative informative implication of equity offerings made by parents, and the market understanding of the growth opportunity is improved by the public listing of subsidiaries, while the restructuring of managerial responsibilities improves efficiency.

Focusing on the announcement behaviour of bond prices, Kalay and Shimrat (1987) distinguish between various hypotheses explaining the average -3.78% SEO announcement returns to the issuer. Given that the bond price reacts negatively by 0.33% to the announcement of an equity offering, the authors argue that the information-release hypothesis prevails over the price pressure and wealth redistribution hypotheses. Linn and Pinegar (1988) document a -1.295% return from the day before the day of announcement subject to a sample of preferred stock issued in 1962-1984. Jain (1992) employs a sample of 269 common stock issues by industrial firms in 1979 through 1983 and documents -2.89% cumulative abnormal returns over the window of (-2, 0) relative to the announcement. Consistent with the hypothesis that the issuer provides market signals about future earnings, the author finds that the SEO announcement period return is positively related to the revision by financial analysts subsequent to the announcement. In a study demonstrating the existence of finite price elasticity of demand for common stock, Loderer *et al.* (1991a) use 430 offerings by regulated firms over the period of 1969 to 1982 and find a -0.93% average announcement effect of primary stock offerings. In addition, the authors rule out the possibility of adverse information regarding future cash flow conveyed in the announcement and the change in risk of common stock. Slovin *et al.* (1994) study the market response to the first SEO following the firm's IPO. The mean abnormal returns earned from the SEO are -2.87% following a large positive stock price runup. Furthermore, the SEO announcement effect is positively affected by prior IPO underpricing, and the authors argue that the finding is consistent with the Welch (1989) model, where IPO underpricing is a signal by managers of high-quality firms to distinguish them from their low-quality peers. Ownership structure characteristics do not explain the SEO valuation effect; however, insider sales through secondary distribution significantly worsen the SEO announcement returns. Denis (1994) investigates the market response to SEOs and the profitability of the issuer's growth opportunities after observing an announcement returns mean of -2.49% for the whole sample. The author finds a positive relation between *ex ante* growth opportunity measures and announcement period prediction errors for sub-samples of young and higher-growth firms. However, the non-positive announcement effect is independent of the expected profitability of investment opportunities. The author concludes that investment opportunity plays a minor role in explaining SEO announcement distribution. Bayless and Chaplinsky (1996) find an average -2.32% announcement of SEOs. Specifically, the price reaction in high-volume equity offering periods is 200 basis points lower than that in low-volume periods, and this underperformance is independent of macroeconomic characteristics. The authors suggest that the existence of 'windows of opportunity' arises from reduced information asymmetry. Singh (1997) focuses on right offerings and documents a mean -1.07% announcement returns and -2.18% during the rights settlement period. The authors argue that the underwriters purchase rights hedged by short selling of the underlying stock to reduce their risk exposure to standby underwriting and find that the price discount is positively related to the amount of rights sell-offs during the offering period.

More recently, Kumar and Shome (2008) find that the announcement returns of shelf-registered offerings are significantly higher than those of traditional SEOs (-0.30% versus -1.61%). The suggested reasons are that the option feature can be used to defer the offering, underwriter fees are lower, and the offering method can be chosen according to the market condition based on universal shelf filings. This is consistent with the findings of an early study about shelf-registered stock offerings (Blackwell *et al.* 1990). Elliott *et al.* (2009) test the leverage risk reduction hypothesis to study the wealth effect in SEO issuance for bond holders. The authors find that the bond holders earn an average of 30 basis points for an SEO announcement, while the equity holders experience a mean return of -1.2% over a 3-day window around the announcement. Furthermore, this effect is more pronounced for lower-rated bonds. The authors suggest that negative SEO announcement returns can be partly explained by the wealth transfer to bond holders. While documenting -1.39% average announcement returns of 3,093 primary share SEOs from 1982 to 2006, Demiralp *et al.* (2011) find that the announcement is positively related to total and active institutional ownership levels and concentration. Furthermore, the long-run post-issue stock return is positively related to the change in contemporaneous post-announcement total and active institutional ownership levels and the concentration of shareholdings. Zeidler *et al.* (2012) study the performance of convertible bond offerings and seasoned equity offerings with respect to risk dynamics. Apart from documenting -1.8% mean announcement returns, the authors find that systematic risk increases significantly prior to the announcement and declines sharply thereafter. The authors argue that the results fit a real option framework, where growth opportunities are much riskier than the underlying assets, and the exercise of the option at issuance leads to an immediate decrease in risk. Duca *et al.* (2012) provide an arbitrage-based explanation of the increasingly negative announcement returns to convertible offerings. They find that the underlying reason is that more arbitrage funds buy convertible bonds while shorting the underlying stocks, creating downwards price pressure. This is evident in that the difference in announcement returns between the traditional investor period (1984-1999) and the arbitrage period (2000-2008) disappears after controlling for arbitrage-induced short selling. Bradley and Yuan (2013) document a competitive effect in that the SEO generates an average -2.4% announcement for the issuer, while the rival companies experience a significant 0.26% return following primary SEO announcements but a significant -0.35% return following secondary share announcements. The authors note that the primary equity offerings suggest a positive prospect, while the secondary distribution by insiders signals the opposite. Cline *et al.* (2014) find an average -1.62% announcement of diversified SEO issuers. They further report that firms engaging in value-destroying investment or performing cross-subsidization experience a mean 46 basis points higher yield spread when issuing bonds. The authors argue that by refraining from equity issues, conglomerates engaging in value-destroying activities avoid monitoring through an inefficient internal capital market. Henderson and Zhao (2014) report significant -7.85% announcement returns of SEOs. The authors argue that issuers are more likely to choose SEOs when facing valuable growth opportunities while the capital supply is low. Akhigbe and

Whyte (2015) test the hypothesis that the negative announcement returns of the SEO are mitigated by the efficiency of the internal capital market. Observing an average -2.02% CAR around announcements on a sample containing 2,775 SEOs over 1996-2012, the authors find that SEO announcement returns are positively related to efficiency measures and suggest that efficiency resolves the market's uncertainty about the value of the issuer's assets in place. Using a sample of 410 underwritten SEOs from 1990 to 2005, Ferreira and Laux (2016) observe -1.8% mean announcement returns and find that the announcement returns are higher for issuers with a board dominated by independent directors, and this relation is magnified by lower monitoring costs and more severe financial constraints. The authors argue that board independence increases SEO returns due to better control of agency problems through both monitoring and certification. Deshmukh *et al.* (2017) investigate the relation between informed short selling and the SEO announcement effect. The overall average announcement returns are -2.09%, and the authors find a significant and negative relation between changes in pre-announcement short interest and announcement returns, long-run operating stock and operating performance. This effect is more pronounced in shelf-registered issuers. The results highlight the existence of informed short sellers around SEO announcements. Holderness (2018) finds -2.22% equity issuance announcement returns for U.S. firms from 1979 to 1997. The author argues that announcement is positive in the presence of shareholder approval, and the announcement returns are negative and 4% lower when shareholders do not approve the issue. In addition, the shorter time interval from the vote to the issuance and the greater required plurality are positively related to the announcement returns. It is suggested that agency theory dominates in explaining the SEO announcement effect.

A number of studies also report significantly negative announcement returns (averaged to approximately -3%) to the SEO issuer, although they differ in the definition of the announcement period over which the cumulative excess return is measured, the sample period covered, and the type and number of equity offerings included in the sample, in the U.S. market (Pettway & Radcliffe 1985; Hansen 1988; Polonchek *et al.* 1989; Hansen & Crutchley 1990; Bayless & Chaplinsky 1991; Denis 1991; Brous & Kini 1992; Eckbo & Masulis 1992; Tripathy & Rao 1992; Choe *et al.* 1993; Manuel *et al.* 1993; Sant & Ferris 1994; Akhigbe & Madura 2001; Corwin 2003; Higgins *et al.* 2003; Chang & Shin 2004; Clarke *et al.* 2004; Kadiyala & Rau 2004; Datta *et al.* 2005; Zhang 2005; Akhigbe *et al.* 2006; Kennedy *et al.* 2006; Intintoli & Kahle 2010; Krishnan *et al.* 2010; Ang & Cheng 2011; Booth & Chang 2011; Wang *et al.* 2011; Fich *et al.* 2014; Gokkaya & Highfield 2014; Golubov *et al.* 2016; Michaely *et al.* 2016; Chan *et al.* 2018; Johnson *et al.* 2018). More recently, consistent results have been found for the European banking industry (Botta & Colombo 2019).

In contrast, several studies report that stock price reacts negatively to the announcement of the SEO; however, they fail to document the significance of the statistic (Jegadeesh *et al.* 1993; Vijh 2006; Francis *et al.* 2010) or do not report significance (Lease *et al.* 1991; Diltz *et al.* 1992; Pilotte 1992; Varma & Szewczyk 1993;

Hadlock *et al.* 2001; Wu & Kwok 2002; Byoun & Moore 2003; D'Mello *et al.* 2003; Byoun 2004; Heron & Lie 2004; Rauterkus & Song 2005; Walker & Yost 2008; Gao & Ritter 2010; Tandon *et al.* 2010; Autore *et al.* 2011; Chaudhuri & Seo 2012; Qian *et al.* 2012; Kim & Purnanandam 2013; Brisker *et al.* 2014; Hao 2014; Autore & DeLisle 2016; Walker *et al.* 2016).

2.2.1.2. Positive SEO announcement return evidence

One study establishes the link between market response to corporate financing decisions and ownership concentration changes (Wruck 1989). Based on a sample of 128 private sales of equity over the period of 1 July 1979 to 31 December 1985, the authors document that the total holdings of non-management-controlled purchasers increase from 31% to 37% on average and suggest that the decision to sell a block of securities to non-management investors increases shareholder wealth despite the management having the opportunity to construct a self-serving deal that will damage shareholders. Specifically, the average abnormal returns over the 1-day period prior to the announcement are 1.89% (significant at the 10% level), in addition to 2.52% (significant at the 5% level) average abnormal returns over the period of [-3, -2] relative to the announcement date. The author explains that this finding contradicts what is reported for underwritten common stock offerings owing to the mitigation of adverse selection since managers can negotiate directly with purchasers and release more information regarding the valuation. As a result, the market perceives announcements of private placements as positive signals. In the cross-sectional analysis, the author regresses the changes in firm value on ownership concentration levels, changes in ownership concentration, the indicator that the purchaser intends to take over, and the indicator that the purchaser is management controlled. The estimated coefficient of the percentage change in ownership concentration is 0.009 (significant at 5%), accompanied by the estimated coefficient of ownership concentration before the sale (0.022 but non-significant), suggesting that firm value is positively related to ownership concentration and may be slightly positively associated with more concentrated ownership before the sale. In addition, the dummy variable indicating that the purchaser intends to take over has a significant and negative coefficient estimate that appears to be supportive of entrenchment. The author notes that this may also be because the market overestimates a high-value takeover but revises this probability downwards as a result of private placement, even if the managers act in the interest of shareholder benefits. A piecewise linear model with turning points of 5% and 25% yields similar results.

Hertzel and Smith (1993) confirm the private placement discount by documenting 1.72% abnormal returns over the 3-day window prior to the announcement and 3.28% abnormal returns over a more extended period as long as 9 days. The authors argue that an information effect exists where the private placement discount reflects the information costs borne by the private investors, especially when uncertainty about the firm value is high. The authors extend the Myers and Majluf (1984) model by adding private placement as an additional choice in the equity issue decision framework while adopting the same assumptions, timing conventions, and notions. The authors assume that the managers of a firm lacking financial slack maximize the existing shareholder value with respect to the choice of public issue, private placement, or neither. They demonstrate that private placement by undervalued firms can mitigate the underinvestment problem and can also reduce wealth transfer to new shareholders. The undervaluation of the firm is signalled to the market by the conjecture of the willingness of private investors to commit funds and the manager's decision to forgo a public issue. Based on a sample of 106 private placements over the period from 1 January 1980 through 31 May 1987, the authors conduct cross-sectional regression to empirically test the information hypothesis. Given the discount of private placement as the dependent variable, the estimated coefficient of the number of shares issued as a fraction of total shares is 0.41 and is significant at the 5% level, suggesting that investment opportunities are more difficult to value than assets-in-place. The estimated coefficient of financial distress is 0.091 and is marginally significant at the 10% level, suggesting that the investor in a financially distressed firm requires another 9% discount. The estimated coefficient of the book-to-market ratio of equity is -0.141 and is significant at the 5% level, implying that the private placement discount is higher when intangible assets are more important in determining firm value. The weighted least squares regression using discount-adjusted abnormal returns as dependent variables confirms the above findings. In summary, the authors lend support to the information hypothesis that the private placement discount increases the uncertainty of the valuation of the issuing firm due to the higher information cost borne by the private purchaser.

Similar to the above early studies, recent research documents that positive equity offering announcement returns pertain to samples of private placement. Barclay *et al.* (2007) use a sample of 559 private placements and find a significant 1.7% announcement, which, however, deteriorates to -9.4% over a 120-day period afterwards. In conjecture with the post-offering activities of purchasers, and comparison with arm's-length trades of large blocks of stock, the authors suggest that private placements are often made to passive investors to help the management to entrench their control, although some private placements are motivated by monitoring and certification. Wruck and Wu (2009) investigate the impact of the relation between investors and issuers on the performance of 1,818 private placements with an average announcement period return of 2.02%. The authors find that both announcement price response and 5-year long-run post-announcement stock return are positively related to the formation of new relations via placements, and investors tied to the issuer are more likely to be offered directorship as part of the placement. Chen *et al.* (2010a) also find average 2.48% (significant at the 1% level) announcement returns for private placements. They argue that private placement issuers overstate earnings in the quarter prior to the announcement, while sophisticated investors do not ask for a proper discount. Furthermore, aggressive earnings management is associated with relatively lower long-run post-announcement stock returns and operating performance. Berkman *et al.* (2016) find

2.22% average announcement returns in a sample consisting of 339 private placements of common stock and 323 convertible bond offerings. However, they find widespread pre-announcement short selling, and short sellers are able to predict the announcement returns. This effect is more pronounced when hedge funds are involved and the number of purchasers is high.

Other studies also document significantly positive announcement returns to equity offerings (Wansley & Dhillon 1989; Krishnamurthy *et al.* 2005; Marciukaityte & Pennathur 2007; Hovakimian & Hutton 2010; Billett *et al.* 2015), while a few fail to determine that the positive return is significant, such as Holderness and Pontiff (2016), or do not report the significance level (Dai 2007; Chen *et al.* 2010b; Floros & Sapp 2012).

2.2.1.3. International evidence

Most studies focusing on markets outside the U.S. agree with the negative SEO announcement. For example, Armitage (2002) finds average -0.96% announcement returns for 1,008 rights issues and open offers in the UK. The author concludes that there is a negative relation between the market response and the discount allowed by the issuer. However, the author disagrees that the deep discount substitutes for underwriting; rather, it serves as an anticipation of bad news released at the announcement, which in turn causes the negative announcement returns. More recently, Li *et al.* (2019) find an inverted U-shaped relation between the announcement returns and the bank regulation among an international sample of 1,307 SEOs with average announcement returns of -0.74% (significant at the 1% level). Specifically, under a low to moderate regulation environment, the announcement of a bank SEO is positively related to the level of regulation; however, the relation becomes negative when the regulation is too stringent. Other studies around the world also find consistent significantly negative announcement returns for Australia (Holderness 2018), New Zealand (Marsden 2000), the UK (Slovin *et al.* 2000; Iqbal 2008; Armitage 2012), China (Huang *et al.* 2016; Liu *et al.* 2016), France (Gajewski *et al.* 2007), Hong Kong (Lee *et al.* 2014; Lee *et al.* 2018), the Netherlands (De Jong & Veld 2001; Kabir & Roosenboom 2003), Spain (Martín-Ugedo 2003), Taiwan (Lin *et al.* 2008; Twu 2010), and the EU countries (Fauver *et al.* 2017). In addition, a number of studies document negative equity offering announcements but fail to determine significance (Corby & Stohs 1998; Salamudin *et al.* 1999; Gajewski & Ginglinger 2002; Higgins *et al.* 2002; Errunza & Miller 2003; Pandes 2010; Dong *et al.* 2012; Ginglinger *et al.* 2013; Dissanaike *et al.* 2014).

In contrast, studies outside the U.S. more frequently report significant positive equity offering announcements. For example, Tsangarakis (1996) studies the wealth effect of rights offerings in Greece from 1981 to 1990 and documents significantly positive announcement returns of as much as 3.97%. Furthermore, the author finds that abnormal returns are negatively related to share ownership diffusion and are positively associated with issue size, stock price variance, and the pre-announcement market runup. The author rejects the adverse selection and price pressure explanations in the context of the Greek market. Cooney Jr *et al.* (2003) study all public SEOs of common stocks in Japan from 1974 to 1993. The authors document 0.63% (significant at the 1% level) announcement returns, in contrast to the U.S. market. The authors interpret the results as consistent with the underwriter's certification of the issuer's value. By characterizing the underwriter's risk as a put option, the authors find that the SEO announcement returns are positively related to the underwriter's risk exposure. Similarly, a study employs a more comprehensive Japan sample report of 1.05% and 0.45% for convertible debt and equity issues, respectively (Kang & Stulz 1996). The authors argue that Japanese firms, especially small ones, decide to issue equity based on different considerations than those of U.S. firms. Cronqvist and Nilsson (2005) develop and test a nested logit model to study how firms choose between different equity offering methods in a sample of 296 Sweden SEOs. While a weighted average of 3.54% is obtained for announcement returns from two sub-samples, the authors find that family firms avoid choosing an issue method that dilutes control benefits or subjects them to heavier monitoring. Furthermore, family firms with a higher degree of asymmetric information tend to choose underwriter certification in rights offerings and private placements when the information asymmetry is extremely high.

Other articles also document significant and positive equity offering announcement returns in Canada (Maynes & Pandes 2011), the UK (Armitage & Capstaff 2009; Silva &

Bilinski 2015), China (Fonseka *et al.* 2014; Chen 2017; He *et al.* 2019), France (Baruch *et al.* 2017), Germany (Bessler *et al.* 2016), Hong Kong (Wu *et al.* 2005; Ching *et al.* 2006), Israel (Hauser *et al.* 2003), Japan (Kato & Schallheim 1993), Norway (Bøhren *et al.* 1997), Taiwan (Wang *et al.* 2008; Liang & Jang 2013; Cheng *et al.* 2014), and an international sample (Dahiya *et al.* 2013). In addition, a few studies outside the U.S. find positive equity offering announcement returns, which are, however, not statistically significant on at least a 10% level (Bigelli 1998; Anderson *et al.* 2006; Marisetty *et al.* 2008; Dionysiou 2015; Yeh *et al.* 2015).

2.2.2. SEO long-run post-announcement return

The literature regarding the long-term valuation effect of the SEO issue is relatively less well developed than that regarding the short-run announcement effect. One of the earliest studies examining the long-run post-issue performance of equity offerings focuses on the anomaly that initial public offerings (IPOs) appear to be overpriced in the long run (Ritter 1991). Using a sample of 1,526 IPOs over the period of 1975 to 1984, the author finds an average holding period return of as much as 34.47% during the 3-year period subsequent to the issue. In contrast, the average total return of 1,526 control firms matched in firm size and industry over the same period is 61.86%. The author examines the underlying cause of this underperformance by studying several time-series and cross-sectional patterns. First, the author segments the issuers by industry and finds IPO 3-year post-issue underperformance in 11 of 14 industries, suggesting that this pervasive underperformance relative to the control firm is more consistent with the ‘fad’ explanation, where the firm goes public when the investor is irrationally optimistic about the future prospects of certain industries. Second, the issuer’s aftermarket performance is categorized based on the annual volume of the IPO, and a negative relation is detected. The author argues that the firm chooses to go public when the investors are willing to pay for valuable growth opportunities reflected in high multiples, and the subsequent underperformance is due to the disappointing realization of cash flow. This evidence is consistent with both the ‘fad’ and pure bad-luck explanations. Third, the author groups the issuer’s post-announcement performance by firm age and reports that younger firms, which typically have higher market-to-book ratios, experience heavier underperformance, lending support to the fad explanation. Finally, to disentangle the above effects, a cross-sectional regression is performed for the 3-year post-issue total return. Specifically, the estimated coefficient of firm age is 0.127 and is significant at the 1% level; the estimated coefficient of annual issue volume is -0.109 and is significant at the 1% level; and the estimated coefficient of the oil industry (banking sector) is -0.765 (0.825) and is significant at the 1% level. The regression results coincide with those of the previous univariate analysis. Overall, the author asserts that the long-run underperformance of IPO issuers is due to investors being overly optimistic about the future earnings of young growth firms and the firms taking advantage of these ‘windows of opportunity’ to go public.

A later study explores the source of this overoptimism by studying the impact of discretionary accruals on the cross-sectional variation of IPO post-issue long-term stock performance based on 1,649 IPO firms over the period of 1980-1992 (Teoh *et al.* 1998a). Due to the lack of available data prior to the IPO announcement, the authors use accruals data from the first public financial statement and relate it to the stock market performance from three to six months after the fiscal year end. The authors document that IPO firms using the most aggressive discretionary current working capital accruals earn 20% to 30% less cumulative abnormal returns than their peers using conservative discretionary accruals, depending on the benchmark specification. First, in the event-time cross-sectional regression where the 3-year abnormal returns are the dependent variable, the estimated coefficient of discretionary current accruals is -0.227 and is significant at the 5% level. Second, two portfolios that are different in discretionary accruals but are matched in terms of firm size and book-to-market ratio are constructed, and their estimated intercepts are compared in a regression of portfolio returns on the Fama and French (1993) three-factor returns. In case the portfolio is value weighted, the estimated coefficients of the difference calculated as the intercept of the aggressive portfolio minus the intercept of the conservative portfolio range from -0.63% to -0.71%, suggesting a loss ranging from 7.88% to 8.86% from a strategy of buying aggressive IPO firms' stock and shorting conservative IPO firms' stock. Third, the authors use Fama and MacBeth (1973) monthly panel regression to control contemporaneous correlations in returns and to compare the impact of discretionary current accruals on IPO firms against the impact on non-IPO firms. They also replace Fama-Macbeth's factor sensitivities with the firm's own size and book-to-market ratio as better predictors of returns, as suggested by Daniel and Titman (1997). The authors find an average cross-sectional mean of IPO discretionary current accruals of as much as 10.96%, suggesting that 2.11% of annual underperformance can be explained by the average level of earnings management in IPOs. Finally, the authors find that conservative IPO firms are 20% more likely to be able to raise capital via seasoned equity offerings after IPOs, suggesting that the market rewards conservative issuers by enabling them to reissue more frequently after IPOs since they forgo the pretence of a higher-quality prior IPO through earnings management.

To see whether the SEO long-run post-announcement returns are similar to those of the IPO, Spiess and Affleck-Graves (1995) conduct the first analysis of 3- and 5-year post-SEO stock performance among comparable firms matched according to firm size, book-to-market ratio, and industry according to the method of Ritter (1991). Using a sample consisting of 1,247 primary SEOs announced from 1975 to 1989, the authors argue that although the SEO issuers earned absolute positive abnormal returns in the post-issue period, they underperformed the control firms considerably and consistently. In addition, the adjusted cumulative abnormal returns of the SEO issuers were positive and significant at the 5% level in the first month after the issuance regardless of the benchmark used. In the long term, the SEO issuers earned 34.11% abnormal returns over the 3-year period subsequent to the announcement, while the comparable firms earned 56.95%; the SEO issuers earned 55.72% abnormal returns over the 5-year period after the issue, while the comparable non-issuers earned 98.11%. Next, the authors attempt to determine the nature of this observed long-run underperformance by partitioning the issuers according to offer year, book-to-market ratio, firm size, firm age, trading system, and industry classification. However, the underperformance of the SEO issuers relative to their corresponding matching firms was found in all book-to-market and firm-size quintiles, in each firm-age and trading-system category, in 12 of the 15 years covered by the sample, and in 13 of 16 industries. Consequently, the authors provide two possible explanations of the economic significance of the long-run underperformance. First, the market is irrationally overoptimistic about seasoned equity offerings at announcement; however, along with the information release over the long-run post-issue period, the market corrects the initial mistake by justifying the initial positive return with long-term underperformance. Second, the managers of SEO issuers time when the market is willing to overpay for their equity. Similar to the findings of Lakonishok and Vermaelen (1990) and Ikenberry *et al.* (1995) in the share re-purchase market, the market does not correctly re-evaluate the issuer at announcement, and the investors wait for further evidence about the issuer's earning capacity over the long run. The authors also note the possibility that underperformance is due to the mismeasurement of risk; however, since the firms are matched in the same industry groups and are of similar size, underperformance is not likely to be due to traditional risk factors.

Another contemporaneous study rooted in the methodology of Ritter (1991) but not restricting the sample to primary equity offerings also documents negative SEO issuer's long-run post-announcement underperformance. In terms of matching procedures, the authors match SEO issuers with control firms that have close but greater market capitalization. The industry and book-to-market value are not considered to better account for the timing of industry-wide misvaluation. The authors fail to find any underperformance of SEO issuers during the first 6-month period after the issue. The average annual returns over the 5-year post-announcement period are 7% and 15% for SEO issuers and matching firms, respectively. It is suggested that 44% more money is required if investing in a portfolio of SEO issuing firms to achieve the same wealth as that gained from investing in a portfolio consisting of non-issuers. The authors conclude that the observed stock return pattern is inconsistent with the asymmetric model, according to which the market should correctly respond to the announcement, and no further underperformance should be detected. The finding that the issuer is not appropriately re-valued by the market and remains substantially overvalued at announcement, however, is consistent with the explanation that managers of SEO issuers time the market and take advantage of transitory 'windows of opportunity' to sell equity at substantially overvalued prices.

To study the source of stock underperformance after an SEO, Eberhart and Siddique (2002) focus on post-issue bond performance to test wealth transfer from equity holders to bond holders. Based on a sample of 1,368 SEOs from 1980 through 1992, the authors document a significant and positive long-term bond return. First, the authors confirm the small and positive one-month stock return after the SEO, which becomes negative and declines afterwards. In contrast, the initial bond return is small but becomes positive and rises from the third month after the issue. Second, the average and median bond raw return is consistently higher than the stock performance at 6 and 12 months and beyond. Second, the authors conduct calendar time tests and find that the abnormal stock returns are significantly negative within every model used, while the abnormal bond return is always positive. The authors extend the test to all SEOs within the sample period without requiring traded debt, and the negative results for stock performance remain, suggesting that the previous result is not an artefact due to the data requirements. Finally, the authors test the wealth transfer hypothesis in the context of cross-section regression, where the dependent variable is the abnormal returns of shareholders and the explanatory variable is the abnormal returns to bond holders. The intercept and estimated coefficient of the independent variable are -0.05 (-88337.20) and -0.49 (-1.12), respectively, and are both significant at the 1% level, with the dependent variable being the abnormal percentage returns (dollar returns). The authors argue that this lends support to the partial wealth transfer hypothesis, where the total abnormal returns to the firm are significantly negative, while bond holders gain at the expense of stock holders. Furthermore, the authors suggest that the results are consistent with the argument that managers of SEO issuers exploit 'windows of opportunity' when the firm is overvalued.

Carlson *et al.* (2006) develop a rational model in a real option framework with rational expectations and dynamically consistent corporate decisions to explain the salient features of SEO issuance. In addition, they replicate the moments documented in the survey by Ritter (2003), specifically the -2% SEO announcement effect and 3.4% underperformance over a 5-year period after the issue relative to size and book-to-market matched control firms. The authors suggest that the investor's expected return decreases following the SEO because the growth options are converted into assets in place, which is always less risky than the real option before the SEO issue. Clarke *et al.* (2001) investigate managerial motives for raising equity by examining the relation between long-run performance and insider trading activities around both completed and cancelled SEOs. The authors find that completed offerings experience significant -14.3% abnormal returns over a 3-year period after the announcement, while cancelled offerings earn -3% abnormal returns, which, however, is not significant. Insider selling is found to rise prior to both completed and cancelled offerings but decreases afterward only for cancelled offerings. Furthermore, insider selling is negatively related to the probability of SEO cancellation. The authors suggest that the overall findings are consistent with the explanation that managers take advantage of 'windows of opportunity' to sell overvalued equities. Duca (2016) studies whether investors form a belief in corporate intention based on the outcomes of previous offerings by the same firm. Using a sample of 5,317 SEOs (where 1476 are follow-on issues) over the period 1975 through 2007, the author documents a negative relation between 6- and 12-month long-term post-issue stock performance and underpricing in the follow-on offerings. The author posits that market feedback has a significant impact on investor beliefs concerning the firm's investment opportunities in subsequent offerings. In a study supporting the agency explanation of the choice between issuing debt or equity to raise capital, Jung *et al.* (1996) find that the 5-year post-announcement average excess return from 1977 to 1984 is -32.69 for equity-issuing firms and 2.03% for debt-issuing firms. When studying insider trading activities and long-run performance, Lee (1997) reports that SEO issuers underperform because issuing firms earn an average 40.8% buy-and-hold return over a 3-year period after the announcement, while industry- and size-adjusted matching firms earn 54.6%, and firms matched by pre-announcement annual return, size, and book-to-market ratio earn 54.5% over the same period. Focusing on earnings management prior to the SEO announcement, Rangan (1998) employs a sample of 712 SEOs from 1987 to 1990 and finds a negative relation between discretionary accruals and the holding period return during the four quarters over which the new earnings information is released after the issue. Specifically, a one-standard-deviation increase in discretionary accruals leads to a 10% decrease in market-adjusted stock returns. Clarke *et al.* (2004) also find 3- and 5-year underperformance of the SEO issuer's stock in supporting the 'windows of opportunity' hypothesis. Silva and Bilinski (2015) document that the 3-year underperformance of SEO issuers in the UK ranges from 9.47% to 21.31% relative to matching firms based on various matching techniques. Specifically, they find that SEOs stating that the proceeds will be used for general and recapitalization purposes significantly underperform, and the underwriter quality has a significantly positive effect on the long-run performance of SEOs. Overall, the authors argue that the prospectus information helps the market to identify stocks with better post-issue prospects. Other studies also document consistent evidence concerning SEO issuers in the UK (Levis 1995; Ngatuni *et al.* 2007; Capstaff & Fletcher 2011).

In terms of private placements, Hertzel *et al.* (2002) study long-run post-issue performance for their documented differences from public offerings. Using a sample of 619 private placements from 1980 to 1996, the authors measure long-term stock performance following the placement using both a matching procedure and the calendar-time approach. Depending on various matching bases, the long-run performance ranges from -23.78% to -45.15%; the implied 3-year return according to the adjusted intercept in the equally weighted portfolio is -31.04%. The significant negative long-run performance following private placement and the positive announcement returns collectively suggest that investors are overoptimistic about the issuer's prospects and correct this biased expectation over the long term, while the results are inconsistent in relation to the underreaction hypothesis (Hertzel *et al.* 2002). Similarly, based on a sample of 1,976 traditional private placements of common stock over a similar sample, Wruck and Wu (2009) find an average -3.31% (significant at the 10% level) cumulative abnormal returns over the 5-year period after placement and an average 3-year match-adjusted return of as much as -25.27% (significant at the 1% level). Krishnamurthy *et al.* (2005) also report consistent results. In a study asserting that sophisticated investors do not require sufficient discounts when purchasing private placements (Chen *et al.* 2010a), the authors find that the reversal of the pre-issue earnings management effect significantly determines the long-term post-issue stock performance. Furthermore, it is found that the stock performance of the issuer using aggressive earnings management significantly underperforms that of peers using conservative management. The authors argue that the long-run issuer's underperformance is consistent with the behavioural explanation that investors overweight recent experience in the formation of expectations.

2.2.3. SEO long-run post-announcement operating performance

In a study designed to test the earnings downturn argument, which refers to a firm raising external capital to offset declining future earnings, Hansen and Crutchley (1990) construct a sample of 109 common stock offerings from 1975 to 1982 and find mixed evidence. The authors estimate abnormal earnings (return on assets) in three ways, namely, unconditional ordinary least squares, portfolio ordinary least squares, and portfolio generalized least squares. First, the annual average earnings over the 3-year period subsequent to the equity offering is significantly negative. Specifically, the abnormal earnings over 3 years after the issue range from -2.88% to -3.41% depending on the estimation method employed, and are all significant at the 1% level. However, the average abnormal earnings in the announcement year for common stock offerings is negative but not statistically significant. The authors suggest that common stock issuers raise capital before they step into an earnings downturn. Second, the authors perform ordinary least squares regressions to examine the determinants of the issue size, as measured by the relative proceeds raised. The estimated coefficients of abnormal earnings over the 3-year post-offering period range from -1.97 to -2.14 for various abnormal earning estimation methods and are all significant at the 1% level. In contrast, the estimated coefficients of abnormal earnings on the offering year are not significant. This finding is consistent with the earnings downturn argument prediction that more capital is raised when a greater earnings downturn is expected. Finally, however, the authors fail to find a significant relationship between the announcement period stock price reaction and the size of abnormal earnings or the amount of capital raised. Collectively, the authors argue that the common stock offering is motivated by declining operating performance, and the amount of capital raised provides a direct implication for the future earnings downturn; however, the offering event does not systematically convey new information regarding the magnitude of the earnings downturn or the amount of capital raised.

However, there exists a counter-argument that operating performance does not decrease after the equity offering. Healy and Palepu (1990) study the nature of the information revealed by the primary stock offering and find no evidence that the issuer's earnings decrease subsequent to the offering. First, the authors document consistent evidence about negative stock price reaction upon announcement, which is -3.1% and -2.0% for the sample mean and median risk-adjusted returns, respectively. Second, they report that the issuer's mean and median standardized earnings changes are consistently positive over a 5-year period prior to the announcement and are all significant at conventional levels. However, no significantly positive earnings changes are found during the post-issue period. The mean earnings changes are 1.69 and 1.20 in years 0 and 2, respectively, and the median earnings changes are all positive 5 years after the issue. Third, by examining the industry-adjusted earnings changes, the test firms (issuers) have significantly higher median earnings than the companies in the same industry in years 0, 2, and 3, which is inconsistent with the proposition that the equity offering conveys the information that the earnings will decline. Fourth, the authors collect data about earnings forecasts for quarters 0 to 5 relative to the announcement from Value Line reports. The mean and median earnings forecasts in quarter 0 are 0.21% and 0.10%, respectively, and are both significant at conventional levels. During the post-issue period, both the mean and median earnings forecasts are negative and significant only in quarter 3, while they are non-significantly different from zero in other quarters. Finally, the authors regress standardized earnings forecast revisions in each quarter on the equity offering announcement returns to test whether the analysts revise their earnings forecasts in response to the observed SEO announcement returns. The estimated coefficient of the announcement returns is non-significant, suggesting that no revision occurs due to negative announcement returns. The authors conclude that the equity offering does not convey information regarding future earnings decline because there is no significant decline in earnings after the announcement relative to either pre-issue period earnings or industry earnings, and the analysts do not revise their earnings forecasts downwards in response to the announcement returns.

In contrast with previous studies, McLaughlin *et al.* (1996) use operating cash flow scaled by the book value of assets to gauge operating performance because this approach can better represent the economic benefit generated by the firm (Barber & Lyon 1997). By extending the sample of past studies to include Nasdaq firms, the authors construct a sample of 1,296 primary seasoned equity offerings issued by industrial firms over the period of 1980 through 1991. First, the authors examine the dynamics of a firm's operating performance 3 years prior to and 3 years subsequent to the SEO. The median value of the raw cash-flow-to-assets ratio in year -3 is 14.5%, which increases to 15% in the year before the SEO and subsequently declines to 13.4%, 11.6%, and 11.5% in the three years following the SEO. The use of an industry-adjusted measure of the cash-flow-to-assets ratio yields consistent results. The authors find that the median *change* in the cash-flow-to-assets ratio from years +1, +2, and +3 relative to year -1 is -0.012, -0.022, and -0.030, suggesting a 12.5%, 14.66%, and 20% decline in operating performance, respectively. Industry-adjusted changes in operating performance are similar. Second, the authors explore the determinants of post-SEO change in operating performance by regressing changes in industry-adjusted operating cash flow on the amount of pre-announcement free cash flow. The estimated coefficient of the ratio of free cash flow to assets in year -1 is -0.432 and is significant at the 1% level, suggesting that greater firm cash flow results in more deteriorated operating performance after the SEO. Furthermore, the estimated coefficient of the change in operating performance measure from year -2 to -1 is -0.111 and is significant at the 1% level, implying that the issuer's post-SEO operating performance is negatively related to the pre-announcement operating runup. Finally, in the logit regression combining SEO firms and matched non-SEO firms, the authors fail to find any significant relation between pre-announcement free cash flow and the probability of initiating an SEO, which is inconsistent with the argument that a firm with a large amount of free cash flow conducts an SEO purely to exploit the overvaluation of its equity (which predicts a significantly positive relation). While confirming the findings of previous studies that SEO issuers experience deteriorated operating performance, the authors also find evidence supporting the free cash flow hypothesis (Jensen 1986) in that the decline in performance is positively related to the issuer's free cash flow level.

Loughran and Ritter (1997) later study the pattern of operating performance around seasoned equity offerings on a sample of 1,338 SEOs over the period of 1979 to 1989. The authors construct six measures of operating performance, namely, operating income scaled by assets, profit margin, ROA, operating income scaled by sales, capital expenditures plus research and development (R&D) expenses relative to assets, and market-to-book value of equity. The authors find consistent evidence across six measures that the operating performance peaks at the time of or immediately before the offering but experiences a significant decline during the 4-year period subsequent to the announcement. For example, the median ROA of sample issuers is 6.4% and 6.3% in years -1 and 0, respectively; however, it decreases to 3.2% in the fourth year after the offering announcement. Although non-issuers also experience decreasing operating performance after an offering, the Wilcoxon match-pairs test suggests that the decline in issuers' operating performance is significantly more rapid. In addition, the decline in operating performance is more pronounced for small issuers. Finally, although the issuers are disproportionately growth firms, they still underperform non-issuers with the same growth rate. The authors interpret the operational underperformance of issuers as managers intentionally and successfully misleading the market by the around-announcement performance. However, the authors note that most managers take advantage of 'windows of opportunity' to issue overvalued equity rather than manipulating earnings since such manipulation takes time, which increases the issuer's exposure to downwards market movement.

Other articles also study the operating performance associated with SEOs. For example, Teoh *et al.* (1998b) decompose net income to accruals and cash flow from operations. They argue that pre-announcement discretionary current accruals are negatively related to post-issue long-run net income. Although the negative relation is common to all firms over the sample period, it is more pronounced for new equity issuers. The authors suggest that investors naively extrapolate pre-announcement earning information and ignore the information in the discretionary parts of accruals. Consequently, the informationally imperfect market is overly optimistic about the equity offering and is disappointed when it discovers that high earnings are not sustainable. Similarly, Rangan (1998) also reports a negative relation between discretionary accruals during the year around the offering and earning changes in the following year. Specifically, a one-standard-deviation higher discretionary accrual is related to a 2-3% earnings decline per dollar of assets. However, it is argued that post-SEO operating performance is not only a reflection of accrual reversals. Cohen and Zarowin (2010) use three proxies for operational decisions related to earnings management, namely, abnormal levels of cash flow from operations, discretionary expenses, and production costs, and find that firms with a higher level of real earnings management activities experience a higher level of underperformance in terms of ROA over the 3-quarter period following the SEO announcement. Thus, it is argued that post-SEO operating performance is also a consequence of real earnings management activities.

Chen *et al.* (2010a) construct a sample of private placements and use quarterly ROA data to measure operating performance following the method of Lie (2005). The authors find that the issuer's operating performance improves relative to control firms over a 4-quarter period prior to the placement; however, it significantly underperforms over the 8 following quarters. The authors suggest that long-run underperformance is a result of investors' overweighting of recent experience. Furthermore, the authors document that issuers who aggressively manage earnings experience poorer post-placement operating performance than those who conservatively manage earnings. To investigate issuers in the UK, Andrikopoulos (2009) uses a sample of 1,542 rights issues over the period of 1988 to 1998 and finds that the issuers experience significantly deteriorated operating performance after the issues, as indicated by ROA, earnings before tax, and net profit margin regardless of the control benchmarks employed. This finding coincides with previous studies regarding the UK market (Ho 2005).

2.3. Literature opportunities & hypotheses development

2.3.1. Literature opportunities

Equity issuance, which is a major corporate event, has long been an important research field in finance; therefore, it is crucial to study its valuation effect and post-announcement performance. In particular, SEOs are even more important than IPOs because they are sold with a wider array of alternative flotation methods and have an active secondary market from which the current price and pre-announcement firm characteristics can be obtained.

The literature reviewed above yields several implications for this chapter. First, although most studies pertaining to the SEO short-run valuation effect document negative announcement returns, most studies explain the underlying cause of the observed negative announcement returns by aligning reported returns with empirical predictions yielded by various theories, among which the adverse selection explanation (Myers & Majluf 1984) and signalling theory (Leland & Pyle 1977) receive the widest support. However, the empirical prediction of these two theories regarding the SEO announcement is the same since they are both based on the idea that the investor discounts the offering due to the belief that the issuer's management possesses and exploits inside information; thus, it is difficult to distinguish between them.

Second, in terms of the *new issues puzzle*, advocates posit that the fact that the SEO issuer is overpriced at the time of announcement is evident from the issuer's long-run post-announcement underperformance, which reflects the continuation of the revelation of negative information conveyed by the offering announcement (Loughran & Ritter 1995; Spiess & Affleck-Graves 1995). In other words, the short-run negative abnormal returns to the issuer do not fully incorporate the negative information. However, the problem exists due to the technical method employed by these studies, namely, the matching-firm technique. It is argued that the long-run issuer's underperformance that underpins the *new issue puzzle* is merely a reflection of lower-risk exposures brought by equity offerings (Eckbo *et al.* 2000).

Third, as an extension of the overvaluation explanation of the new issue puzzle, the reported issuer's long-run underperformance in operating measures arguably confirms the issuer's overvaluation at announcement (Loughran & Ritter 1997). As a result, it faces the same problem of employing matched non-issuers as the performance benchmark.

This chapter, therefore, employs the SEO issuer's pre-announcement valuation uncertainty to examine the whole SEO value realization process and provides a consistent explanation of the underlying cause of the SEO valuation effect. There are three reasons that the pre-announcement issuer's valuation uncertainty is appropriate for responding to the problems identified above. First, by restricting the sample to seasoned equity offerings (and excluding IPOs), we can obtain access to the issuer's pre-announcement firm characteristics information. Since this information is publicly available, the direct test conducted on the pre-announcement uncertainty sidesteps signalling theories that are based on the market's reaction to managers' private information.

Second, the level of adverse selection increases in investor uncertainty about equity issuers' assets, which is defined as *ex ante uncertainty*, at the time of the submission of the purchase order (Beatty & Ritter 1986). In their analytical framework, uninformed investors experience the 'winner's curse' in purchasing IPOs since they can buy the stock only when informed investors perceive it to be overvalued. As a result, the uninformed investor would raise the expected IPO underpricing to compensate for the loss from the 'winner's curse'. Further, this 'winner's curse' is intensified by the higher degree of *ex ante* uncertainty because the more uncertain the market is about the issuer's value, the more underpricing uninformed investors require. Similarly, this chapter argues that the same rationale exists in the context of a pure SEO sample. When an SEO is announced, the investor perceives it to be overpriced and imposes a discount due to adverse selection. The informed investor performs an analysis regarding the appropriate price that can justify both the overvaluation and the information acquisition cost. After informed investors form a belief about the reasonable value of the issuer, due to the institutional nature of the market, they leave the stock for uninformed investors to purchase only if the issuer's reservation (offer) price is greater than this reasonable value (Rock 1986). Consequently, uninformed investors face the same 'winner's curse' problem as in the context of IPOs. Thus, they require more 'money left on the table' to justify this loss by imposing a greater discount on the SEO's reservation price. Again, this 'winner's curse' is magnified by the issuer's *ex ante* uncertainty. The higher the *ex ante* uncertainty, the more the uninformed investor could lose; consequently, the higher discount the uninformed investor would request. Therefore, the *ex ante* uncertainty serves as a proper proxy to test the adverse selection explanation (Myers & Majluf 1984) of the SEO announcement valuation effect.

Third, valuation uncertainty is widely documented to have a positive relation with valuation level. Despite different theoretical frameworks, the general idea is that the stock's price is higher if there is a higher degree of uncertainty about its valuation, since the stock is always held by the most optimistic investors (Miller 1977; Mayshar 1983; Scheinkman & Xiong 2003). In addition, the price discovery process is by definition the process of resolving uncertainty of valuation. Consequently, by examining the relationship between *ex ante* uncertainty and the issuer's long-run post-announcement stock and operating performance, one can provide implications for the

SEO overvaluation hypothesis advanced in the *new issues puzzle* (Loughran & Ritter 1995).

2.3.2. *Hypotheses development*

Prior research on SEO performance focuses on three aspects. First, the majority of previous studies find that the average short-run abnormal returns to issuers around announcements are approximately -3%. For example, Asquith and Mullins Jr (1986) document -2.7% average two-day abnormal returns for 531 common stock offerings over the period of 1963 to 1981 and consider this finding consistent with an adverse selection framework. Over almost the same period and using a more comprehensive sample, including primary stock offerings, combination offerings, and dual offerings, Masulis and Korwar (1986) report -3.25% average abnormal returns for industrial issuers, arguing that this finding is in line with the signalling model proposed by Leland and Pyle (1977). Other consistent evidence includes -3.44% announcement returns on a small sample (360 randomly selected issuers) over the period of 1972 to 1982 (Mikkelson & Partch 1986) and -2.69% announcement returns on a large sample (1,024 underwritten industrial issuers) over the period of 1978 to 1983 (Korajczyk *et al.* 1991). In contrast, a minority of studies document positive announcement returns (Barclay & Litzenberger 1988; Wruck 1989; Hertzel & Smith 1993). Although the predictions of signalling theories based on asymmetric information, such as Leland and Pyle (1977) and Miller and Rock (1985), obtain partial support, most findings about negative announcement returns are explained by adverse selection (Myers & Majluf 1984).

Second, in terms of SEO long-term post-announcement performance, the literature generally suggests that issuers underperform in the long run. For example, using 1,247 common stock offerings over the period of 1975 to 1989, Spiess and Affleck-Graves (1995) report that although SEO issuers experience a positive raw return one month after announcement, they significantly underperform relative to non-issuers matched according to industry, firm size, and book-to-market ratio over a period as long as five years. The authors suggest that investors overreact to the offering announcement, and the market corrects this mis-evaluation over the long run. Furthermore, the authors note that the underlying cause is that managers of issuers mislead the market by selling overvalued equity based on their superior inside information. Another study also documents that both IPO and SEO issuers significantly underperform matched non-issuers over the 5-year post-announcement period (Loughran & Ritter 1995). The authors propose that the long-term underperformance of issuers reflects the initial overvaluation, and managers take advantage of issue stocks when they perceive that equity is overvalued (Loughran & Ritter 1995). From the perspective of wealth transfer, SEO issuance causes the transition of wealth from stock holders to debt holders, since the long-run stock return is significantly lower than the bond return over the same period, while the CRSP index following an SEO is significantly higher than the Corporate Bond Index (Eberhart & Siddique 2002). Jung *et al.* (1996) and Loughran and Ritter (1997) also find long-run SEO issuers' underperformance. In summary, the long-run post-announcement underperformance of SEO issuers is interpreted as the announcement returns not fully revealing the information contained in the offerings and managers of issuing companies taking advantage of overvaluation to sell their equity in the best interest of existing shareholders.

Third, most issuers suffer from deteriorated operating performance relative to non-issuers, which is explained as managers successfully selling overvalued equity since the bad operating performance fails to justify the high equity valuation at the time of the SEO announcement. In one of the most representative articles regarding SEO post-announcement operating performance, Loughran and Ritter (1997) construct a sample consisting of 1,338 offerings over the period of 1979 to 1989 and find that the operating performance of the issuers significantly declined during the 4-year period subsequent to announcement relative to that of non-issuers matched according to industry, asset size, and operating performance. In conjuncture with the long-run post-announcement stock return underperformance, the authors attribute this observation to managers of issuers successfully misleading the market and selling overvalued equity (Loughran & Ritter 1997). Consistent evidence indicates that the issuer's return on assets declines significantly subsequent to the SEO announcement (Hansen & Crutchley 1990).

There are two obstacles in the literature preventing a consistent explanation of the SEO valuation effect. First, almost all short-run studies judge the valuation effect by examining the absolute magnitude and the sign of SEO announcement returns and then attempt to make the findings coincide with empirical predictions yielded by various theories. This can lead them to reject theories that can be directly tested; for example, the pure capital structure explanation is rejected, as change in net debt ratio has no explanatory power for two-day excess return (Asquith & Mullins Jr 1986). However, this method fails to distinguish explicitly between theories producing the same prediction regarding the sign of SEO announcement returns, such as adverse selection and signalling based on asymmetric information, which both predict that an SEO will lead to a decrease in the stock price at announcement. Nevertheless, most empirical studies are consistent with the adverse selection model in which investors demand a price discount to hedge against the risk that SEO issuers are overvalued (Eckbo & Masulis 1995). Therefore, an appropriate proxy allowing a direct test of adverse selection theory is called for.

Past studies highlight the potential of firm-level uncertainty to be influential in explaining the valuation effect in the context of equity issuance. The theoretical work advanced by Choe *et al.* (1993) posits that the adverse selection problem will be greater when investor uncertainty concerning the value of assets in place increases. The authors proxy market uncertainty about issuers' asset value by shareholder concentration, Tobin's q ratio, and regulatory status and find that the announcement valuation effect is less negative for issuers with lower uncertainty (Choe *et al.* 1993). Similarly, Schwert (1989) measures investor uncertainty concerning the value of assets in place by stock price volatility, which is an increasing function of operating leverage.

On the empirical front, Beatty and Ritter (1986) measure investor uncertainty about the value of issuers' assets at the time of submitting the purchase order for primary offerings, which is defined as *ex ante* uncertainty, by the inverse of gross proceeds from the equity offering and the number of specified uses of the proceeds. The authors find that *ex ante* uncertainty is positively related to the expected level of adverse selection (Beatty & Ritter 1986). Consistent evidence indicates that value uncertainty is positively related to both equity underpricing and overvaluation (Song *et al.* 2014). Consequently, this study establishes a direct link between *ex ante* uncertainty and the level of adverse selection in the context of SEOs.

H1: The SEO issuer's announcement returns are negatively associated with the issuer's ex ante uncertainty.

The second problem in the literature is related to the measure of SEO long-run post-announcement underperformance. It is argued that this long-run underperformance of SEO issuers is evidence of overvaluation at announcement, since the negative information contained in the offering announcement is revealed through a post-announcement period as long as five years (Loughran & Ritter 1995). However, the literature is critical of this argument. For example, it is argued that the matching-firm technique does not properly control for risk, and the documented underperformance of issuers actually reflects lower systematic risk exposure due to the issuer's decreased leverage and increased stock liquidity (Eckbo *et al.* 2000). Using a sample of 4,860 firm-commitment SEOs, Eckbo *et al.* (2000) construct a zero-investment portfolio consisting of a short position on SEO issuers and a long position on matched non-issuers, and they find that such a portfolio fails to provide investors with positive abnormal returns different from zero. Since they construct abnormal returns based on expected returns produced by a factor-generating model, the factor loadings of the portfolio shed light on the risk exposure of issuers. The authors find that issuers face low exposure to risk factors such as unanticipated inflation, default spread, and term structure dynamics; therefore, they conclude that the issuer's negative long-run post-announcement returns reflect the lower unexpected inflation risk and lower default risk due to decreased leverage rather than underperformance in comparison to non-issuers (Eckbo *et al.* 2000). Carlson *et al.* (2010) later achieved a consensus that the SEO issuer's long-run underperformance reflects decreased systematic risk exposures. Similarly, another article suggests that the return following the equity offering reflects a pattern among a broader set of public companies, and the observed underperformance of issuers is concentrated in the sub-sample of small issuers with low book-to-market value (Brav *et al.* 2000). In addition, for young growth firms, the decreased post-announcement idiosyncratic risk can also partly explain the low return of the SEO issuer (Huang *et al.* 2014). Another strand of the literature proposes that increased market liquidity due to the issue of new equity is the underlying reason for the decreased expected return of investors (Eckbo & Norli 2005; Bilinski *et al.* 2012; Lin & Wu 2013).

Consequently, motivated by the unresolved SEO long-run underperformance puzzle and the criticism of the matching-firm methodology, this study proposes another path that sidesteps the controversial matching-firm technique. The overvaluation explanation is based on the idea that long-run underperformance reveals the issuer's overvaluation at announcement, which is not fully incorporated into the stock price through short-run market reaction. To the same end, *ex ante* uncertainty serves as an appropriate proxy to test the overvaluation hypothesis since it is widely documented that the valuation level increases in uncertainty about a firm's value, both theoretically (Miller 1977; Mayshar 1983; Morris 1996; Scheinkman & Xiong 2003) and empirically (Chen *et al.* 2002; Diether *et al.* 2002; Jones & Lamont 2002).

Some studies already highlight that the resolution of firm-level uncertainty can partially explain negative SEO returns. For example, Mikkelson and Partch (1986) and Korajczyk *et al.* (1991) both note that the resolution of uncertainty can partially justify the negative announcement returns to equity issuers. More specifically, the short-run adverse selection model developed by Korajczyk *et al.* (1992) finds that equity issues are more frequent after accounting earnings releases, suggesting lower investor concern about adverse selection due to decreased uncertainty about assets in place. Dierkens (1991) provides empirical support. However, the existing literature lacks any direct investigation of the role of uncertainty about the equity issuer's assets in place in the issuer's valuation realization process. Some studies include measures of uncertainty as a control variable in explaining two-day announcement returns to equity issuers, such as Masulis and Korwar (1986); however, the authors do not report significant coefficient estimates of uncertainty measures. One possible explanation is that the primary equity offerings included in the sample and the data collected to construct uncertainty measures for IPO issuers are not unbiased from the market's perspective.

Following the same rationale, assuming that the short-run SEO return does not fully reveal the overvaluation information conveyed by the announcement, as suggested by Loughran and Ritter (1995), then the pre-announcement uncertainty must not be fully resolved upon announcement. Consequently, *ex ante* uncertainty should exert a significant impact on the issuer's long-run post-announcement returns as a result of the market gradually revealing the negative information conveyed in the announcement. Given the positive relation between uncertainty about a firm's value and the stock price, this study proposes that a negative relation exists between *ex ante* uncertainty about an issuer's value and the long-run post-announcement returns should the overvaluation explanation (Loughran & Ritter 1995) hold.

H2: The SEO issuer's long-run post-announcement returns are negatively associated with the issuer's ex ante uncertainty.

Finally, per the *new issues puzzle* that the issuer's low post-announcement operating performance manifests overvaluation at announcement, the operating underperformance should continue until the negative information contained in the SEO announcement is fully revealed, in other words, until the overvaluation of the SEO issuer is fully corrected by the market. Taking the path suggested above rather than using the matching-firm technique should mean that *ex ante* uncertainty as a reflection of initial overvaluation will have a negative effect on the issuer's post-announcement operating performance. Therefore, this chapter proposes the following hypothesis.

H3: The SEO issuer's long-run post-announcement operating performance is negatively associated with the issuer's ex ante uncertainty.

2.4. Data & methodology

2.4.1. Sample selection

In this chapter, since the objective is to investigate the impact on SEO performance of *ex ante* uncertainty, firm data prior to the announcement are required. Consequently, the sample is restricted to seasoned equity offerings, and all IPOs are excluded. The U.S. SEO data are obtained from the Thomson One database over the period of 1 January 1985 to 31 January 2018. For inclusion in the sample, the following criteria need to be met:

1) The issuer is a U.S. publicly listed firm and must be covered by Compustat and by CRSP to obtain accounting and stock price data.
2) The issue must be an SEC-registered underwritten offering of common stocks.

Rights offerings, joint offerings, unit offerings, and shelf registrations are excluded.

3) The issue must be a primary seasoned offering, and any other offerings, including secondary share distributions, are excluded.
4) Offerings issued by financial institutions (SIC codes 6000–6999) or utilities (SIC codes 4900–4949) are not included.

Table 2.1 summarizes descriptive statistics of the final sample which includes 3183 qualified deals.

[Insert Table 2.1 here]

Table 2.1 provides descriptive statistics about issuer and deal characteristics. In terms of issuer characteristics, it is evident that issuers with higher *ex ante* uncertainty issue more shares as a percentage of existing shares, experience higher runup prior to the issue, raise more proceeds from the target market, and accumulate higher working capital in the year before the issue (all significant at the 1% level). Furthermore, issuers with high *ex ante* uncertainty experience a greater increase in leverage through seasoned equity offerings, which is significant at the 10% level. In contrast, these issuers have significantly smaller firm size. In terms of deal characteristics, the gross spread is higher (significant at the 1% level) for issuers with higher *ex ante* uncertainty, which reflects compensation for the risk assumed by underwriters.

2.4.2. Ex ante uncertainty measures

The main variable of this study is the SEO issuer's *ex ante* uncertainty about its assets in place. Therefore, several measures of this firm-level uncertainty are discussed here.

First, the concept of *ex ante* uncertainty is developed by Beatty and Ritter (1986), who employ the inverse of gross proceeds raised from the equity issue as the proxy. The reason is that smaller issues are perceived by the market as more speculative, reflecting a higher degree of investor valuation uncertainty (Ritter 1985). Therefore, the larger inverse of gross proceeds represents the higher level of *ex ante* uncertainty.

Second, the variance in stock return prior to the SEO announcement arguably captures the market's uncertainty about the issuer's current asset value (Masulis & Korwar 1986; Eckbo & Masulis 1992). Since one of the main focuses of this chapter is direct testing of the adverse selection model, it is predicted that the variance in the stock rate of return is positively related to the issuer's negative return around the SEO announcement. Specifically, the issuer's total risk is calculated as the variance in stock return over 60 trading days preceding the SEO announcement, following Masulis and Korwar (1986). It is calculated for issuer i as

$$Var_{60} = \frac{\sum_{t=-59}^{0}(R_{it} - \mu_i)^2}{60} \tag{2.1}$$

where R_{it} represents the daily return calculated for issuer i on day t, while μ_i is the mean return calculated for issuer i over the period of 60 trading days prior to the SEO announcement. As an alternative, the variance in stock return over 120 trading days preceding the SEO announcement, Var_{120}, is calculated in the same manner. In addition, when the dependent variable is CAR (-1, +1) relative to the issue date in the robustness tests, the variances in the issuer's return are measured over the 60-day (120-day) period prior to day -1, denoted as Var_{61} (Var_{121}).

Third, a less direct approach also links volatility in stock returns to the investor uncertainty concern of the issuer's current asset value. It is argued that the monthly standard deviation of stock returns increases during economic recessions due to the increased operating leverage, which in turn is positively associated with investor uncertainty regarding the issuer's value of assets in place (Schwert 1989). Therefore, this chapter calculates the standard deviation of the stock return of the issuer over the 60-trading day period prior to the SEO announcement. It is derived as

$$SD_{60} = \sqrt{\frac{\sum_{t=-59}^{0}(R_{it} - \mu_i)^2}{60}} \tag{2.2}$$

where R_{it} represents the daily return calculated for issuer i on day t, while μ_i is the mean return calculated for issuer i over the period of 60 trading days prior to the SEO announcement. As an alternative, the standard deviation of stock return over 120 trading days prior to the SEO announcement, SD_{120}, is calculated in the same way. In addition, when the dependent variable is CAR (-1, +1) relative to the issue date in the robustness tests, the standard deviations in the issuer's return are measured over the 60-day (120-day) period prior to day -1, denoted as SD_{61} (SD_{121}).

Fourth, using the *ex ante* uncertainty measures derived from stock price to gauge adverse selection implicitly assumes market efficiency; in other words, the stock price already contains all available information prior to the announcement and can fully capture investor uncertainty concerning the issuer's asset value. Since market efficiency is not unambiguously supported by the empirical evidence, it is hereby proposed that operating measurements should be considered to proxy *ex ante* uncertainty as a complement to stock market measurements. To this end, prior studies suggest that cash flow uncertainty captures the business risk to which a firm is exposed (Opler *et al.* 1999; Freund *et al.* 2003; Han & Qiu 2007; Bates *et al.* 2009). Intuitively, the investor adjusts the valuation uncertainty level according to the business risk the firm faces. Consequently, this chapter uses cash flow uncertainty, which is defined as the rolling standard deviation of the SEO issuer's operating cash flow over the 2-year period prior to the announcement deflated by the mean value of operating cash flow over the same period, as a fourth measure of ex ante uncertainty. It is developed as

$$CFU_2 = \sqrt{\frac{\sum_{t=-1}^{0}(CF_{it} - \mu_i)^2}{2}} \Bigg/ \frac{\sum_{t=-1}^{0} CF_{it}}{2} \tag{2.3}$$

where CF_{it} represents the annual operating cash flow of issuer i in year t, while μ_i is the mean operating cash flow calculated for issuer i over a period as long as 2 years preceding the SEO announcement. As alternative measures, the standard deviation of operating cash flow over 3 and 4 years before the SEO announcement, CFU_3, and CFU_4, are also calculated.

Fifth, since the core variable of interest for H3 is operating performance, the measure that is more directly linked with variance in operating performance developed by Chay and Suh (2009), namely, the variation in operating rate of return, is used to gauge cash flow uncertainty. Specifically, the operating rate of return is calculated as operating income scaled by total assets, while operating income after depreciation and operating income before depreciation are both employed. Then, the 3-year standard deviation in two measures of the operating rate of return is calculated.

2.4.3. Empirical method

2.4.3.1. H1

First, univariate analysis is carried out to compare cumulative abnormal returns (CARs) and other firm and offering characteristics between issuers with high and low *ex ante* uncertainty. The specification of the *ex ante* uncertainty level is relative to the sample median. For every variable, the difference between issuers with high and low *ex ante* uncertainty will be calculated, and a significance test will be conducted on the calculated difference.

Second, cross-sectional ordinary least square (OLS) regression is performed to examine the explanatory power of *ex ante* uncertainty and other independent variables suggested in the literature against the dependent variable, which is the SEO issuer's short-run announcement returns. The regression model used to test H1 is

$$CAR_i = \alpha + \beta_1 \cdot Uncertainty_i + \lambda \cdot Controls_i + \varepsilon_i \tag{2.4}$$

where $Uncertainty_i$ represents the *ex ante* uncertainty of issuer i and $Controls_i$ is the control variables, which will be defined below, for each sample issuer. As in most studies on SEO issuance, the cumulative abnormal returns to issuers over the announcement period are the dependent variable, which is the announcement date and the following trading day, denoted hereafter as CAR [0, +1]. Specifically, the CAR is derived as follows. The short-run nominal return R_{it} of issuer i is calculated by daily data as

$$R_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right) \tag{2.5}$$

where P_t is firm i's share price at time t. The market-adjusted abnormal returns of firm i (Brown & Warner 1985) are determined within the two-day event window (0, +1) as

$$AR_{it} = R_{it} - R_{mt} \tag{2.6}$$

where R_{mt} is the normal market return, calculated by the daily Standard & Poor's 500 index, and the market parameters are estimated from daily data over the window [-365, -28] relative to the announcement date. The CAR is the summation of abnormal returns over the event window:

$$CAR_{it} = \sum_{i=1}^{n} AR_{it} \tag{2.7}$$

Several control variables suggested in past studies are considered. Motivated by the mixed evidence of the explanatory power of signalling theories (Eckbo & Masulis 1995), some studies insert variable proxies for the signalling model. Given that it is assumed that perfectly mimicking high-quality firms is prohibitively costly for low-quality firms, the signalling models of Ross (1977), Leland and Pyle (1977), Heinkel (1982), and John and Williams (1985) all suggest that a decrease in leverage reflects the management's negative perspective regarding the firm's future cash flows, thus predicting a negative market re-valuation of the issuer's stock. Consistently, Ross (1977) and Heinkel (1982) also imply that a leverage increase will cause a positive market reaction. Therefore, the issuer's financial leverage change (ΔLev), which is calculated as leverage after SEO minus the average leverage over the five-year period preceding the offering announcement, is included as a proxy of signalling explanation. The above studies predict that the change in leverage should result in similar directional changes in the issuer's future earnings; thus, ΔLev is predicted to be positively related to the issuer's announcement returns. According to agency theory (Jensen & Meckling 1976), the percentage increase in outstanding shares should be negatively related to the announcement since it reflects the decrease in the management's fractional ownership of shares. Therefore, $\Delta Outstanding$ is inserted as a control variable to account for the agency explanation. There is no conclusive evidence of how the issuer's past performance affects the announcement period CAR. Masulis and Korwar (1986) find that the issuer's CAR during 60 days prior to the announcement is negatively related to the announcement returns; the authors explain this as the large price gain making the equity offering less likely and thus more surprising when it actually takes place. In contrast, Asquith and Mullins Jr (1986) document that a 50% increase in the issuer's CAR over a one-year period prior to the announcement is related to 0.75% higher announcement returns. To better explain the announcement, this chapter includes *Runup* as an explanatory variable, defined as the issuer's cumulative stock return over the 60-day period preceding the offering announcement, and expects a negative relation between *Runup* and the issuer's announcement period CAR. In addition, the issue size is argued to have a significantly negative impact on the announcement returns. For example, Asquith and Mullins Jr (1986) report that a $100 million increase in equity issuance size results in a further $7.7 million reduction in firm value on the announcement day, probably because the market perceives the larger equity issue as a signal of greater financial distress risk. Therefore, *Issue size*, which is calculated as the planned proceeds divided by the issuer's pre-announcement equity value, is included. Finally, two standard firm characteristics are considered. One is the issuer's market capitalization, *MV*, calculated as the logged value of the product of outstanding shares at the offering date and the closing price on the same date. Another is the market-to-book value, *MB*, calculated by dividing the market value of equity by the book value of equity on the offering day.

2.4.3.2. H2

First, univariate analysis is carried out to compare buy-and-hold abnormal returns (BHAR) and other firm and offering characteristics between issuers with high and low *ex ante* uncertainty. The specification of the *ex ante* uncertainty level is relative to the sample median. For every variable, the difference between issuers with high and low *ex ante* uncertainty will be calculated, and a significance test will be conducted on the calculated difference.

Second, cross-sectional ordinary least square (OLS) regression is performed. In terms of long-run SEO post-announcement, most studies (if not all) do not investigate the cross-sectional sources of long-run underperformance but focus only on descriptive analysis and comparison between SEO issuers and matched non-issuers. Therefore, this study intends to fill this gap by performing the method employed in IPO long-run performance, as in Ritter (1991), in the context of the SEO market. Specifically, the regression model used to test H2 is

$$BHAR_i = \alpha + \beta_1 \cdot Uncertainty_i + \lambda \cdot Controls_i + \varepsilon_i \tag{2.8}$$

where $Uncertainty_i$ represents the *ex ante* uncertainty of issuer i and $Controls_i$ stands for control variables, which will be defined below, for each sample issuer. Unlike the return calculation for H1, to avoid upwards or downwards bias due to accumulating short-run abnormal returns over long periods (Conrad & Kaul 1993), the market-adjusted holding period return is employed to measure long-run post-issue performance. The dependent variable, $BHAR_i$, represents the 3-year buy-and-hold abnormal returns for SEO issuers subsequent to the announcement. Since the matching-firm technique is abandoned in this study, the empirical method of calculating long-term post-announcement performance, which is holding period return (Loughran & Ritter 1995; Spiess & Affleck-Graves 1995), is not used. The buy-and-hold abnormal returns are derived as

$$BHAR_i = \prod_{t=0}^{T}(1 + R_{it}) - \prod_{t=0}^{T}(1 + R_{mt}) \tag{2.9}$$

where R_{it} and R_{mt} are defined as in the previous section.

A series of control variables are considered to test H2. According to the underreaction theory, the long-run performance of a corporate event is positively related to its short-run market reaction since the investor does not fully react to the information contained in the occurrence of the event (Daniel *et al.* 1998). In the context of the equity market, Ritter (1991) and Teoh *et al.* (1998a) control the initial announcement returns when conducting a cross-sectional study on the long-run performance of IPOs; however, they fail to find significant coefficient estimates. Therefore, this study includes initial return, *IR*, as a control variable to study the long-run performance of equity issuance in the context of SEOs. Following the idea that managers time the market to sell equities when they are overpriced, Ritter (1991) documents that the annual volume of issuance is negatively related to the issuer's long-run performance. Thus, *Vol*, calculated as the annual volume of SEOs in the year of issuance divided by 100, is inserted as a control variable. To determine whether the overvaluation at the time of announcement reflects the market's perception of the firm's growth potential, *Age*, which is calculated as the logged value of one plus firm age at the time of SEO issuance, is employed as a proxy of growth opportunity. As suggested by Ritter (1991), younger firms experience a higher degree of overvaluation, implying a negative relation between *Age* and the issuer's long-run post-announcement performance. Following Clarke *et al.* (2004), the issuer's market capitalization, *MV*, calculated as the logged value of the product of outstanding shares at the offering date and the closing price on the same date, is controlled. Additionally, market-to-book value, *MB*, calculated by dividing the market value of equity by the book value of equity on the offering day, is considered. In addition, two measures accounting for operating performance and financial expenditure at the year of announcement are controlled owing to their significant effect on equity offerings' long-run post-announcement performance (Teoh *et al.* 1998a; Teoh *et al.* 1998b). The first one, $\Delta CapExp$, is the mean of the asset-scaled capital expenditure measure over the 3-year period prior to the announcement. The second one, ΔNI, is the asset-scaled net income growth over the 3-year period prior to the announcement.

2.4.3.3. H3

First, univariate analysis is carried out to compare the operating performance and other firm and offering characteristics between issuers with high and low *ex ante* uncertainty. The specification of the *ex ante* uncertainty level is relative to the sample median. For every variable, the difference between issuers with high and low *ex ante* uncertainty will be calculated, and a significance test will be conducted on the calculated difference.

Second, ordinary least square (OLS) regression is performed. The regression is specified as

$$OP_i^{Post} = \alpha + \beta_1 \cdot OP_i^{Pre} + \beta_2 \cdot HighUncertainty_i + \varepsilon_i \qquad (2.10)$$

The dummy variable, $HighUncertainty_i$, takes the value of one if issuer i's *ex ante* uncertainty is above the sample median and zero otherwise. Consequently, the coefficient β_2 represents the difference in operating performance between issuers with high and low *ex ante* uncertainty. OP_i^{Post} and OP_i^{Pre} are operating performance measurements for firm i for the post- and pre-announcement periods, respectively. Specifically, OP_i^{Post} is the 2-year average post-announcement operating performance. OP_i^{Pre} is measured by the 2-year average pre-announcement operating performance of the SEO issuer. Since the corporate event under examination in this chapter is seasoned equity offerings, it is argued that the return on equity (ROE) is more appropriate in evaluating the profitability of the issuer around the issue than pure cash flow measures, which do not explicitly incorporate the change in a firm's equity. All ROE measures employed in this chapter are adjusted against the industry median.

Notably, the inclusion of pre-announcement operating performance in independent variables mitigates the potential endogeneity problem in that the operating performance is documented to be a function of firm characteristics (Gao & Mohamed 2018). Thus, regressing post-announcement operating performance on variables without adjusting the actual pre-announcement counterpart could yield biased results.

2.5. Results and discussion

2.5.1. H1

2.5.1.1. Univariate analysis

[Insert Table 2.2 here]

Table 2.2 provides the results from the univariate analysis regarding the 2-day announcement valuation effect of the sample SEOs. In Panel A, issuers with higher *ex ante* uncertainty experience a 1.2% (significant at 1%) lower cumulative abnormal returns upon offering issuance. Panel B and Panel C provide consistent evidence that issuers with higher *ex ante* uncertainty earn significantly lower announcement returns from equity offerings. Overall, the simple univariate analysis for CAR2 lends support to H1, which proposes that the issuer's ex ante uncertainty is negatively related to its SEO announcement returns, and the results are robust across three measures of *ex ante* uncertainty, as specified in Table 2.2.

2.5.1.2. Multivariate analysis

The univariate analysis appears to support H1; however, it is essential to assess the cross-sectional relation between the issuer's short-term announcement returns and other deal and firm characteristics. Therefore, multivariate analysis is performed to reveal these relations. Table 2.3 reports the results from OLS regressions, which are specified in Section 4.

[Insert Table 2.3 here]

The results indicate that the issuer's *ex ante* uncertainty is negatively related to its 2-day announcement returns in seasoned equity offerings, as is evident in negative and significant estimated coefficients of *Ex ante uncertainty* across Models (1) to (3). Specifically, Model (1) suggests that a one-standard-deviation increase in the inverse of gross proceeds leads to a 0.56% decrease in CAR2, which is significant at the 5% level. Model (2) suggests that a one-standard-deviation increase in the variance of stock return over the period of 60 days prior to the issue date results in 86.22% lower CAR2, which is significant at the 1% level. Model (3) suggests that a one-standard-deviation increase in the standard deviation of stock return over the period of 60 days prior to the issue date implies a 15.07% lower CAR2, which is significant at the 1% level. Overall, the results lend support to H1 in that the issuer's *ex ante* uncertainty is negatively related to its short-run abnormal returns from the SEO, and the results are both statistically and economically significant. This is consistent with the finding that the *ex ante* uncertainty of an IPO issuer is positively related to the expected underpricing of the offering (Beatty & Ritter 1986) since the underlying mechanism is adverse selection in the equity allocation process. Specifically, due to the institutional nature of the stock market, an uninformed investor can be allocated the equity offering only if the informed investors perceive the price to be too high to justify the information acquisition cost and the deviation in the offer price from the intrinsic value. Being aware of this, uninformed investors face a winner's curse problem if they can purchase the offering. Thus, the uninformed investors require a greater level of underpricing or a higher discount from the offer price, which leads to a greater negative announcement valuation effect. This winner's curse is intensified by the increased ex ante uncertainty regarding the issuer's value prior to the issue (Choe *et al.* 1993). Therefore, the results provide evidence supporting the adverse selection explanation of SEO negative announcement returns (Myers & Majluf 1984). However, it is noted that the informational explanation (Leland & Pyle 1977; Miller & Rock 1985) cannot be ruled out since it also predicts the negative SEO announcement returns, which is consistent with the univariate analysis findings for CAR2, but does not investigate the issuer's uncertainty prior to the announcement.

In addition, the control variables provide meaningful findings. First, the estimated coefficients of $\Delta Leverage$ range from -0.0097 to -0.0095 across Models (1) to (3) and are all significant at the 1% level, suggesting that the increase in leverage after the SEO is negatively related to the announcement valuation effect. It is argued here that the market perceives the decrease in leverage via the SEO as a positive signal since it decreases the firm's risk of financial distress. Furthermore, the pre-issue leverage level is negatively related to the announcement returns of the equity offering, as is evident in negative and significant coefficient estimates on D/TA, suggesting that the market consistently perceives high leverage to be a signal of higher bankruptcy and financial distress risk and reacts negatively.

Second, the estimated coefficients of *Fraction* range from -0.0270 to -0.0351 across Models (1) to (3) and are significant at the 5% level in Model (1) and at the 10% level in the remaining two specifications. This is consistent with the findings of Masulis and Korwar (1986) and Demiralp *et al.* (2011). The potential explanation is that the dilution of the existing shareholders' equity holding is viewed negatively by the market in terms of the issuer's prospects since the management has to fund investment projects at the expense of the existing shareholders (Jensen & Meckling 1976; Leland & Pyle 1977). This finding is inconsistent with the positive and significant estimated coefficient found by Hertzel and Smith (1993) in the context of private placements.

Third, the estimated coefficients of *Runup* range from 0.0246 to 0.0265 in the three model specifications and are all significant at the 1% level. This suggests that the cumulative abnormal returns over the 60-day period prior to the issue have a significantly positive impact on the short-run valuation effect of the SEO, consistent with the findings of Asquith and Mullins Jr (1986), who find that a 50% increase in CAR over one year prior to the issue leads to a 0.75% higher return to the equity issuance. This positive relation during the short run around the announcement suggests that investors rely heavily on a re-evaluation of the issuing company according to its past performance immediately prior to the issue. However, whether investors react to equity offerings rationally remains unresolved. The answer to this question will be discussed later in this chapter, after the whole valuation process following the SEO is revealed. Notably, this finding contradicts a number of studies that find a negative relation between price runup and SEO announcement returns (Masulis & Korwar 1986; Denis 1994; Aggarwal & Zhao 2008; Demiralp *et al.* 2011). These articles suggest that a larger pre-issue stock return makes the equity issue less likely, and hence it is more of a surprise when it is actually implemented.

Fourth, the estimated coefficients of *Firm size* range from -0.0064 to -0.0072 across Models (1) to (3) and are all significant at the 1% level. This implies that the larger issuer experiences lower abnormal returns upon announcement, consistent with Demiralp *et al.* (2011). However, this finding is inconsistent with a number of studies that also insert firm size as a control variable and find a positive relation (Altınkılıç & Hansen 2003; Aggarwal & Zhao 2008; Lee & Masulis 2009; Akhigbe & Whyte 2015; Ferreira & Laux 2016). Similarly, the coefficient estimates of *Working capital* range from -0.0066 to -0.0080 in the three model specifications and are all significant at the 1% level. This is explained as the market being surprised by the offering made by issuers with high working capital, which implies great capability to deal with financial responsibilities.

Fifth, it is noteworthy that the size effect is not detected here, since the estimated coefficients of *Issue size* are small in magnitude and non-significant statistically. The magnitude of the offering is argued to be negatively and significantly related to the price effect (Asquith & Mullins Jr 1986; Aggarwal & Zhao 2008; Ferreira & Laux 2016), which is evidence supporting the argument that the price reduction following the SEO is due to the information effect (Myers & Majluf 1984; Miller & Rock 1985) instead of the pure capital structure explanation. Nevertheless, there are studies that directly test and reject the hypothesis that the price decline following the SEO is related to the issue size (Marsh 1979; Hess & Frost 1982), while others find non-significant coefficients of measures of issue size in explaining the SEO discount (Lee & Masulis 2009; Akhigbe & Whyte 2015).

Finally, in terms of the controlled offering deal characteristics, the estimated coefficients of gross spread vary from 0.0090 to 0.0123 in the three models and are consistently significant at the 1% level. This suggests that the difference between the underwriting price received by the issuer and the actual offer price for the investor is positively related to the price reaction in the first two days after the SEO. The potential explanation is that the higher spread, which represents the higher profit earned by the underwriter, serves as compensation for the effort of selling the equity to maximize the issuer's benefit in terms of appropriate timing and locating investors.

Next, the alternative measures advanced in Section 4 are employed to test the SEO short-run valuation effect. Specifically, OLS regressions for which dependent variable remains CAR2 are performed, while the *ex ante* uncertainty measures are the inverse of gross proceeds plus overallotment in the target market, the variance in stock return over the 120-day period prior to the issue, and the standard deviation of stock return over the 120-day period prior to the issue. The results are displayed in Table 2.4.

[Insert Table 2.4 here]

The results in Table 2.4 are consistent with those in Table 2.3. The estimated coefficients of *Ex ante uncertainty* are negative and significant at the 1% level in all three model specifications. In addition, all control variables have coefficient estimates in the same sign and at the same level of significance as those in Table 2.3, hence lending support to H1. Therefore, the results shown in Table 2.3, which is the short-run valuation effect as measured by 2-day cumulative abnormal returns, are negatively related to the SEO issuer's *ex ante* uncertainty measured in three ways and remain sound after alternative measures of the issuer's *ex ante* uncertainty are applied.

2.5.1.3. Robustness tests

The price effect in the above tests is measured by CAR2, which is the cumulative abnormal returns on the day of issue and the first day after the issue. While this measure is commonly employed in the literature (Bhagat *et al.* 1985; Masulis & Korwar 1986; Barclay & Litzenberger 1988; Walker & Yost 2008), another measure of SEO around-issue measure (CAR3), namely, the cumulative abnormal returns over the period from one day prior to the issue to one day after it, is also frequently adopted (Moore *et al.* 1986; Jegadeesh *et al.* 1993; Clarke *et al.* 2001; D'Mello *et al.* 2003; Akhigbe *et al.* 2006). Consequently, as the results appear to support H1 in the previous section, robustness tests are conducted in this section by substituting CAR2 for CAR3.

Since the event window extends to day -1 relative to the issue date, several independent variables are adjusted. Specifically, *Runup* is measured as the cumulative abnormal returns over the period [-61, -1], variance in stock return over the 60-day period prior to the issue is measured over the period [-61, -1], and standard deviation of stock return over the 60-day period prior to the issue is measured over the period [-121, -1]. The results of the OLS regressions are displayed in Table 2.5.

[Insert Table 2.5 here]

The estimated coefficients of *Ex ante uncertainty* range from -0.3106 to -2.0307 and are all significant at the 1% level. This finding is consistent with those obtained in the previous section and lends support to H1 in that the issuer's *ex ante* uncertainty is negatively associated with the offering's short-run valuation effect.

In terms of the control variables, the pre-issue level of leverage (*D/TA*) loses significance while remaining negative. Furthermore, *Runup* also turns out to be non-significant in all the model specifications. It is proposed here that the investor's reaction reflected in the 3-day window is not affected as heavily by the issuer's past performance as the reaction reflected in the 2-day window. The reason is probably that the investor does not form an expectation of the issuer's value, at least the part that is based on the issuer's past performance, until the issue is made public. Finally, in Models (2) and (3), the estimated coefficients of *Issue size* are positive and significant at the 10% and 5% level, respectively. This is consistent with Lee and Masulis (2009) and Akhigbe and Whyte (2015) and serves as direct evidence contravening the existence of a size effect implied by the informational explanation (Miller & Rock 1985) of the SEO discount.

Finally, the alternative measures of *ex ante* uncertainty are employed in the same way as in the previous section. The regression results are displayed in Table 2.6.

[Insert Table 2.6 here]

The results of *ex ante* uncertainty measures and control variables in all the model specifications are consistent with the results discussed above and directly support H1.

2.5.2. H2

2.5.2.1. Univariate analysis

[Insert Table 2.7 here]

Table 2.7 provides the results from the univariate analysis regarding the 2-year valuation effect after the issue date of the sample SEOs. In Panel A, issuers with higher *ex ante* uncertainty experience 14.3% (significant at 1%) lower buy-and-hold abnormal returns over the 24 months after the issuance. Panel B and Panel C provide consistent evidence that issuers with higher ex ante uncertainty earn significantly lower buy-and-hold returns from equity offerings. Overall, the simple univariate analysis of BHAR24 lends support to H2, which posits that the issuer's *ex ante* uncertainty is negatively related to its long-run SEO returns, and the results are robust across three measures of ex ante uncertainty, as specified in Table 2.7.

2.5.2.2. Multivariate analysis

Multivariate analysis is performed to reveal cross-sectional relations between BHAR24 and other firm characteristics in addition to ex ante uncertainty. Table 2.8 reports the results from OLS regressions that are specified in Section 4. The main *ex ante* uncertainty measure is the 2-year standard deviation in the issuer's net cash flow from operating activities scaled by the mean value over the same period (CFUOANCF0); however, two alternative measures are employed, namely, 3- and 4-year standard deviations in the issuer's net cash flow from operating activities scaled by the mean value over the same period.

[Insert Table 2.8 here]

The issuer's *ex ante* uncertainty is negatively related to the 2-year BHAR, as is evident in the negative and significant estimated coefficients of *Ex ante uncertainty* through Models (1) to (3). Specifically, the estimated coefficient of the 2-year standard deviation in the issuer's net cash flow from operating activities scaled by the mean value over the same period (OANCF0) is -0.0127 in Model (1), which is significant at the 1% level. The estimated coefficient of the 3-year standard deviation in the issuer's net cash flow from operating activities scaled by the mean value over the same period (CFUOANCF) is -0.0097 in Model (2), which is significant at the 1% level. The estimated coefficient of the 4-year standard deviation in the issuer's net cash flow from operating activities scaled by the mean value over the same period (CFUOANCF1) is -0.0069, which is significant at the 5% level. Overall, the cross-sectional evidence supports H2 in that the issuer's long-run buy-and-hold abnormal returns are negatively related to its *ex ante* uncertainty. This finding makes two important contributions to the SEO literature. First, the direct investigation of the negative relation between the *ex ante* uncertainty of the SEO issuer and its long-term post-issue stock performance supports the explanation that the issuer's manager takes the window of opportunity of overvaluation to sell equity (Loughran & Ritter 1995), since the issuer's *ex ante* uncertainty is designed as a proxy for the issuer's overvaluation level (Miller 1977; Scheinkman & Xiong 2003). This method sidesteps the controversial method of comparing issuers' and non-issuers' long-run performance due to the inappropriate way of accounting for systematic risk (Eckbo *et al.* 2000). Second, this long-run SEO valuation effect further supports the adverse selection explanation of the short-run negative price effect by ruling out asymmetric information explanations such as those of Leland and Pyle (1977) and Miller and Rock (1985), according to which any negative information conveyed by the equity offering should be completely incorporated into the stock price upon issuance. However, given the finding that the issuer's *ex ante* uncertainty exerts a significant impact on its buy-and-hold abnormal returns, it is evident that the market continuously reveals any negative information, such as the issuer's overvaluation, over a post-issuance period as long as two years.

The results of the control variables also yield meaningful implications. First, the estimated coefficients of *Initial return* range from -0.2606 to -0.2665 across Models (1) to (3) and are significant at the 5% level in Models (1) and (2) and marginally significant at the 5% level (*p*-value=0.052) in Model (3). This finding suggests that the issuer's long-term buy-and-hold abnormal returns are negatively related to its short-run price effect upon the issuance, which is consistent with previous research such as Chen *et al.* (2010a). In the previous section, it is found that the initial return (CAR2) is positively related to the price runup prior to the issue, which suggests that investor valuation of the issuer depends heavily on the issuer's past stock performance. However, the question of whether the investor's reaction is rational remains unresolved. The negative relation between the initial return and the 2-year long-run buy-and-hold abnormal returns provides an answer to this question: the investor responds to the equity offering issuance irrationally. The reason is that the relation between the initial return and long-run return must be non-significant if the initial investor reaction is rational; in other words, all information conveyed by the issuance is correctly incorporated into the stock price upon announcement. In addition, the evidence found here suggests that the investor overreacts to the price runup at the time of issuance, and this overreaction is corrected by the market over time as more information is incorporated. This is consistent with the abovementioned implication that the market continuously reveals negative information contained in the SEO over the long term after issuance.

Second, the coefficient estimates on *Issue size* vary from -0.0562 to -0.0564 across the three model specifications, suggesting that the greater proceeds raised from the equity offering result in greater loss for the issuers in the long run. In conjuncture with the supported ‘windows of opportunity’ argument, this long-term size effect implies that the manager of the issuer takes the overvaluation opportunity to sell overvalued equity to raise as much capital as possible; however, this behaviour is recognized and punished by the market in the long run. In other words, the larger the amount of capital raised from the offering, the greater the decline in stock performance in the long run as the market realizes that negative information was conveyed in the initial offering.

2.5.2.3. Robustness tests

As a robustness check, the long-run buy-and-hold abnormal returns are also measured over a 3-year period after the issue date, which is denoted as BHAR36 in this chapter, as suggested by a number of equity offering studies (Ritter 1991; Spiess & Affleck-Graves 1995; Teoh *et al.* 1998a). Table 2.9 reports the OLS regression results after substituting BHAR24 for BHAR36.

[Insert Table 2.9 here]

The estimated coefficients of *Ex ante uncertainty* are largely consistent with those shown in Table 2.8 in terms of sign and significance except that a decrease in significance from the 1% level to the 5% level is observed in Model (3). Further, other control variables are also robust to the change in period over which the long-run stock performance is measured. However, there is a decrease in significance from 5% to 10% in Models (1) and (2) for the estimated coefficients of *Initial return*. Overall, it is argued that the conclusions obtained in the previous section remain robust.

2.5.3. H3

2.5.3.1. Univariate analysis

[Insert Table 2.10 here]

Table 2.10 provides the results of the univariate analysis regarding the 2-year post-issue operating performance of the sample SEOs. In Panel A, issuers with higher *ex ante* uncertainty experience 0.824 (significant at 5%) lower average industry-adjusted ROE in the 2-year period after the issuance. Panel B provides consistent evidence that issuers with higher *ex ante* uncertainty have significantly lower operating performance. Overall, the simple univariate analysis regarding adjusted ROE lends support to H3, which posits that the issuer's *ex ante* uncertainty is negatively related to its long-run operating performance, and the results are robust across two different measures of *ex ante* uncertainty, as specified in Table 2.10.

2.5.3.2. Multivariate analysis

Multivariate analysis is performed to reveal cross-sectional relations between adjusted ROE and the issuer's *ex ante* uncertainty while controlling for the issuer's pre-issue operating performance. Table 2.11 reports the results from the OLS regressions, which are specified in Section 4.

[Insert Table 2.11 here]

The independent variable of main interest is *Ex ante uncertainty*, which is the standard deviation of operating income before and after depreciation deflates by total assets, respectively, over [-5, -2] year period relative to the issue date. The estimated coefficients of *Ex ante uncertainty* are -0.6061 and -0.5854 in Models (1) and (2), respectively, and both are significant at the 1% level. This suggests that *ex ante* uncertainty has a negative and significant effect on the SEO issuer's post-issue operating performance. In other words, the *ex ante* market uncertainty regarding the issuer's value is not completely resolved until at least two years after the issue date. This again stands in contradiction to the informational explanation of SEO performance (Jensen & Meckling 1976; Leland & Pyle 1977), according to which all uncertainty due to asymmetric information prior to the equity offering should be resolved in a short event period following the issuance. Further, it is demonstrated theoretically and empirically that uncertainty is an indicator of firm overvaluation (Miller 1977; Diether *et al.* 2002; Scheinkman & Xiong 2003); therefore, the finding lends support to the argument that the SEO's long-term operating performance is due to the issuer's overvaluation at the time of issuance, and the manager takes this window of opportunity to issue overvalued equity and successfully misleads the market (Loughran & Ritter 1997).

The estimated coefficients of *Pre-issue 2-year ROE* are 0.0105 and 0.0103 in Models (1) and (2), respectively, while neither is statistically significant at the conventional level. The obvious implication is that the pre-issue operating performance has no explanatory power in the formation process of long-run post-issue operating performance, which is consistent with the conclusions of Loughran and Vijh (1997) that the nature of the pre-issue peak of operating performance is transitory, and the market corrects its valuation mistake after the nature of the peak is discovered.

Overall, H3 is supported empirically in that post-issue operating performance is negatively related to the issuer's *ex ante* uncertainty.

2.5.3.3. Robustness tests

Three alternative measures of the *ex ante* uncertainty of the SEO issuer, which are the same three measures used in the tests of H2, are employed to conduct robustness checks, namely, the standard deviation in the issuer's net cash flow from operating activities 2, 3, and 4 years prior to the announcement scaled by the absolute value of the mean over the same period. The results of OLS regressions where the standard deviation of the operating rate of return is replaced by these three alternative measures are shown in Table 2.12.

[Insert Table 2.12 here]

The estimated coefficients of *Pre-issue 2-year ROE* remain similar in terms of magnitude and the same in sign, and none is statistically significant across Models (1) and (2). In contrast, the coefficient estimates on *Ex ante uncertainty* lose significance in Models (1) and (2). Nevertheless, no contradictory evidence, which is a significant and positive relationship between the issuer's *ex ante* uncertainty and its long-run post-issue operating performance, is detected. One possible reason for this loss in significance level is that the alternative *ex ante* measures focus on operating cash flow per se rather than accounting for the dynamics of the issuer's capability of yielding an operating profit after the equity offering. In summary, it is suggested that the result remains weakly robust; thus, H3 cannot be rejected.

2.5.4. Endogeneity tests

According to the analysis of endogeneity inherent in the *ex ante* uncertainty measures and instrumental variables identified in the previous section, 2SLS regressions are performed. in terms of long-run *ex ante* uncertainty measures, the regressions in Table 2.8 are re-performed using two instrumental variables, namely, *Depreciation* and *Current accounts payable*, and the results are shown in Tables 2.13 and 2.14, respectively.

[Insert Table 2.13 here]

[Insert Table 2.14 here]

The results in Tables 2.13 and 2.14 remain robust in comparison to those in Table 2.4; in other words, the SEO issuer's long-term *ex ante* uncertainty is negatively related to the long-run post-issue stock performance, given the negative and highly significant estimated coefficients of *Ex ante uncertainty* in all model specifications in the above two tables. Furthermore, the significance level of the coefficient even increases from the 5% to the 1% level when the 4-year pre-issue *ex ante* uncertainty measure is employed, in comparison with the results in Table 2.4. The results support H2.

In summary, after considering the endogeneity problem of *ex ante* uncertainty, the main conclusion of this chapter, which is that the issuer's *ex ante* uncertainty has a significant and negative effect on its short-run and long-run valuation effect subsequent to the issue date, remains robust. The underlying reason for the negative short-run price effect after the seasoned equity offering can be explained as the adverse selection problem associated with the winner's curse faced by uninformed investors, and the reason for a publicly traded firm to initiate an equity offering is that the management takes the window of opportunity when the firm's stock is overvalued.

2.6. Conclusion

This chapter studies the relation between the SEO issuer's *ex ante* uncertainty and the issuer's whole post-issue valuation effect process. Specifically, the short-run announcement price effect, the long-run buy-and-hold abnormal returns, and the long-run operating performance are examined. On the basis of a comprehensive U.S. SEO dataset, a negative and significant relation between issuer's *ex ante* uncertainty and these post-issue performances is documented. The empirical results obtained in this chapter support the idea that the short-run SEO price effect is determined by the adverse selection process of uninformed investors, and the reason for initiating the offering is that the manager takes the window of opportunity to sell overvalued equity (Loughran & Ritter 1995, 1997) in the interest of existing shareholders.

H1 proposes that the SEO issuer's short-run return upon the issue date is negatively related to the issuer's *ex ante* uncertainty. The results support H1 in terms of the various short-term *ex ante* uncertainty measures used. This is consistent with the prediction of the adverse selection model (Myers & Majluf 1984) in the equity-issuing process (Beatty & Ritter 1986). Furthermore, the adverse selection problem is intensified by the increased level of uncertainty regarding the value of the issuer's assets in place (Choe *et al.* 1993).

H2, which receives empirical support, proposes that the issuer's *ex ante* uncertainty is negatively associated with its long-run post-issue stock performance. This direct test of the relation between pre-issue uncertainty and post-issue long-term stock performance sidesteps the controversial matching-firm technique. Since the market uncertainty concerning the issuer's assets value is a measure of the overvaluation level, the documented negative relation between *ex ante* uncertainty and long-run post-issue return supports the 'windows of opportunity' hypothesis (Loughran & Ritter 1995) that the manager exploits the opportunity of being overvalued to sell equity. In addition, the significant relation between pre-issue uncertainty and post-issue long-term return implies that the market reveals information conveyed by the offering issuance gradually over the long-term period, thus firmly rejecting the informational explanations of SEO discounting (Jensen & Meckling 1976; Leland & Pyle 1977).

H3 proposes that the issuer's *ex ante* uncertainty has a negative effect on its long-run operating performance subsequent to the issue date. While the empirical evidence lends support to this hypothesis, it again supports the 'windows of opportunity' explanation (Loughran & Ritter 1995, 1997) in that the long-run operating performance manifests the initial overvaluation of the SEO issuer.

In addition, the control variables provide meaningful insights. $\Delta Leverage$ and *D/TA* both have a significantly negative effect on the short-run price effect of the SEO issuer, suggesting that the market views both the existing leverage level and the increase in leverage level as negative signs of the firm's prospects. *Fraction* also has a negative impact on the short-run price effect, consistent with previous findings that newly issued shares as a percentage of existing common stock shares destroy firm value (Masulis & Korwar 1986; Demiralp *et al.* 2011). It is argued that the dilution of the equity holdings of existing shareholders is valued negatively by the market. Both *Firm size* and *Working capital* have a negative impact on the short-run stock return of the SEO issuer, which is explained as the market being more surprised by the issue of equity by larger firms and firms with sufficient working capital to satisfy financial needs. Gross spread has a positive effect on the issuer's short-run price effect, probably because the high profit earned by the underwriter justifies the cost and effort of circulating and issuing the equity at the most appropriate price and timing. Pre-announcement operating performance has no explanatory power about post-issue operating performance, which is consistent with the explanation that when the firm reaches a peak in operating performance, the manager takes the opportunity to issue equity, but this high level of operating performance is transitory and does not last after the equity offering (Loughran & Ritter 1997).

In conclusion, first, facing the winner's curse problem, uninformed investors require a greater discount when placing a purchasing order in the SEO, and this adverse selection problem (Myers & Majluf 1984) is the underlying motivation of the observed negative SEO announcement price effect. Although the negative market reaction upon issuance per se is also consistent with informational theories (Jensen & Meckling 1976; Leland & Pyle 1977), the finding that *ex ante* uncertainty exerts a significant negative impact on long-run buy-and-hold abnormal returns firmly rejects a pure asymmetric information explanation because the information conveyed by the offering issuance is not fully incorporated into the market price at announcement, which is contradictory to any informational explanations.

In addition, the reported negative relation between the issuer's *ex ante* uncertainty and its short-run return after the issue date coincides with three other explanations in the literature. First, a strand of literature identifies the determinants of the direct flotation cost of the equity offering (Smith Jr 1977; Hansen & Pinkerton 1982; Smith & Dhatt 1984; Booth & Smith II 1986) and finds that the standard deviation of the issuer's pre-issue daily stock return is positively related to the direct underwriting cost (Eckbo & Masulis 1995). Second, the *ex ante* uncertainty measured as the standard deviation of daily stock return is argued to have a positive impact on the option value of holding equity; thus, the negative SEO short-run price effect is a reflection of a decrease in option value due to the decrease in *ex ante* uncertainty after the issuer turns the growth opportunity into less risky assets in place (Carlson *et al.* 2006; Aggarwal & Zhao 2008). Third, a study highlighting the potential link between firm-level risk and the SEO discount asserts that a high-quality issuer has low idiosyncratic risk and demonstrates its quality to the market through the lower SEO discount; in other words, the issuer's idiosyncratic risk is negatively related to the issuer's short-run valuation effect (Andrikopoulos *et al.* 2017).

Second, while avoiding the use of the problematic matching-firm technique, this chapter lends support to the 'windows of opportunity' argument (Loughran & Ritter 1995) since *ex ante* uncertainty, which is designed to represent the overvaluation level of the issuer, is negatively related to long-run stock performance. Hence, it is suggested that the underlying motivation of initiating an SEO is to take advantage of market misvaluation to sell overvalued equity (Loughran & Ritter 1997). In addition, as a manifestation of stock performance, the long-term post-issue operating performance is affected negatively by the issuer's *ex ante* uncertainty until all negative information contained in the equity offering is incorporated into the stock price. This suggests that the market corrects the mistake, which is the initial overvaluation of the issuer, over time through the evolution of operating performance.

Third, in terms of investor behaviour in response to SEO issuance, it is suggested that investors form expectations regarding the issuer's value according to its past stock performance since the price runup has a positive and significant effect on short-run returns. However, the initial return of the SEO is negatively related to the long-run stock performance over a 2-year period after the issue date. Collectively, investors overreact irrationally to the equity offering based on the issuer's recent stock performance and form the correct valuation gradually over the long-term period after the announcement. In other words, the information conveyed in the equity offering is not correctly incorporated into the stock price over the short term around the issue date, but the market corrects this mistake over time. This also suggests that the manager successfully misleads the market by selling equity after a period of good stock performance.

Fourth, the size effect of the issuance is not detected in the short run; however, it is significant in explaining long-run stock performance. This suggests that investors do not judge the issuer's value according to the size of equity offered in the short run, to which investors react irrationally. However, over the long term, the issue size is considered when investors correct for the initial valuation mistake. Further, this implies that the issuer's management offers a greater amount of equity when it perceives that it is overvalued by the market, acting in the best interest of the existing shareholders.

This chapter updates the literature in that, using an up-to-date database, it confirms that the SEO issuer experiences a significant negative return in both the short run (Asquith & Mullins Jr 1986; Masulis & Korwar 1986) and the long run (Loughran & Ritter 1995; Spiess & Affleck-Graves 1995) subsequent to the issue date. In addition, this chapter contributes to the literature of equity in several ways. First, this study employs the issuer's publicly available *ex ante* uncertainty as an appropriate proxy of adverse selection by ruling out the concern of signalling private information and tests the explanatory power of the *new issues puzzle* while controlling for signalling theories (Leland & Pyle 1977), the overvaluation effect (Asquith & Mullins Jr 1986), and the agency explanation (Jensen & Meckling 1976). Second, in terms of explaining the *new issue puzzle* from the long-run post-announcement perspective, this study sidesteps the conventional, albeit controversial, matching-firm technique. By directly measuring the overvaluation level at announcement by *ex ante* uncertainty, this study lends support to the 'windows of opportunity' explanation advanced by Loughran and Ritter (1995) by considering the role of uncertainty resolution in the price discovery process. Third, most previous studies regarding long-run post-announcement SEO performance fail to investigate the sources of performance in a cross-sectional framework. Teoh *et al.* (1998b) conduct cross-sectional regression on long-run SEO performance; however, the only vector of independent variables is discretionary accruals components, while the only control variable is the change in capital expenditures. Clarke *et al.* (2004) performs a multivariate analysis on SEO long-run performance; however, their sample focuses on secondary distributions, while this chapter restricts the sample to underwritten primary seasoned offerings. In other words, this study investigates the sources of SEO long-term post-announcement performance from the perspective of corporate and existing shareholders. Fourth, this study applies the method of examining long-run issuance performance in the IPO market to the SEO market by selecting appropriate variables on the ground of theoretical feasibility. Any difference in estimated coefficients calls for further investigation regarding the differing natures of IPOs and SEOs. Fifth, similar to the findings of Ritter (1991) in the IPO market, the finding that an irrationally optimistic forecast of the issuer's value on the SEO issue date based on its past performance is eventually corrected in the long run yields implications for informational efficiency. It provides evidence for the hypothesis that equity markets in general, and the SEO market in particular, are subject to 'fads' that affect market prices (Shiller 1990). Sixth, while this chapter adds evidence that the market overreacts to the past performance of SEO issuers, along with the evidence that the market gradually incorporates the negative information conveyed at the SEO issuance into the market price and resolves the pre-issue valuation uncertainty over the long run, it also suggests that the market underreacts to the SEO issuance over the announcement period.

Furthermore, this study can be extended by considering how the reported relation between pre-issuance uncertainty and the valuation process varies among different sub-samples constructed, for example, according to exchange-listing status since significant cross-sectional variation is found for SEO underpricing between exchange-listed and over-the-counter stocks (Loderer *et al.* 1991b).

2.7. Tables for Chapter 2

Table 2. 1 – Summary statistics

This table displays summary statistics on issuer and deal characteristics. The sample consists 3679 deals over the period of 1985-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded.

Issuer characteristics include change in leverage, new shares issued as a fraction of existing shares of common stock, cumulative abnormal return over 60-day period prior to the issue, issue size, firm size, leverage, working capital. Working capital and operating profit are deflated by total assets. Deal characteristic includes gross spread in dollars. Working capital and gross spread are taken natural log. The sample is divided into two groups (High and Low) based on issuer's ex ante uncertainty which is 60-day variance in stock return. All continuous variables are winsorized at the 1% and 99% levels. Student's t-tests are conducted to test differences between means for acquirers with high and low pre-announcement cash flow uncertainty. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Ex ante uncertainty		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Issuer Characteristics					
ΔLeverage	mean	-0.093	-0.079	-0.099	0.020*
	n	3679	1096	2583	
Fraction	mean	0.202	0.233	0.190	0.043***
	n	3614	1071	2543	
Runup	mean	0.065	0.097	0.052	0.045***
	n	3679	1096	2583	
Issue size	mean	1.119	1.529	0.946	0.583***
	n	3659	1087	2572	
Firm size	mean	5.954	5.441	6.172	-0.731***
	n	3679	1096	2583	
D/TA	mean	0.204	0.135	0.233	-0.098***
	n	3679	1096	2583	
Working capital	mean	-1.287	-0.899	-1.457	0.558***
	n	3384	1032	2352	
Deal Characteristics					
Gross spread	mean	1.302	1.222	1.337	-0.115***
	n	3452	1056	2396	

Table 2. 2 – Univariate analysis of CAR2

This table reports issuer's value-related measures on the sample of 3679 offerings. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on three ex ante uncertainty measures. Specifically, the inverse of gross proceeds raised on target market, 60-day pre-announcement stock return variance, and 60-day pre-announcement stock return standard deviation are employed in Panel A to Panel C, respectively. Market-adjusted model is employed to calculate cumulative abnormal returns, where the abnormal return is calculated as the difference between actual firm return and the Standard & Poor's 500 index return. CAR [0, +1] represents cumulative abnormal returns (CARs) to issuers during the 2-day event window upon the issue date. The 2-day CAR is winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Ex ante uncertainty		
			High (1)	Low (2)	Difference (1) - (2)
Panel A: Inverse Proceeds					
2-day CAR	mean	-0.016	-0.025	-0.013	-0.012***
	n	3679	1093	2586	
Panel B: varret60					
2-day CAR	mean	-0.016	-0.025	-0.012	-0.013***
	n	3679	1096	2583	
Panel C: sdret60					
2-day CAR	mean	-0.016	-0.024	-0.011	-0.013***
	n	3679	1458	2221	

Table 2. 3 – OLS regressions of issuer 2-day performance on short-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 2-day announcement returns. The sample consists 3183 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 2-day cumulative abnormal stock returns. *Ex ante uncertainty* is the inverse of proceeds raised from target market, variance of issuer's stock return over 60-day period prior to the issue date, standard deviation in issuer's stock return over 60-day period prior to the issue date in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	InverseP	**varret60**	**sdret60**
Ex ante uncertainty	-0.1371**	-2.1226***	-0.3271***
	(0.037)	(0.001)	(0.000)
ΔLeverage	-0.0097***	-0.0096***	-0.0095***
	(0.006)	(0.006)	(0.007)
Fraction	-0.0351**	-0.0270*	-0.0275*
	(0.022)	(0.074)	(0.069)
Runup	0.0246***	0.0261***	0.0265***
	(0.000)	(0.000)	(0.000)
Issue size	0.0004	0.0006	0.0007
	(0.492)	(0.320)	(0.280)
Firm size	-0.0072***	-0.0064***	-0.0071***
	(0.000)	(0.001)	(0.000)
D/TA	-0.0137**	-0.0158**	-0.0170***
	(0.035)	(0.016)	(0.009)
Working capital	-0.0080***	-0.0072***	-0.0066***
	(0.000)	(0.000)	(0.000)
Gross spread	0.0090***	0.0118***	0.0123***
	(0.001)	(0.000)	(0.000)

Constant	0.0151	0.0068	0.0199
	(0.243)	(0.548)	(0.094)
Observations	3183	3183	3183
Adjusted R Square	0.034	0.036	0.039
Year fixed effect	Yes	Yes	Yes

Table 2. 4 – OLS regressions of issuer 2-day performance on short-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 2-day announcement returns. The sample consists 3183 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 2-day cumulative abnormal stock returns. *Ex ante uncertainty* is the inverse of the sum of proceeds raised from target market and the overallotment, variance of issuer's stock return over 120-day period prior to the issue date, standard deviation in issuer's stock return over 120-day period prior to the issue date in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	InverseP1	**varret120**	**sdret120**
Ex ante uncertainty	-0.2041***	-3.6264***	-0.4224***
	(0.003)	(0.000)	(0.000)
ΔLeverage	-0.0096***	-0.0091***	-0.0091***
	(0.006)	(0.009)	(0.009)
Fraction	-0.0367**	-0.0259*	-0.0272*
	(0.017)	(0.086)	(0.072)
Runup	0.0240***	0.0266***	0.0268***
	(0.000)	(0.000)	(0.000)
Issue size	0.0004	0.0007	0.0007
	(0.509)	(0.261)	(0.253)
Firm size	-0.0075***	-0.0066***	-0.0073***
	(0.000)	(0.000)	(0.000)
D/TA	-0.0138**	-0.0167**	-0.0175***
	(0.035)	(0.011)	(0.008)
Working capital	-0.0080***	-0.0068***	-0.0063***
	(0.000)	(0.000)	(0.000)
Gross spread	0.0079***	0.0120***	0.0123***

	(0.002)	(0.000)	(0.000)
Constant	0.0200	0.0105	0.0252**
	(0.117)	(0.350)	(0.036)
Observations	3183	3183	3183
Adjusted R Square	0.036	0.040	0.041
Year fixed effect	Yes	Yes	Yes

Table 2. 5 – OLS regressions of issuer 3-day performance on short-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 3-day announcement returns. The sample consists 3183 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 3-day cumulative abnormal stock returns. *Ex ante uncertainty* is the inverse of proceeds raised from target market, variance of issuer's stock return over [-61, -1] day period relative to the issue date, standard deviation in issuer's stock return over [-61, -1] day period relative to the issue date in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	InverseP	**varret61**	**sdret61**
Ex ante uncertainty	-0.3106***	-2.0307***	-0.3237***
	(0.000)	(0.010)	(0.000)
ΔLeverage	-0.0093**	-0.0095**	-0.0094**
	(0.025)	(0.022)	(0.023)
Fraction	-0.1035***	-0.0900***	-0.0901***
	(0.000)	(0.000)	(0.000)
Runup	-0.0029	0.0009	0.0015
	(0.634)	(0.889)	(0.806)
Issue size	0.0012	0.0014*	0.0015**
	(0.102)	(0.054)	(0.045)
Firm size	-0.0137***	-0.0117***	-0.0124***
	(0.000)	(0.000)	(0.000)
D/TA	-0.0054	-0.0073	-0.0085
	(0.481)	(0.351)	(0.273)
Working capital	-0.0083***	-0.0075***	-0.0069***
	(0.000)	(0.000)	(0.000)
Gross spread	0.0155***	0.0212***	0.0217***

	(0.000)	(0.000)	(0.000)
Constant	0.0542***	0.0288**	0.0417***
	(0.000)	(0.032)	(0.003)
Observations	3183	3183	3183
Adjusted R Square	0.033	0.031	0.033
Year fixed effect	Yes	Yes	Yes

Table 2. 6 – OLS regressions of issuer 3-day performance on short-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 3-day announcement returns. The sample consists 3183 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 3-day cumulative abnormal stock returns. *Ex ante uncertainty* is the inverse of the sum of proceeds raised from target market and the overallotment, variance of issuer's stock return over [-121, -1] day period relative to the issue date, standard deviation in issuer's stock return over [-121, -1] day period relative to the issue date in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	InverseP1	**varret121**	**sdret121**
Ex ante uncertainty	-0.3710***	-4.3379***	-0.4855***
	(0.000)	(0.000)	(0.000)
ΔLeverage	-0.0092**	-0.0089**	-0.0089**
	(0.028)	(0.033)	(0.031)
Fraction	-0.1039***	-0.0876***	-0.0891***
	(0.000)	(0.000)	(0.000)
Runup	-0.0032	0.0017	0.0021
	(0.606)	(0.776)	(0.728)
Issue size	0.0012	0.0016**	0.0016**
	(0.109)	(0.036)	(0.035)
Firm size	-0.0138***	-0.0119***	-0.0127***
	(0.000)	(0.000)	(0.000)
D/TA	-0.0055	-0.0089	-0.0097
	(0.478)	(0.252)	(0.213)
Working capital	-0.0082***	-0.0068***	-0.0063***
	(0.000)	(0.000)	(0.001)
Gross spread	0.0146***	0.0215***	0.0219***

	(0.000)	(0.000)	(0.000)
Constant	0.0569***	0.0342**	0.0504***
	(0.000)	(0.011)	(0.000)
Observations	3183	3183	3183
Adjusted R Square	0.035	0.035	0.036
Year fixed effect	Yes	Yes	Yes

Table 2. 7 – Univariate analysis of BHAR24

This table reports issuer's value-related measures on the sample of 3611 offerings. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on three long-term ex ante uncertainty measures. Specifically, the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period are employed in Panel A to Panel C, respectively. Market-adjusted model is employed to calculate buy-and-hold abnormal returns, where the abnormal return is calculated as the difference between actual firm return and the Standard & Poor's 500 index return. BHAR [0, +24] represents buy-and-hold abnormal returns (BHARs) to issuers during the 2-year period subsequent to the issue date. The 2-year BHAR is winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	**Ex ante uncertainty**		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A: CFUOANCF0					
BHAR24	mean	-0.426	-0.541	-0.398	-0.143***
	n	3611	717	2894	
Panel B: CFUOANCF					
BHAR24	mean	-0.426	-0.525	-0.403	-0.123***
	n	3611	695	2916	
Panel C: CFUOANCF1					
BHAR24	mean	-0.426	-0.498	-0.408	-0.089***
	n	3611	731	2880	

Table 2. 8 – OLS regressions of issuer 2-year performance on long-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 2-year announcement returns. The sample consists 3596 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 2-year buy-and-hold abnormal stock returns. *Ex ante uncertainty* is the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF0	**OANCF**	**OANCF1**
Ex ante uncertainty	-0.0127***	-0.0097***	-0.0069**
	(0.001)	(0.006)	(0.040)
Initial return	-0.2665**	-0.2631**	-0.2606*
	(0.046)	(0.049)	(0.052)
Issue size	-0.0564***	-0.0562***	-0.0564***
	(0.000)	(0.000)	(0.000)
M/B	0.0097***	0.0097***	0.0097***
	(0.000)	(0.000)	(0.000)
Tobin q	-0.0100***	-0.0100***	-0.0101***
	(0.000)	(0.000)	(0.000)
Constant	-0.3535***	-0.3546***	-0.3573***
	(0.000)	(0.000)	(0.000)
Observations	3596	3596	3596
Adjusted R Square	0.027	0.026	0.025
Year fixed effect	Yes	Yes	Yes

Table 2. 9 – OLS regressions of issuer 3-year performance on long-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 3-year announcement returns. The sample consists 3596 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 3-year buy-and-hold abnormal stock returns. *Ex ante uncertainty* is the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF0	**OANCF**	**OANCF1**
Ex ante uncertainty	-0.0129***	-0.0095**	-0.0074*
	(0.003)	(0.021)	(0.061)
Initial return	-0.2908*	-0.2871*	-0.2850*
	(0.064)	(0.067)	(0.069)
Issue size	-0.0683***	-0.0682***	-0.0684***
	(0.000)	(0.000)	(0.000)
M/B	0.0122***	0.0122***	0.0122***
	(0.000)	(0.000)	(0.000)
Tobin q	-0.0095***	-0.0096***	-0.0097***
	(0.000)	(0.000)	(0.000)
Constant	-0.4963***	-0.4979***	-0.4996***
	(0.000)	(0.000)	(0.000)
Observations	3596	3596	3596
Adjusted R Square	0.024	0.023	0.023
Year fixed effect	Yes	Yes	Yes

Table 2. 10 – Univariate analysis of post-issue operating performance

This table reports issuer's operating performance measures on the sample of 2611 offerings. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on two long-term ex ante uncertainty measures. Specifically, standard deviation of operating rate of return over 3-year prior to the issue is employed as ex ante uncertainty measure, where operating rate of return is calculated as the operating income before (after) depreciation scaled by total assets, and is denoted as sdORR1 (sdORR2), is employed in Panel A and Panel B, respectively. Operating performance is measured by 2-year average industry-adjusted return on equity (ROE), which is calculated as the issuer's ROE minus the industry median, where ROE is calculated as the net income divided by equity value. Industry-adjusted ROE is winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	**Ex ante uncertainty**		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A: sdORR1					
Adjusted ROE	mean	-0.145	-0.785	0.039	-0.824**
	n	2611	583	2028	
Panel B: sdORR2					
Adjusted ROE	mean	-0.145	-0.824	0.051	-0.875**
	n	2611	585	2026	

Table 2. 11 – OLS regressions of issuer 2-year operating performance on long-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 2-year post-issue operating performance. The sample consists 2091 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's average 2-year post-issue industry-adjusted return on equity (ROE), which is calculated as the net income divided by the stockholder's equity. *Pre-issue 2-year ROE* is the issuer's average industry-adjusted ROE over 2-year period prior to the offering. *Ex ante uncertainty* in model (1) and (2) is the standard deviation of operating income before and after depreciation deflates by total assets, respectively, over [-5, -2] year period relative to the issue date. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**
	sdORR1	**sdORR2**
Ex ante uncertainty	-0.6061***	-0.5854***
	(0.000)	(0.000)
Pre-issuance OP	0.0105	0.0103
	(0.314)	(0.322)
ΔLeverage	-0.1382**	-0.1385**
	(0.037)	(0.037)
Fraction	0.1125	0.1119
	(0.648)	(0.650)
Runup	-0.0355	-0.0349
	(0.680)	(0.685)
Issue size	0.0095	0.0096
	(0.374)	(0.370)
Firm size	0.0274	0.0273
	(0.355)	(0.358)
D/TA	0.0539	0.0546
	(0.605)	(0.600)
Working capital	-0.0519**	-0.0514**

	(0.039)	(0.041)
Gross spread	-0.0348	-0.0349
	(0.348)	(0.346)
Constant	-0.1835	-0.1828
	(0.311)	(0.313)
Observations	2091	2091
Adjusted R Square	0.019	0.014
Year fixed effect	Yes	Yes

Table 2. 12 – OLS regressions of issuer 2-year operating performance on long-term ex ante uncertainty

The table reports OLS regressions to estimate issuer's 2-year post-issue operating performance. The sample consists 2091 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's average 2-year post-issue industry-adjusted return on equity (ROE), which is calculated as the net income divided by the stockholder's equity. *Pre-issue 2-year ROE* is the issuer's average industry-adjusted ROE over 2-year period prior to the offering. *Ex ante uncertainty* is the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively

	Model (1)	**Model (2)**	**Model (3)**
	OANCF0	**OANCF**	**OANCF1**
Ex ante uncertainty	0.0051	-0.0069	0.0012
	(0.691)	(0.524)	(0.909)
Pre-issuance OP	0.0087	0.0085	0.0086
	(0.408)	(0.420)	(0.409)
ΔLeverage	-0.1353**	-0.1359**	-0.1351**
	(0.042)	(0.041)	(0.043)
Fraction	0.1723	0.1776	0.1733
	(0.486)	(0.472)	(0.483)
Runup	-0.0536	-0.0563	-0.0539
	(0.534)	(0.514)	(0.532)
Issue size	0.0043	0.0044	0.0044
	(0.684)	(0.683)	(0.679)
Firm size	0.0331	0.0315	0.0326
	(0.266)	(0.289)	(0.273)
D/TA	0.0897	0.0868	0.0883
	(0.390)	(0.405)	(0.397)

Working capital	-0.0756***	-0.0739***	-0.0752***
	(0.002)	(0.003)	(0.002)
Gross spread	-0.0348	-0.0338	-0.0345
	(0.350)	(0.363)	(0.354)
Constant	-0.3227*	-0.2999*	-0.3163*
	(0.073)	(0.096)	(0.079)
Observations	2091	2091	2091
Adjusted R Square	0.009	0.008	0.007
Year fixed effect	Yes	Yes	Yes

Table 2. 13 – 2SLS regressions of issuer 2-year performance on long-term ex ante uncertainty

The table reports 2SLS regressions to estimate issuer's 2-year announcement returns. The sample consists 3596 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 2-year buy-and-hold abnormal stock returns. *Ex ante uncertainty* is the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. *Ex ante uncertainty* is instrumented by *Depreciation* of the fiscal year prior to the equity offering. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF0	**OANCF**	**OANCF1**
Ex ante uncertainty	-0.5030***	-0.4562***	-0.4642***
	(0.000)	(0.000)	(0.000)
Initial return	-0.5565*	-0.4941	-0.4491
	(0.093)	(0.122)	(0.181)
Issue size	-0.0371**	-0.0261	-0.0244
	(0.039)	(0.157)	(0.215)
M/B	0.0068	0.0064	0.0067
	(0.110)	(0.120)	(0.125)
Tobin q	-0.0099*	-0.0135***	-0.0169***
	(0.060)	(0.010)	(0.003)
Constant	0.1741	0.2228	0.2923*
	(0.210)	(0.129)	(0.090)
Observations	3588	3588	3588
First stage result			
F statistic	18.5335	19.9481	17.6928
Prob. > F	0.0000	0.0000	0.0000

Adj. R Square	0.005	0.006	0.006
Year fixed effect	Yes	Yes	Yes

Table 2. 14 – 2SLS regressions of issuer 2-year performance on long-term ex ante uncertainty

The table reports 2SLS regressions to estimate issuer's 2-year announcement returns. The sample consists 3596 deals over the period of 1989-2017. To be included in the sample, the deal must be seasoned equity offering issued by U.S. issuers and target on the U.S. market only. All initial public offerings are excluded. Issuers are required to be publicly listed firms and have data available on CRSP and Compustat. In addition, all issuers from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is issuer's 2-year buy-and-hold abnormal stock returns. *Ex ante uncertainty* is the standard deviation in issuer's net cash flow from operating activities 2-, 3-, and 4-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. *Ex ante uncertainty* is instrumented by *Current Tax Payable* of the fiscal year prior to the equity offering. Control variables are defined as in section 2.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OANCF0	**OANCF**	**OANCF1**
Ex ante uncertainty	-0.2882***	-0.2606***	-0.2975***
	(0.000)	(0.000)	(0.000)
Initial return	-0.4696**	-0.4973**	-0.4443*
	(0.036)	(0.026)	(0.071)
Issue size	-0.0390***	-0.0339***	-0.0302**
	(0.001)	(0.005)	(0.030)
M/B	0.0066**	0.0067**	0.0066**
	(0.018)	(0.016)	(0.032)
Tobin q	-0.0096***	-0.0116***	-0.0141***
	(0.007)	(0.001)	(0.001)
Constant	-0.0648	-0.0372	0.0448
	(0.403)	(0.655)	(0.695)
Observations	3271	3271	3271
First stage result			
F statistic	25.8685	27.1117	19.4775
Prob. > F	0.0000	0.0000	0.0000

Adj. R Square	0.007	0.009	0.007
Year fixed effect	Yes	Yes	Yes

Chapter 3

3.1. Introduction

Tax research has long lain at the intersection of several academic fields, such as economics, finance, accounting, and law, with different perspectives. Economists usually focus on tax compliance, tax incidence, investment and economic growth effects, for example, Alm *et al.* (1992) and Alm (2019). Finance studies view tax as a market imperfection in a Miller and Modigliani world, so they often focus on how tax affects firm value, corporate financial decisions, and investor portfolio decisions, such as Berger (1993). In the accounting field, built upon methodology in economics and finance, scholars utilize specific knowledge of financial accounting rules and the understanding of the institutional details of financial reporting to examine research questions (Shackelford & Shevlin 2001; Hanlon & Heitzman 2010). The necessity of thinking more broadly to align more evidence and theory from both accounting and applied economics (Maydew 2001; Gentry 2007; Shevlin 2007) calls for further investigation regarding the interaction of tax research from various fields. Given that this thesis falls into the category of finance, this chapter aims to study the effect of tax-related variables in empirical finance by leveraging the comparative advantage of accounting research, which is the informational role of income tax disclosures. Specifically, how do tax-related variables affect corporate decisions and firm value?

This chapter focuses on a specific perspective of corporate tax, namely, tax uncertainty.

The reason is that tax uncertainty studies did not attract the attention of academics until the late 2010s. A consensus on the definition of tax uncertainty did not even exist (Guenther *et al.* 2017; Hanlon *et al.* 2017; Saavedra 2019). Thus, broadly, tax uncertainty based on various tax items captures different underlying factors that could exert an impact on corporate decisions. While how taxes affect real corporate decisions such as capital structure (Dhaliwal *et al.* 1992), organizational form choice (Mackie-Mason & Gordon 1997), pay-out policy (Poterba 2004), and investment in intangibles (Brown & Krull 2008) has been widely documented, little attention has been paid to how tax uncertainty affects corporate decisions and the associated effect on firm value. Therefore, this chapter extends the study under the framework of tax having a significant effect on corporate decisions by examining the effect of tax uncertainty on firm value. Specifically, tax expense uncertainty is calculated since it has been clearly documented that tax expense captures earnings management (Maydew 1997; Dhaliwal *et al.* 2004; Gleason & Mills 2008) and earnings quality (Phillips *et al.* 2003; Lev & Nissim 2004; Hanlon 2005).

To make the research question empirically applicable, this chapter chooses mergers and acquisitions (M&As) as a testing instrument for the following reasons. First, as one of the most significant corporate events, acquisitions involve a high volume of capital reallocations, with an estimated aggregate amount of $1.34 trillion each year (Bonaime *et al.* 2018). Second, current studies about how tax affects acquisition outcomes focus mainly on the target’s tax condition (Landsman & Shackelford 1995;

Erickson 1998; Erickson & Wang 2007), and little attention is paid to the acquirer's tax position; thus, this chapter aims to fill this gap. More importantly, another two reasons that tax uncertainty could potentially drive acquisition performance exist. One is that tax uncertainty has been found to be positively related to firm risk (Hutchens & Rego 2015; Drake *et al.* 2019); thus, the market may re-value the acquirer according to pre-announcement tax uncertainty when the acquisition announcement injects new information and justify the acquirer's value against the risk it bears via cumulative abnormal returns. The other is that tax uncertainty triggers a precautionary approach in management decision-making processes. For example, a plausible channel through which tax uncertainty can affect acquisition outcomes is corporate cash reserve. High tax uncertainty makes management approach more precautionary (Jacob *et al.* 2019), leading managers to reserve a high volume of cash in fear of future cash outflows due to tax charges (Hanlon *et al.* 2017) and to invest the cash raised because of precautionary motives more carefully and prudently by selecting value-enhancing acquisitions (Gao & Mohamed 2018).

Therefore, this chapter formalizes the research question as 'How does tax uncertainty on the acquirer's side affect the acquisition outcomes, especially in the dynamics of the acquirer's shareholder wealth'. In total, three hypotheses are empirically tested. H1 proposes that the probability of initiating an acquisition and the acquirer's pre-announcement tax uncertainty are negatively related. According to Jacob *et al.* (2019), firms experiencing high tax volatility are more precautionary, which results in delayed large capital expenditures. Therefore, H1 assumes that this precautionary motive arises from tax uncertainty and reduces the likelihood of capital expenditure in the form of acquisitions in a given year. The results support the hypothesis in that all coefficient estimates for pre-announcement tax uncertainty proxies in the logit model are negative, while two-thirds are significant at the 1% level, suggesting that firms with high cash flow volatility are less likely to initiate acquisitions, which is consistent with the precautionary explanation of the real effect of tax uncertainty on corporate investment decisions. The results remain robust when the probit model is employed.

H2 is developed to test the direct relation between the acquirer's pre-announcement tax uncertainty and its abnormal gain surrounding the announcement date. The empirical results suggest that the relation is positive and significant. Specifically, the estimated coefficients of the acquirer's 3-year pre-announcement tax uncertainty proxies range from 0.0008 to 0.0017 when the dependent variable is the 3-day cumulative abnormal returns and are all highly significant. The results remain unchanged when 5-year pre-announcement tax uncertainty is employed, as well as when the endogeneity problem is fixed by running two-stage least square (2SLS) regressions.

H3 concerns whether the effect of tax uncertainty on the acquirer's announcement gain is manifested by long-term post-announcement operating performance. The results show that 12-month post-announcement operating performance is positively related to 3-year pre-announcement tax uncertainty. Specifically, the estimated coefficients of tax uncertainty proxies vary from 0.0203 to 0.0336 depending on the different operating performance indicators selected and are all marginally significant at the 1% level. As for H2, the results remain solid when using acquirer's 5-year pre-announcement tax uncertainty and after considering the endogeneity problem.

Overall, since supportive evidence is found for the three proposed hypotheses, this chapter concludes that the firm's tax uncertainty has a real effect on corporate investment decisions and shareholder wealth through acquisitions. Various non-mutually exclusive explanations are suggested. First, according to Jacob *et al.* (2019), as a reflection of corporate investment opportunity costs (the potential future cash outflows charged by the tax authority), high tax uncertainty forces management to choose only those acquisitions that can balance the opportunity cost. Second, high tax uncertainty also proxies for the high firm risk borne by the acquirer (Hutchens & Rego 2015; Drake *et al.* 2019); thus, the observed greater announcement gain is the market's compensation for this high firm risk after re-valuation of the acquirer upon the deal announcement. Alternatively, in the behavioural explanation of precautionary theory, high tax uncertainty triggers precautionary behaviour of managers (Hanlon *et al.* 2017), who in turn invest more carefully by reducing the frequency of engaging in acquisitions and selecting deals that are positively valued by the capital market. An alternative explanation concerns earnings management. Since the tax expense that appears in the financial statement is a result of managers' engagement in earnings management (Dhaliwal *et al.* 2004; Gleason & Mills 2008), this chapter suggests that tax expense uncertainty represents earnings management quality. Specifically, the volatility in tax expense represents managers actively managing earnings to adapt to any possible outside circumstances, for example, attempting to meet analysts' forecasts. Therefore, the positive association between the acquirer's tax uncertainty and its announcement gain reflects the market understanding and rewarding active engagement in earnings management by the acquirer's managers.

This chapter contributes to the literature in the following aspects. First, it supplements uncertainty studies in the context of M&As. Prior studies generally focus on market-level uncertainty (Asquith 1983; Chatterjee *et al.* 2012; Bhagwat *et al.* 2016), while this chapter identifies firm-level uncertainty, namely, tax uncertainty, that has a significant impact on acquisition outcomes. Second, this chapter also contributes to the M&A literature by filling a gap in examining the impact of the acquirer's tax condition on acquisition outcomes, as few studies have done. This chapter suggests, however, that just as the target's tax position can significantly affect acquisition characteristics, the acquirer's tax uncertainty is incrementally informative to other priced factors in the acquisition process and is understood by the market. Third, this chapter identifies a channel, acquisitions, through which tax uncertainty has a real effect on corporate investment. Recent research regarding tax uncertainty documents only that tax uncertainty plays a part in real corporate decisions (Hanlon *et al.* 2017; Jacob *et al.* 2019) but fails to specify the channel through which tax uncertainty affects shareholder wealth. Fourth, this chapter adds evidence to the precautionary literature from the perspective of tax uncertainty, suggesting that tax uncertainty is a source of managers' precautionary behaviour, at least in the context of M&As, which is consistent with the findings of Hanlon *et al.* (2017) in terms of corporate cash reserves. Fifth, this chapter contributes to accounting tax studies, especially the strand of tax uncertainty, in that tax expense is economically meaningful and informative about tax uncertainty. It is suggested that future research can consider tax expense uncertainty since it captures important fundamental and behavioural factors of a firm, such as earnings quality and earnings management behaviour.

The remainder of this chapter is organized as follows. Section 2 reviews prior studies of M&As and tax, particularly tax uncertainty. Section 3 identifies the literature opportunities and develops three hypotheses. Section 4 constructs the sample and outlines the methodological approach. Section 5 presents the empirical results. Finally, Section 6 concludes this chapter.

3.2. Literature review

3.2.1. Tax literature

3.2.1.1. Tax informational role

Tax expense has been documented as informative, especially for earnings management. Tax expense is one of the last accounts closed before an earnings announcement, is complex and requires discretion, which are argued to be necessary conditions for earnings management (Schipper 1989). Therefore, Dhaliwal *et al.* (2004) examine the relation between tax expense and earnings forecasts, specifically, whether the tax expense is determined by the fact that the firm's earnings would have missed the consensus forecast as well as the amount by which it misses the forecast. The authors construct the earnings management proxy as the difference between the annual effective tax rate (ETR) at year end and the estimated annual ETR at the third quarter and calculate the amount by which the firm's earnings miss the forecast as the difference between the I/B/E/S consensus forecast estimate and earnings without tax expense management. Based on a sample of 14,938 firm-year observations over the period of 1986 to 1999, the authors find that the estimated coefficient of the amount by which the firm falls behind the forecast in estimating earnings management is -0.04 and is significant at the 10% level, suggesting that the firm's annual ETR decreases in the last quarter by 0.191% for each cent by which the firm would have missed the forecast. This is consistent with the hypothesis that managers use tax expense to achieve earnings targets. Further, to test whether the earnings management is successful, the authors examine only firms that would have missed the forecast when using estimated annual ETR at the third quarter. Firms that reported earnings that exceeded the forecast had a significantly more negative estimated coefficient when estimating the earnings management proxy than those firms that continuously missed the target, suggesting that decreased tax expense assists firms in meeting the consensus forecast. Overall, the authors conclude that firms use tax expense as a cookie-jar reserve to manage earnings when other pre-tax accruals fail to achieve the earnings target.

Gleason and Mills (2008) later re-examine the market's reaction to a firm's earnings management to beat analysts' forecasts through the account of tax expense around the earnings announcement date. The authors restrict their sample to 6,080 firm-year observations with positive annual pre-tax income for companies that met or exceeded the I/B/E/S consensus forecasts by less than 5 cents, as they believe that firms close to target can beat the forecast by managing a sufficient amount of tax expense. Basically, they adapt the standard approach by regressing the cumulative abnormal returns around the annual earnings announcement date on a dummy variable indicating that the firm beat the forecast earnings per share (EPS) but would have missed in the absence of a reduction in the last-quarter tax expense. Specifically, the authors calculate the expected annual EPS with the expected tax expense by multiplying annual pre-tax income per share by the difference of one and effective tax rate in the third quarter and then define the dummy variable, which is that the firm beat the forecast with a decrease in tax expense but would otherwise have missed it, equalling one if the actual EPS is greater than the forecast amount and if the calculated expected annual EPS is less than the forecast amount and zero otherwise. The estimated coefficient of the main dummy is -0.006 and is significant at the 1% level, while the intercept representing the cumulative abnormal returns of other firms that beat the forecast is 0.007, suggesting that the market discounts earnings management behaviour through tax expense by 86% (0.006/0.007); however, it still rewards firms that beat the forecast since the sum of the estimated coefficient of the main dummy and the intercept is positive (0.007-0.006). The results are robust to the inclusion of abnormal accruals. The authors also include firms that missed the forecast in the regression, and the reward for beating the forecast (the estimated coefficient equals 0.005 and is significant at the 5% level) is much greater than the penalty for missing the forecast (the estimated coefficient equals -0.007 and is significant at the 1% level on the dummy indicating firms that missed the forecast). Furthermore, the authors find that the annual earnings changes due to decreased tax expense provide no explanatory power for annual earnings in the next year, suggesting that the market does not perceive the decrease in tax expense to beat the forecast as persistent. Overall, the authors argue that the market distinguishes between managed and unmanaged earnings, and tax expense contains information regarding earnings management.

In response to the misclassification involved in prior studies that use various accrual measures to measure managerial discretion, Phillips *et al.* (2003) evaluate the incremental usefulness of deferred tax expense in detecting earnings management since they believe deferred tax expense can better measure managers' discretionary choices under GAAP, which allows more room for discretion than tax law. Specifically, the test is carried out in three settings: the effectiveness of deferred tax expense in avoiding (1) reports of earnings decline, (2) reports of a loss, and (3) failure to meet analysts' earnings forecasts. Because SFAS No. 109 had not yet taken effect in 1993 to significantly affect GAAP regarding income tax reporting, the authors select their sample from 1994 to 2000, and it consists of 2,179 to 2,530 observations, depending on the accrual metrics calculated. The basic method for all three settings is probit regression, where the dependent variable equalling one indicates (1) change in net income is greater than zero, (2) net income itself is positive, and (3) the analysts' forecast is met. The estimated coefficient of deferred tax expense in the first setting is 3.78 and is significant at the 5% level, while the total accrual also has a significantly positive impact on the dependent variable, suggesting that deferred tax expense provides incremental explanatory power beyond accrual measurement in identifying an earnings decline. In the second setting, the estimated coefficient of deferred tax expense is 5.43 and is significant at the 5% level, while the coefficient of total accrual is also positive and significant, consisting of deferred tax expense being incrementally useful in identifying earnings management to avoid a loss. In the last setting, however, the estimated coefficient of deferred tax expense is non-significant, suggesting that it has no explanatory power beyond total accruals in detecting earnings management to meet analysts' forecasts. In addition, the author conducts receiver operator characteristic (ROC) analysis to evaluate the relative usefulness of deferred tax expense versus total accruals. The results indicate that the area under the ROC curve is significantly greater for deferred tax expense than total accruals in the second setting, suggesting that deferred tax expense is more useful than accrual measures in classifying firm-year according to earnings management with respect to avoiding a loss.

Hanlon (2005) constructs a sample at the intersection of the CRSP and Compustat databases over the period of 1994-2000 to examine the informative role of book-tax differences in terms of earning persistence. The author documents a negative relation between persistence of earnings and absolute temporary book-tax differences, and this relation remains for the accrual portion of earnings, suggesting that book-tax difference contains information regarding earnings persistence. The author also finds that the market incorporates this relation into the market price, and hence, the reported book-tax difference is a 'red flag' for investors. Lev and Nissim (2004) focus on the ratio of taxable income to book income. They compute the ratio by dividing the taxable income after a statutory tax rate by net income. Over the period of 1973 to 2000, the authors find that future earnings growth is positively associated with the ranked tax-to-book ratio. More specifically, the authors argue that the total book-tax difference contains information regarding earnings growth, while the temporary difference does not. In addition, they report that their tax-to-book ratio can be used to predict returns.

However, tax planning transactions can also give rise to changes in the GAAP ETR. For example, Desai (2003) finds that the relationship between book income and tax income changed significantly over the period of 1982 to 2000 due to increased engagement in tax-sheltering activities, which aim to enhance accounting earnings. Cook *et al.* (2008) argue that in addition to tax accruals management, tax avoidance behaviour helps to explain the results of Dhaliwal *et al.* (2004). Using fees paid to auditors as a proxy of tax avoidance behaviour, the authors find that among firms that would miss consensus earnings forecasts without tax management, higher audit fees are associated with larger third- to fourth-quarter ETR reduction; specifically, the estimated coefficient of tax fees is -0.07 (significant at the 1% level) in estimating ETR reduction.

The literature also identifies specific accounts through which earnings management has an effect. First, the change in valuation allowance is negatively associated with earnings. Schrand and Wong (2003) investigate whether banks strategically set high valuation allowances associated with deferred tax assets to manage earnings in subsequent periods. In a sample of 336 commercial banks, the authors find that banks consistently manage valuation allowances to achieve the analysts' consensus forecasts. The authors acknowledge the potential lack of generalizability of the results due to the use of a homogeneous sample, but they also suggest that the results are expected to be similar across industries since the incentives of earnings management are not unique to banks. To correct this sample selection bias, Frank and Rego (2006) select a more diverse sample that consists of all U.S. publicly traded companies with positive book values reported on Compustat from 1993 to 2002, and they find more comprehensive yet consistent evidence that firms manage earnings through valuation allowance accounts but not through other accounts. Second, the tax contingency reserve can also be used to manage earnings because it is not limited by the amount of deferred tax assets, rarely discloses prior FIN48, and thus involves a higher degree of managerial discretion (Gleason & Mills 2002). However, there is little empirical evidence about the effect of earnings management through this account due to the lack of data. Third, firms can manage earnings via the designation of permanently reinvested earnings. Specifically, firms can either increase or decrease the amount of foreign source earnings designated as permanently reinvested. Based on a sample of 805 firm-years of U.S. multinational corporations over the period 1993 to 1999, Krull (2004) suggests that firms use permanently reinvested earnings (PRE) to meet analysts' forecasts by documenting a positive relation between year-to-year changes in reported PRE and the difference between earnings forecasts and pre-managed earnings. However, earnings management via PRE is not used for other purposes, such as avoiding earnings decline and smoothing earnings.

3.2.1.2. Tax impact on real corporate decisions

Tax is argued to play an important role in real corporate decisions, such as capital structure, organizational form, and investment in intangible assets. Following the development of capital structure theory, there have been several time-series studies providing evidence on the leverage-related cost, since there is a consensus recognition that the existence of an optimal structure depends on whether leverage-related costs can economically and significantly affect the corporate borrowing cost. Bradley *et al.* (1984) take another path to directly examine the issue of optimal capital structure using cross-sectional, firm-specific data. First, they develop a single-period model that synthesizes several theoretical aspects of capital structure, including tax-advantage and bankruptcy-costs trade-off models (Kraus & Litzenberger 1973), agency costs-of-debt arguments (Jensen & Meckling 1976), and potential loss of non-debt tax shields (DeAngelo & Masulis 1980). The model predicts that the usage of leverage is inversely related to the expected costs of financial distress (agency costs and bankruptcy costs) and the amount of non-debt tax shield. In the cross-sectional tests, the non-debt tax shield is calculated as the sum of annual depreciation charges and investment tax credit scaled by the sum of annual earnings before depreciation, interest, and taxes. The authors find that the estimated coefficient of non-debt tax shields is 0.370 and is significant at the 1% level for 821 firms from 1962 to 1981, while the estimated coefficients of proxies of agency costs and bankruptcy costs are all negative and significant (the dependent variable is debt-to-value ratio). The results remain the same when the sample is restricted to 655 non-regulated firms. This negative relation between the optimal leverage level and non-debt tax shield contradicts the model's prediction, and the authors suggest that the non-debt tax shield is an instrumental variable for the securability of a firm's assets; thus, more securable assets are associated with higher leverage.

MacKie-Mason (1990) also studies how tax affects capital structure. However, the author differs from previous research by studying incremental financing decisions using discrete choice analysis, since the author believes that the incremental choice approach focusing on actual decisions made by firms has greater power in the current situation than approaches based on historical aggregate decisions. The findings indicate that tax shields are negatively related to the likelihood of using debt, and the author's explanation is that the high tax shield reduces the effective marginal tax rate on interest deductions. Dhaliwal *et al.* (1992) test the substitution hypothesis in a cross-sectional setting and find evidence for the existence of debt and investment-related tax shield substitution effects for firms that have a substantial probability of not fully exploiting tax shields. Specifically, the authors discover a negative relation between investment-related tax shields and debt tax shields for firms facing a substantial probability of losing the immediate deductibility of tax shields.

There has been discussion about how tax legislation affects a firm's economic behaviour. Ayers *et al.* (1996) examine how the choice of organizational form by small businesses is influenced by tax and non-tax factors. In contrast to the prior literature that limits the organizational form in taxable corporations (C corporations) and electing subchapters (S corporations), this study further includes the unincorporated form. The authors select their sample from the 1988-89 National Survey of Small Business Finances. To be included in the sample, the firm had to be a non-financial, non-farm small business in the December 1987 Dun's Market Identifier file. The authors argue that the reason for limiting the sample to small businesses is that these firms make the vast majority of organizational decisions and are subject to fewer constraints, such as owners' meetings and proxy voting. The final sample is divided into two sub-samples, namely, 1,616 single-owner firms and 1,378 multi-owner firms.

Multinomial logit analysis is carried out to investigate the potential association between choice of organizational form and both tax and non-tax considerations, and within each sub-sample, the choices of three organizational forms (C corporation, S corporation, and unincorporated) are evaluated against each other. The authors construct two variables representing tax considerations. First, LOSS equals one if a firm is less than six years old and has negative taxable income. Second, LNTAX is calculated as the natural log of the amount of corporate-level tax on the entity's taxable income. The estimated coefficients of LOSS are positive and significant in both sub-samples when evaluating the choice between S corporation and C corporation but are statistically non-significant for other comparisons. The estimated coefficient of LNTAX varies from 0.0392 to 0.1244 within the multi-owner firm sub-sample, suggesting that the corporate-level income tax is negatively related to the probability of (1) being a C corporation as opposed to an S corporation or unincorporated and (2) being an S corporation versus operating in partnership. Furthermore, the authors document other non-tax considerations that have a significant influence on the organizational form choice, including ownership structure, firm age, firm value, and being in the manufacturing industry.

Guenther (1992) focuses on two research questions, namely, the tax costs associated with different organizational forms and how managers respond to an external event that makes the corporation form of the organization costlier than an alternative form. Based on a sample of 95 NYSE corporations in the manufacturing, wholesale, and retail industries, the author finds that the corporation form is associated with higher tax costs. Furthermore, the author finds that managers will change long-term debt, non-dividend distributions, and dividend pay-out ratio in response to any event that increases the cost of the corporation form of the organization. Mackie-Mason and Gordon (1997) examine how the size of tax distortion affects the aggregate allocation of assets and taxable income between corporate and non-corporate firms over the period of 1959 to 1986. The authors predict that profitable firms will shift out of the corporate sector when tax distortion of incorporation is greater, and they find strong empirical support. Furthermore, the report of the implied efficiency losses due to the organizational form choice in response to tax distortion equals 16% of tax revenue, suggesting that non-tax factors dominate organizational form choice.

Motivated by previous research that yields mixed evidence regarding whether R&D spending is affected by tax credit, Berger (1993) includes non-tax variables and credit usability variables at the firm level and selects a sample consisting of both firms that are able to use credit and those that are unable to use credit to isolate the effect of credit on R&D spending from other factors. By assuming positive price elasticity of demand for R&D, the firm is better off owing to R&D tax credits if it increases R&D expenditures beyond those in a base period. The author predicts a positive relation between R&D spending and credit usability for firms that can effectively use the credit. To conduct the R&D spending model tests, the author constructs a sample of 263 Compustat firms for which information is available over the period of 1975 to 1989, of which 231 firms are classified as able to use tax credits. The author performs both individual firm regressions and pooled regressions, where the individual firm regressions are not required to have equal slope coefficients, and the pooled regressions are estimated using a fixed effects estimator that produces a separate intercept for each sample firm. First, in the individual firm regressions, the estimated coefficient of credit usability is 0.0012 and is significant at the 1% level. Second, in the pooled regressions, the estimated coefficient of credit usability varies from 0.0005 to 0.0008 and is significant at the 1% level. To determine whether the positive relation is due to a post-1980 increase in a firm's R&D intensity that is unrelated to the credit enactment, the author replaces the credit usability variable with a yearly dummy from 1981 to 1989 and reports that the effect of credit incentive on R&D spending is greater from 1982 to 1985 than in other sample years. Specifically, a firm's ability to use tax credit during 1982-1985 is associated with an 8.5% increase in R&D intensity compared with pre-ERTA levels. Third, the estimated coefficient of the interaction term indicating that the firm-year is unable to use tax credit never displays significance in regressions, providing evidence that the apparent increase in R&D expense is not associated with factors unrelated to tax credits. Furthermore, the cash flow proxy, Tobin's q, industry R&D intensity, and lagged R&D all display significance at various levels in the regressions. Overall, the author concludes that R&D expenditure is sensitive to tax credits.

Klassen *et al.* (2004) investigate firms' response to tax incentives designed to facilitate research and development (R&D) spending by conducting a cross-border comparison between the U.S. and Canada. Using a sample consisting of 287 Canadian firm-years and 534 U.S. firm-years matched according to industry and firm size, the authors examine the cost-effectiveness of tax credits after controlling for other determinants of R&D spending. The authors find that U.S. incentives produce an average of $2.96 in additional R&D spending for every $1 of forgone tax revenue, and the average for Canada is $1.30. Thus, the U.S. credit design yields a larger incentive for R&D spending for the same price.

However, the response of investment to tax incentives can be mitigated by financial reporting incentives. To test the competing arguments regarding the impact of institutional investor ownership on investment, Bushee (1998) examines how institutional ownership affects R&D spending for firms that can reverse a decline in earnings by reducing R&D expenditures. The author finds that a higher level of institutional ownership is associated with a lower probability of reducing R&D spending to reverse an earnings decline, suggesting that institutional investors are more sophisticated and serve as monitors for managers in reducing myopic investment behaviour. However, this relation reverses when institutional investors who have a large proportion of ownership have high portfolio turnover and engage in momentum trading; the author therefore argues that such institutional investors could encourage myopic investment behaviour. A later study suggests that stock option exercises by R&D employees also have an impact on the amount of R&D investment; specifically, decreased R&D spending to avoid an earnings decline can be mitigated by 16% to 42% by the tax credits generated by stock option exercises by R&D employees (Brown & Krull 2008).

3.2.1.3. Tax avoidance

This section reviews the determinants and consequences of tax avoidance. The evidence of the relation between firm size and tax avoidance, which is always measured as the effective tax rate (ETR), is mixed. The political cost theory posits that visibly larger and more successful companies are subject to greater regulatory actions and wealth transfers (Watts & Zimmerman 1978), which is one important element of the total political costs borne by firms. In contrast, political clout theory argues that more successful firms can affect political processes in their favour to achieve tax savings. However, regardless of the relationship documented between ETR and firm size, Gupta and Newberry (1997) argue that previous studies suffer from one major limitation: they all investigate the relation in a univariate framework that creates a potential correlated omitted variables problem. Specifically, after realizing that a firm's operating performance and investment and financing decisions can all affect ETR, the authors re-examine the ETR-firm size relation by controlling the firm's profitability, capital structure and asset mixes in fixed effect regressions. Based on a sample of two separate periods spanning TRA86, namely, 1982-1985 and 1987-1990, the authors study this relation in two different tax regimes. First, consistent with the authors' prediction, the estimated coefficients of return on assets (ROA) are all positive and significant at the 1% level across various measurements of ETR and two different periods, suggesting that controlling for operating performance when studying the ETR-firm size relation is necessary. Second, during 1982-1985, estimated coefficients of firm size are positive and significant at better than the 5% level, which is consistent with political cost theory; however, they turn out to be negative and significant at the 1% level over 1987-1990, which lends support to political clout theory. The authors suggest that the sensitivity of ETR to firm size crucially depends on sample composition, which is supported in that there is no size effect when the sample is restricted to firms with a longer history (those that have all data available in all eight sample years). Furthermore, capital intensity has a negative impact on ETR, and inventory intensity also has a negative effect on ETR. Overall, this study highlights that the determinants of tax avoidance include factors beyond firm size, such as operating performance and capital structure, while the size effect is sensitive to sample selection.

A new literature incorporates agency elements into the determinants of tax avoidance. The rationale is that managers whose interest is aligned with that of shareholders by compensation incentives based on after-tax performance will engage in more tax avoidance activities to increase firm value. For example, Phillips (2003) investigates the relation between firms’ tax avoidance (proxied by effective tax rates) and after-tax accounting-based performance measures for both CEOs and business unit managers. The author finds that the usage of after-tax performance measures for business unit managers results in significantly lower ETRs and economically meaningful tax benefits, suggesting that business unit managers are important in tax planning efforts, which can be effectively promoted by using accounting-based incentives. On the other hand, by modelling the effect of incentive compensation and governance structure on the determination process of tax avoidance, Desai and Dharmapala (2006) find that tax avoidance is inversely related to equity-based compensation, and the employment of cross-sectional variation indicates that this negative relation holds only for firms with low institutional ownership and weak shareholder rights.

Another strand of studies identifies the ownership structure as important in determining tax avoidance. For example, to test the hypothesis that family firms are more likely to engage in greater tax avoidance since family owners can benefit from the resulting tax savings, Chen *et al.* (2010c) examine the explanatory power of family firms on tax avoidance and find contrary evidence. Specifically, using four measures of tax avoidance (effective tax rate, cash effective tax rate, and two measures of book-tax difference), the authors find that the family firm indicator is inversely related to tax avoidance behaviour relative to non-family firm firms. Hence, the authors suggest that family owners are more concerned with the non-tax costs of potential price discounts from non-family shareholders, the potential penalty charged by authorities, and damage to the firm’s reputation.

In terms of the consequences of tax avoidance, there has been little discussion about how shareholder wealth is affected by tax avoidance behaviour. Reduced tax ability due to tax avoidance can serve to maximize firm value by minimizing the corporate tax payment net of the private cost of doing so. However, there is cost associated with tax avoidance behaviour, which is the possibility of being deemed non-compliant by tax authorities and being charged penalties. Consequently, tax avoidance behaviour can theoretically either increase or depress firm value, and the authors investigate this issue empirically using traditional event study methodology.

Hanlon and Slemrod (2009) construct their sample by searching ‘tax shelter’ and ‘corporate’ or ‘corporation’ to capture articles in the Factive database over the period of 1990 to 2004 and then excluding articles in which firm names are not associated with tax shelters. Additionally, transfer pricing and taxes in foreign countries are excluded, resulting in a final sample of 601 articles. The authors find that the 3-day cumulative abnormal returns around the first mention in the press of tax shelters are -1.20, which is significant at the 1% level, suggesting that the market reacts negatively to news that a firm is in a tax shelter. Next, the authors investigate the partial relationship between firm characteristics and the stock price reaction to tax shelter news by examining the cross-sectional relation between firm characteristics and 3-day cumulative abnormal returns. The estimated coefficient of cash ETR is 0.055 (significant at the 10% level), implying that a one-standard-deviation lower cash STR is associated with a 0.75% lower cumulative abnormal returns over the 3-day period surrounding a tax shelter news release. Furthermore, the estimated coefficient of the dummy variable indicating the retail sector is -0.028 and is significant at the 5% level.

The authors interpret this as part of the reaction being due to consumer/taxpayer backlash. However, while the authors conclude that the market perceives tax avoidance negatively, they highlight the limitation that the sample firms are those being accused of tax sheltering; thus, the results may be different for firms that are less aggressive in tax avoidance.

In contrast, Desai and Dharmapala (2009) fail to find any significant relation between tax avoidance (measured by abnormal book-tax difference) and firm value (measured by market-to-book ratio); however, the authors report that there is cross-sectional variation in the association; specifically, the positive relation between tax avoidance and firm value is stronger for firms with a high level of institutional ownership. The authors explain this as the value shareholders place on corporate tax avoidance according to their ability to control the manager, consistent with the argument that a governance difference explains cross-sectional variation in the consequences of tax avoidance. Another study investigates the market reaction surrounding the passage of FIN 48, predicting a positive market reaction if the market expects the disclosures to improve and a negative market reaction if the market expects the tax costs to increase (Frischmann *et al.* 2008). However, little market reaction is found surrounding the passage of the rule, and only small positive cumulative abnormal returns (1.56%) are detected over the 3-day period surrounding the first disclosure for firms under the rule.

3.2.1.4. Individual-level tax impact on asset price

It is recognized that shareholder-level tax can affect share price because individual tax is imposed on the distribution of earnings and reduces the after-tax cash flow to the investor. Ayers *et al.* (2002) take the increase in the dividend tax rate from 31.0 to 39.6% enacted in the Revenue Reconciliation Act of 1993 (RRA93) as an opportunity for a natural experiment to investigate how the individual-level tax can affect the share price. Specifically, they regress 5-day cumulative abnormal returns on proxies of dividend yield, institutional ownership, and the event period of RRA93 while controlling other variables that may affect stock returns, including firm size, profitability, leverage, and book-to-market ratio. The authors construct two alternative specifications of dividend policy: the first is a dummy variable that equals one if the sample firm is ranked in the top three deciles of dividend yield for the fiscal year ending prior to January 1993, and the second is a continuous variable calculated as the firm's common stock dividend scaled by the firm's market value. Based on a sample of 1,312 firms across nine industries, the authors conduct OLS regressions using both dichotomous and continuous specifications of dividend policy. The estimated coefficients of the interaction term of dividend policy and event period dummy range from -0.0216 to -0.2540 and are significant at the 1% level, suggesting that the market reaction to RRA93 is negative for stocks with a low level of institutional ownership. Furthermore, the estimated coefficients of the three-way interaction term (dividend policy, institutional ownership, and event period dummy) range from 0.0294 to 0.5040 and are all significant at the 1% level, implying that the negative relation is mitigated by institutional ownership since institutional investors are not affected by changes in individual tax policy. Overall, the authors conclude that the tax status of a firm's marginal investors plays a significant role in how shareholder dividend taxes affect firm value. In addition, the authors lend support to the traditional 'tax penalty' view that the firm's dividend policy is related to the magnitude of price decline due to an increased dividend tax rate.

The literature does not provide conclusive evidence regarding the effect of capital gains tax rates on share prices. Capital gains tax capitalization theory predicts that share prices will increase in expectation of future reduced capital gains taxes (Collins & Kemsley 2000), while others suggest that reduced capital gains taxes can reduce shareholders' reservation prices by mitigating the lock-in effect and thus reduce share prices as well (Klein 1999). Another strand of the literature predicts that the change in capital gains tax rates will have no impact on share prices since marginal investors are unaffected by capital gains taxes (Miller & Scholes 1978).

Lang and Shackelford (2000) employ capital market event study methodology to assess the equity effects of capital gains taxes by evaluating stock price movements surrounding a likely change in expected capital gains tax rates, specifically, the May 1997 budget accord, which resulted in the long-term capital gains tax rate reduction from 28% to 20%. The authors proxy the value relevance of the expected capital gains tax by dividend yields, since investors are likely to place less weight on the expected capital gains tax rate when assessing firms with high dividend yields, and construct a categorical variable that equals one if the budget accord takes place in the sample week. In regressions where the dependent variable is 5-day cumulative abnormal returns, the estimated coefficients of the interaction term by event dummy and dividend yield range from -3.31 to -4.25, depending on the variables controlled, and are all significant at the 1% level. Next, the authors restrict the sample to dividend-paying companies, and the results are not materially changed. The estimated coefficients of the same interaction term vary from -0.29 to -0.16 and are all significant at better than the 10% level. Overall, this study contributes to the literature in that in addition to dividend taxes, capital gains taxes significantly affect share prices during the week in which the expected capital gains tax rates are likely to decrease. The authors provide two explanations: first, reduced capital gains tax rates attract investors when stock returns will be taxed as capital gains, and second, the reduction in capital gains tax rates increases the market value of shares held by individual shareholders.

Based on a sample of 51 preferred stocks and 61 high-yield common stocks drawn from the 1994 Compustat database, Erickson and Maydew (1998) study how the security price changes in response to the 1995 proposal to reduce deductions for dividends received from 70% to 50%. Given that the proposal effectively increases the taxes paid on dividends received by corporate investors, the authors find that preferred stocks suffer significant negative abnormal returns, suggesting that these preferred stocks bear implicit taxes. In contrast, there is no significant price reaction for common stocks. The authors argue that this finding explains why issuers employ preferred stocks: the implicit tax as a result of investor-level tax preference reduces the cost of capital for the issuers. The Jobs and Growth Tax Relief Reconciliation Act of 2003, which reduced the maximum tax rate on capital gains from 20% to 15% and the maximum tax rate on dividends from 38.1% to 15%, was employed to test how individual-level tax affects the cost of capital (Dhaliwal *et al.* 2007). The authors find that the cost of equity decreased by 1.02% on average following the Tax Act, and the magnitude of this decline in equity cost is inversely related to institutional ownership. The authors suggest that this is evidence that individual-level taxes affect equity valuation. In addition, contrary to the expectation, non-dividend-paying firms benefit more from reduced tax than their dividend-paying peers, which is consistent with an earlier study conducted by Auerbach and Hassett (2003). Changes in capital gain taxes can also have an impact on corporate stock prices. For example, Guenther and Willenborg (1999) study the issue price of IPOs by small businesses whose total post-issuance assets are less than $50 million around the 1993 tax law change that reduced capital gain taxes for individuals who purchase stocks directly from the issuer. The authors find that the issue prices of qualified small businesses are significantly higher than those prior to the tax law change after controlling for IPO underpricing. Although the studies discussed above appear to support the notion that changes in tax law are capitalized into price, critics exist. For example, focusing on the same tax law change studied by (Dhaliwal *et al.* 2007), one study argues that there is no significant effect on the value of the aggregate U.S. stock market and that the benefits reaped by dividend-paying firms cannot be attributed to tax-cut news (Amromin *et al.* 2008). In addition, research methods require further modification in that tax changes are endogenous and correlated with other economic factors (Romer & Romer 2009).

3.2.2. Tax uncertainty

The research on tax uncertainty is relatively new and underdeveloped, and there is not yet an agreement regarding what factors tax uncertainty captures and even how to accurately measure tax uncertainty. Hence, different studies focus on various aspects by employing various forms of tax uncertainty measurement.

Due to complexity and ambiguity in tax laws and a firm's aggressive tax avoidance behaviour, the total amount of tax the firm needs to pay is not certain at the time when returns are filed since the tax authority may challenge and disallow the firm's tax position and demand further payment. Therefore, Hanlon *et al.* (2017) hypothesize that firms facing higher tax uncertainty are likely to hold more cash in anticipation of potential repayment. To investigate the relation between tax uncertainty and cash holdings, the authors regress cash balance on a vector of determinants in addition to tax uncertainty. Specifically, cash holdings are measured as the cash-to-assets ratio, while tax uncertainty is defined by the amount of uncertain tax benefit (UTB) disclosed by firms according to FIN48, which requires firms to disclose the estimated amount of past tax savings that management expects could be assessed by a tax authority. Based on a sample of 14,920 firm-year observations over the period of 2007 to 2014, Hanlon *et al.* (2017) report that the estimated coefficient of tax uncertainty is 0.741

(significant at the 1% level) for the full sample, suggesting that a one-standard-deviation increase in tax uncertainty results in a 1.2% increase in total assets in cash. The authors also divide the full sample into deciles according to tax uncertainty and find that firms in the top decile hold 3.3% more total assets in cash than those in the bottom decile, while the average sample assets in cash is 19.8%. Thus, the authors argue that the effect of tax uncertainty on cash holdings is economically meaningful and significant. Next, the authors focus on domestic firms that are not subject to the repatriation tax effect, and the estimated coefficient is 0.983 (significant at the 1% level), which is more pronounced than that of the full sample. In addition, for multinational firms, the estimated coefficient of tax uncertainty is 0.507 (significant at the 1% level) after controlling for five-year repatriation tax cost, suggesting that tax uncertainty provides incremental explanatory power for the repatriation tax in determining multinational firms' cash holdings. Overall, the authors conclude that they provide a tax-based precautionary explanation for cross-sectional variation in cash holdings, which is that management holds more cash when facing uncertain tax positions.

The results of Hanlon *et al.* (2017) imply that a substantial cash balance reserved for precautionary purposes could generate opportunity costs for firms in terms of reduced and delayed investment. To discover the opportunity costs for a specific source of uncertainty, Jacob *et al.* (2019) focus on tax uncertainty (proxied by both UTB and volatility in cash ETR) and investigate how it alters management decisions regarding capital investments. The authors find supportive evidence that higher tax uncertainty is associated with delays in firms' large capital expenditures and lower average annual levels of investment, suggesting an important real opportunity cost of accumulating precautionary cash reserves.

Given that tax risk management is highly valued in the accounting industry, Hutchens and Rego (2015) investigate whether the focus on tax risk management is warranted by examining whether a positive relation exists between tax risk and firm risk as perceived by capital market participants. Empirically, the authors regress proxies of firm risk on a range of variables representing tax risk. They select four variables to measure firm risk, namely, the cost of equity capital, current stock return volatility, future stock return volatility, and dispersion in analysts' forecasts of future earnings. In terms of tax risk, since there is no agreed-upon empirical measure, the authors choose four tax-related uncertainty proxies, including ending balance of unrecognized tax benefits, additions to UTBs related to current-year tax returns, five-year annual cash ETR volatility, and discretionary permanent book-tax difference. Based on a sample of 4,103 firm-years from 1992 to 2013, the authors find that the estimated coefficients of discretionary permanent book-tax difference range from 0.012 to 0.021 and are all significant across regressions using different firm risk measures as the dependent variable, while the estimated coefficients of cash ETR volatility range from 0.006 to 0.014 and are significant in three-fourths of the regressions. However, the estimated coefficients of UTB-related measure of tax risk are never positive and are even significantly negative in certain cases. Therefore, the authors conclude that discretionary permanent book-tax differences and volatility in cash ETR capture tax risk, which is positively related to firm risk. Furthermore, the authors hypothesize that the underlying reason is that investors fail to understand tax information due to poor tax accrual quality and test this hypothesis by examining whether the interaction term of the low-accrual-quality dummy and tax risk can provide incremental explanatory power regarding firm risk. The results suggest that the impact of the discretionary permanent book-tax difference on firm risk is driven by the low quality of tax accrual, while the positive association of cash ETR volatility with firm risk is not affected by tax accrual quality. Overall, the authors conclude that only discretionary permanent book-tax difference and cash ETR volatility capture investors' uncertainty regarding firms' future cash flow. While discretionary permanent book-tax differences increase firm risk through low tax accrual quality, recent cash ETR volatility simply makes the forecast of future earnings more difficult and thus leads to an assessment of higher firm risk regardless of the quality of tax accrual.

Motivated by the mixed evidence regarding the effect of tax risk on the cost of debt and the fact that the syndicated loan market is the primary source of corporate financing, Saavedra (2019) investigates how the volatility of tax affects the loan spread in the syndicated loan market to determine whether lenders penalizes high-tax-volatility borrowers. The author constructs two measures of tax volatility: first, the standard deviation of annual cash ETRs in the past five-year period and second, an unusually large tax payment, defined as a firm experiencing an extremely large tax payment within any of the previous five years. Using a sample consisting of 22,701 firm-year observations, the author regresses loan spread on tax volatility measures along with a vector of control variables, a credit rating dummy variable, a purpose of loan dummy, and year and industry fixed effects. The estimated coefficient of cash ETR volatility is 20.880 and is significant at the 1% level, implying that a one-standard-deviation increase in tax volatility results in a loan spread that is higher by 6.5 basis points, which is equivalent to 5% of the sample median (125 basis points). Similarly, the estimated coefficient of an unusually large tax payment is 15.975 and is significant at the 1% level, suggesting that tax volatility is penalized in the syndicated loan market. Next, to test whether the results are driven by the priority of tax obligations over lenders' claims, the author partitions the sample according to whether the loan has collateral, since a loan without collateral is subordinate to tax obligations in liquidation. The estimated coefficient of cash ETR volatility in the no-collateral sub-sample is 30.209 (significant at the 1% level) and is significantly greater than its counterpart (10.652) in the collateral sub-sample, suggesting that the main results are driven by the sub-sample of loans having lower priority for tax obligations. Overall, the author concludes that tax volatility is incrementally informative in relation to other priced factors in the syndicated loan market.

Other representative studies of tax uncertainty are reviewed below. Drake *et al.* (2019) examine how investors value tax uncertainty and how tax risk affects investors' perceptions regarding tax avoidance behaviour. The authors find that investors positively value tax avoidance and negatively value tax uncertainty based on a sample of 40,375 U.S. firm-year observations over the period of 1992-2014. Specifically, when the dependent variable is firm value, proxied by Tobin's q, the estimated coefficients of tax uncertainty (measured as the standard deviation of 5-year annual cash ETR) and tax avoidance (proxied by cash ETR) are -0.405 and 1.198 (both significant at the 1% level), respectively. Furthermore, the estimated coefficient of the interaction term of tax avoidance and tax uncertainty is -1.235 (significant at the 1% level), suggesting that tax uncertainty negatively affects how investors value tax behaviour. Using a similar view of tax uncertainty, the standard deviation of annual cash ETR, Guenther *et al.* (2017) document a positive association between tax uncertainty and future stock return volatility, suggesting that tax uncertainty is probably an indicator of overall firm risk. The above two studies consider tax uncertainty similarly to the traditional view in the finance literature that risk refers to the dispersion of potential outcomes from an investment and reflects future risk; however, the alternative view posits that tax uncertainty arises from the interaction of economic risk and law uncertainty. For example, Neuman *et al.* (2019) define tax uncertainty as the potential for a current action, or failure to take the action, to lead to future tax outcomes that differ from those that are expected. The authors proxy tax uncertainty by establishing a tax uncertainty index consisting of transactional, operational, compliance, reputational risk, and financial accounting components and find a negative relation between tax uncertainty and future long-run tax avoidance behaviour.

In addition, following the enactment of FIN48 in 2007, studies employ unrecognized tax benefit (UTB) as a measure of tax uncertainty since UTB represents management's perceived uncertain tax position due to potential future charges by authorities for any disallowed tax avoidance currently engaged in. Because UTB data are available only after 2007, the literature regarding the informative role of UTB as a proxy of tax uncertainty is relatively limited and inconclusive. Generally, proponents argue that UTB is informative about future income tax cash outflows, while critics argue that accruing UTB involves too much managerial discretion. On the empirical front, Ciconte *et al.* (2016b) employ a sample consisting of 4,474 firm-year observations over the period of 2007 to 2014 and find evidence supporting UTB's informative role in terms of future income tax cash outflows. Furthermore, the authors discover that this relation converges to one (dollar for dollar) over a five-year period, a finding that is inconsistent with the criticism that UTB is under- or over-reserved. Similarly, Robinson *et al.* (2016) study the relevance of UTB disclosures based on a sample of 14,105 firm-year observations of non-financial firms from 2007 to 2011 and conclude that UTB is informative regarding cash outflows; however, it is usually over-reserved.

3.2.3. M&A literature

3.2.3.1. Tax studies in the M&A literature

It is argued that tax attributes, such as net operating loss (NOL), of the target firm can be acquired to offset the acquirer's tax liabilities. Therefore, since not all potential benefits of tax attributes are capitalized in the stock price prior to the acquisition announcement, it is hypothesized that the tax attribute is positively related to the announcement period returns of both acquirer and target. To this end, Hayn (1989) evaluates the importance of the target firm's net operating loss carry forwards (NOLC) and unused tax credits in motivating acquisitions based on a sample of 640 successful acquisitions over the period of 1970 to 1985. Within the sub-sample of tax-free acquisitions, the estimated coefficients of long-lived NOLC and unused tax credits in estimating the target's and acquirer's 15-day announcement period returns are 0.25 and 0.14, respectively; however, both are statistically non-significant. In contrast, the estimated coefficients of short-lived NOLC and unused tax credits are 0.43 (significant at the 5% level) and 0.21 (significant at the 10% level) for the target's and acquirer's announcement period returns, respectively. The author interprets this sharp contrast as based on the difference in the target firm's usage of NOLC and unused tax credits. Target firms are more likely to eventually use durable NOLC and unused tax credits even without acquisition; however, their ability to take advantage of tax benefits in the short run is limited. Consequently, the acquisition provides an opportunity for the merged firm to exploit the short-lived tax benefit that would otherwise expire. Furthermore, the author highlights the difference in return patterns between tender offers and mergers even after controlling for tax status. The author concludes that the exploitation of the target's tax benefit is one of the underlying motivations of M&As.

Given that some parent countries tax the worldwide income of resident multinationals, some multinationals choose to mitigate this international double taxation problem through cross-border M&As that allow them to choose the location of the parent firm. Huizinga and Voget (2009) provide evidence that international tax considerations can materially affect the organizational outcomes of cross-border M&As. Based on a sample of all acquisitions involving any pair of European countries, Japan, and the U.S. over the period of 1985 to 2004, the authors employ a logit binary choice model to study the selection of being an acquiring or target country. First, the estimated coefficient of the double taxation burden is -0.358 (significant at the 1% level), suggesting that a 1% increase in the double taxation burden in a specific country reduces its probability of being an acquiring country by 9%. The results are robust to the inclusion of various control variables and the probit model. Second, the authors perform a robustness check by assuming that multinational foreign establishments are branches instead of subsidiaries. The estimated coefficient of the relative double taxation variable is -0.355 (significant at the 1% level). Third, the authors highlight the possible endogeneity problem that international double taxation is a user fee for using a country as a parent country; thus, the increased demand for a country to serve as a parent country also increases this user fee endogenously. Therefore, the authors perform a two-step instrumental variable probit in which the double taxation burden is instrumented by its 1- and 2-year lagged values; the estimated coefficient of the double taxation burden is -0.19 and is significant at the 1% level, which is similar to the results of the probit model in terms of both magnitude and significance. Overall, the authors conclude that the prospect of international double taxation is an economically significant determinant of the direction of cross-border M&As.

Ayers *et al.* (2003) link merger pricing with a target's shareholder capital gains tax liabilities by modelling the acquisition premium as a function of long-term capital gains taxes generated by acquisition deals. Based on a sample of 565 taxable cash-for-stock acquisitions and 370 tax-free stock-for-stock acquisitions over the period of 1975 to 2000, the authors not only find a positive association between takeover premium and shareholder-level capital gain taxes but also minimize the potential effect of unobservable factors that may affect takeover premium by testing the difference in the association between taxable and tax-free deals. Specifically, the estimated coefficients across various proxies of long-term capital gains taxes of the target's shareholders vary from 1.165 to 2.773 and are all significant at the 1% level, lending support to the argument that merger pricing increases in the target's shareholders' capital gains taxes. However, the estimated coefficient for the interaction terms of capital gains proxies and indicator variables of tax-free deals range from -0.754 to -1.046 and are all significant at the 10% level, suggesting that the positive association between the takeover premium and the target's shareholders' capital gains taxes is reduced by tax-free deal circumstances. However, the positive association is not reversed since the sum of the estimated coefficient for capital gains proxies and the interaction term is still positive and significant. The authors provide an interpretation that the higher-risk premium is compensation for the target shareholders who intend not to exercise the option to defer taxes on the acquisition and accordingly require a higher price for increasing capital gains through the acquisition. However, the authors highlight the possibility that the positive association captures some unobservable factors affecting premiums in both taxable and tax-free acquisitions. Overall, they suggest a price effect of shareholder-level taxes on taxable acquisitions that varies with the tax status of the target's shareholders.

In addition, Erickson and Wang (2007) examine a sample of taxable stock acquisitions from 1994 to 2000 and find that conduit entities (S corporations) reap a tax-driven purchase price premium relative to those that are taxed separately from their owners (C corporations). The authors argue that the reason is that the sale of S corporations can be structured to increase future tax deductions for the buyer, and the tax benefit is 12% to 17% of the deal's value. In a study analysing tax and non-tax determinants of corporate acquisition structure, Erickson (1998) finds that target shareholder tax liabilities do not have a significant impact on acquisition price based on a sample of 340 acquisitions involving public U.S. acquirers and targets during 1985-1988 and attributes this non-significant relation to high bases (or low potential tax liability) in target stock owned by marginal shareholders. Given access to confidential shareholder records, Landsman and Shackelford (1995) find a negative correlation between the weighted average tax bases of the shares and stock price during the leverage buyout period. Specifically, with every one dollar less in tax basis, shareholders require an additional 20 cents in sale price to compensate for capital gains taxes.

3.2.3.2. Behavioural M&A studies

This section reviews M&A studies from two perspectives, namely, the market-timing explanation of acquisitions and the managerial bias explanation. In terms of the market-timing theory of acquisitions, Shleifer and Vishny (2003) develop a model that takes mispricing as a given under the assumptions of an inefficient market and rational managers who initiate acquisitions to preserve a temporary overvaluation for long-run shareholders instead of reaping synergies. The model also assumes that the merger has no long-term gain and the short-run belief of investors adheres to the current market valuation of a firm and the story of the benefit of mergers (the perceived synergy). The authors demonstrate that the relatively more overvalued firm will take over the less overvalued firm with cash only if the target company is undervalued, and the cash acquisition has an effect on the combined valuation equal to zero. In other words, the target's shareholders benefit from the loss of the bidder's shareholders. More importantly, the authors find that the overvalued firm will acquire a less overvalued firm with stock, and the bidder will gain in the long run if and only if the price paid is less than the perceived synergy. The authors argue that the bidding company may have a negative observed return in the long run; however, this observed return is better than it would be if the acquisition were not made since the use of overvalued equity to acquire hard assets effectively reduces the acquiring cost and increases the bidder's shareholders' claim on physical capital. Finally, the authors show that the model is broadly consistent with the short- and long-run patterns of the price behaviour of mergers and can be employed as an explanation of merger waves.

The market-timing explanation of M&As unifies a number of stylized facts; for example, the fact that acquisitions are facilitated when catering gains are available helps to explain the time-series link between deal volume and stock prices. In addition, the model predicts that cash (stock) acquirers earn positive (negative) long-run post-announcement returns, and this prediction is supported empirically (Loughran & Vijh 1997; Rau & Vermaelen 1998). Later studies find broader supportive evidence for market-timing theory. For example, market-level mispricing proxies are found to be positively correlated with acquisition volume, with acquirers being more overpriced than targets (Ang & Cheng 2006; Dong *et al.* 2006). A short-term catering effect is also discovered in which investors welcome acquisitions by positive short-run cumulative abnormal returns during high-valuation periods; however, the subsequent long-run returns of deals completed in those periods are the worst (Bouwman *et al.* 2009). In cross-border acquisitions, Baker *et al.* (2009) find that deal volume is positively related to the current aggregated market-to-book ratio of the source country stock market and is negatively related to subsequent market returns.

However, for the Shleifer-Vishny framework, there is a question of why managers prefer stock acquisition to equity issues if the market-timing gains are similar. One explanation is that an acquisition hides market-timing motives from investors more effectively than equity issues do (Baker & Wurgler 2013). Another explanation, investor inertia, suggests that investors passively accept acquirers' shares even when they would not have actively participated in an equity issue (Baker *et al.* 2007); as a result, the price impact of stock-financed acquisitions is much smaller than that of an equity issue.

In terms of the managerial bias explanation of acquisitions, resting on the assumption of strong form efficient market and irrational manager, Roll (1986) outlines hubris theory of takeovers, where the valuation is treated as a random variable whose mean is the current market price of the target. Given only offers in which the valuation is higher than the current target market price, the left tail of the valuation distribution can never be observed. In this case, the takeover premium is a random error made by the bidding firm. The author discusses managerial decisions about takeovers for two scenarios regarding the existence of takeover gain. First, if there is no gain arising from the takeover, but the acquiring managers believe there is, the reason for the bidder's managers to undertake a takeover is that they overconfidently believe that their valuation of the target is correct and that the market is currently undervaluing the target. Second, if gain exists, this hubris explanation can still explain at least part of the takeover phenomenon. Considering the valuation distribution, in the case of no gain, the left tail of the distribution is truncated. In the case of takeover gain, the true mean value is greater than the current market price (the target is being undervalued), which is equivalent to the current market price point moving leftwards relative to the mean value. Therefore, in this case, the fraction of valuation distribution being truncated is smaller than that in the first scenario. However, as long as the probability of the valuation being below the current value is positive, this ‘market price truncation’ occurs, implying that part of the distribution is unobservable, which contributes to the misvaluation by the bidder’s managers. From the perspective of auction, rational bidders take into account the valuation error and the fact that the negative errors have been truncated in the repeated bidding process. In the framework of corporate takeovers, the initial bidder is the market, while the second is the acquirer. If the bidder is rational, it recognizes the winner’s curse and adjusts its valuation downwards. As a result, the bid may be abandoned. However, for irrational bidders, the typical conclusion of auction theory is not valid; in other words, the winning bid is not an accurate assessment of the value. Using an option-based proxy for CEO optimism, Malmendier and Tate (2005) lend support to the CEO overconfidence argument in that overconfident CEOs conduct more acquisitions (especially diversifying deals); the effect of overconfidence is greatest among the least equity-dependent firms, whose managers do not have to evaluate the acquisition against an SEO; and investors are more sceptical of acquisition announcements made by overconfident CEOs.

To study how the psychological characteristics of CEOs of both acquirers and targets can affect the entire takeover process, Aktas *et al.* (2016) construct a measure of narcissism for each CEO in a sample of 146 completed significant deals involving 292 CEOs from 2002 to 2006. Specifically, the narcissism score is calculated as the ratio of first-person singular pronouns to total first-person pronouns in speech recorded in transcripts from 1,780 interviews, following the method advanced by Raskin and Shaw (1988). Furthermore, to ensure that the narcissism score captures factors distinct from CEO overconfidence, the authors also include overconfidence as a control variable, calculated as the number of utterances of confident key words divided by the total number of both confident and non-confident utterances. In the probit estimation, the authors find that the probability of takeover initiation is negatively affected by the acquiring CEO's narcissism score (significant at the 10% level), and the results remain the same when overconfidence is controlled. The negative binomial regression suggests that a higher degree of acquirer CEO narcissism is negatively related to the length of the private takeover process (significant at the 1% level). The authors explain this as narcissists being anxious to reap ego benefits from takeover announcements; thus, they shorten the negotiation process. In terms of the cumulative abnormal returns of the acquirer, the authors find no significant relation between acquirer CEO narcissism and announcement returns, while there is evidence that higher target CEO narcissism is negatively associated with the announcement returns. The authors explain this finding as the market not welcoming narcissistic target CEOs, while the narcissism of acquirer CEOs is not necessarily bad. Finally, both acquirer and target CEO narcissism are negatively related to the likelihood that the target CEO will be offered a prestigious position in the merged firm; however, the estimated coefficient of the interaction term of narcissism of both sides is significantly positive. The authors suggest that when one CEO has a low narcissism score, the high-level narcissism score of the counterpart makes it less likely that the target CEO will obtain a position in the aligned firm; however, when CEOs on both sides are narcissists, this negative effect is offset. Overall, the authors highlight the importance of a new psychological factor affecting the takeover process, and acquirer CEO narcissism does not necessarily destroy firm value.

Baker *et al.* (2012) posit that the valuation process in M&As is subjective and allows the existence of psychological influence due to the perception of the price offered by the acquirer. In particular, the authors argue that anchoring the initial negotiation position as the target's 52-week high price affects multiple characteristics of M&As, namely, takeover premium, deal success, acquirer's announcement returns, and merger waves. Based on a sample of 7,020 M&A deals over the period of 1984 to 2007, the authors find support that anchoring the reflecting point on the target's recent peak price provides an explanation for M&As that is not easily reconciled with traditional theories. First, the simple linear regression shows that offer price increases by 1% for every 10% rise in the target's 52-week high; however, while this finding is statistically significant, it is not economically meaningful. The authors argue that the reason is the effect of large outliers in the independent variable. Therefore, the authors perform piecewise linear regression, which indicates that a 10% increase in the target's 52-week high leads to a 3.3% higher offer price, suggesting that the target uses its recent peak price as an anchor in the negotiation process and requests a higher price. Second, in the probit regression, where the dependent variable equals one if the deal is successful, the estimated coefficients of the variable representing the offer premium being greater than the target's 52-week high range from 0.044 to 0.063, depending on various model specifications, and are all significant at the 1% level. The authors interpret this as the bidder being more likely to revise the offer price when the bid comes in low relative to the target's 52-week high. Third, when the bidder's announcement returns are evaluated, the estimated coefficient in the OLS regression on the offer premium is only -0.04, whereas the estimated coefficient in the IV regression on the offer premium, which is instrumented by the target's 52-week high, is -0.245. The authors explain that investors do not consider a high-offer premium per se as overpayment, since it can reflect synergies in profitable combinations. However, the market reacts negatively to the component of offer price, which depends on the target's reference point. Consequently, the 52-week high is argued to represent overpayment instead of synergies. Finally, the target's 52-week high is a negative predictor of quarterly merger activities, and a current price 10% higher than the 52-week high is associated with an 18% lower merger rate relative to the trend.

There is a possibility that managerial biases affect corporate decisions due to limited governance. The literature suggests that cross-sectional variation in governance should be helpful in identifying the effect. For example, Yermack (1996) finds that smaller boards of directors are related to greater firm value. To explain managerial biases in acquisitions by governance factors, these governance mechanisms need to be exogenous. However, governance is typically endogenous to firm performance (Hermalin & Weisbach 2003; Harris & Raviv 2008). Thus, the literature calls for a methodological improvement to properly account for any factors that can potentially explain managerial biases.

3.3. Literature opportunities & hypotheses development

3.3.1. Literature opportunities

The existing tax literature clearly demonstrates that corporate tax activities have a significant impact on corporate investment decisions such as investment (Hall & Jorgenson 1967; Hartman 1984; Berger 1993), capital structure (Graham & Tucker 2006; Graham & Mills 2008; Huizinga *et al.* 2008), organizational form (Guenther 1992; Ayers *et al.* 1996), M&As (Hayn 1989; Ayers *et al.* 2003; Huizinga & Voget 2009), and executive compensation (Core & Guay 1999; Shackelford & Shevlin 2001; Graham & Mills 2008). In addition, unlike price uncertainty[4], tax policy uncertainty leads to delayed and decreased firm investments (Hassett & Metcalf 1999). Intuitively, considering grey areas in tax law and aggressive tax avoidance, one can reasonably assume that uncertainty regarding corporate tax also exerts an impact on corporate decisions.

Indeed, the prior literature regarding corporate tax risk focuses mainly on two areas. First, tax uncertainty is argued to increase firm risk and decrease market value. For example, Hutchens and Rego (2015) utilize four measures of tax-related uncertainty

[4] For example, studies modelling price uncertainty as positively related to firm-level investment include Abel (1985) and Hartman (1972).

and find a robust positive relation between tax risk and firm risk. Drake *et al.* (2019) report that investors negatively value tax uncertainty and positively value tax avoidance. Others find evidence consistent with these results (McGuire *et al.* 2013; Guenther *et al.* 2017). Second, firms pursuing uncertain tax strategies reserve a greater cash buffer owing to precautionary motives (Hanlon *et al.* 2017). In other words, uncertainty in corporate tax position is a trigger of a firm's precautionary behaviour. Therefore, it is reasonable to assume that tax uncertainty, similar to other precautionary motive determinants such as operating cash flow volatility (Opler *et al.* 1999; Bates *et al.* 2009), can significantly affect a firm's investment outcomes. To this end, unlike previous research that focuses on the effect of taxes on corporate decisions, a recent study documents that tax *uncertainty* has a real effect in determining the timing of large corporate investments and the level of capital investment (Jacob *et al.* 2019): higher tax uncertainty is associated with higher opportunity cost regarding corporate investment, thus leading to a lower probability and level of larger capital expenditure (Jacob *et al.* 2019). However, although tax uncertainty is reported to be a determinant of capital expenditures, the authors do not trace the consequences of the reported opportunity cost associated with a high level of tax uncertainty (Jacob *et al.* 2019). More specifically, how this opportunity cost arises from tax uncertainty affecting shareholder wealth is not explored.

On the other hand, M&As are one of the most important corporate investment activities and are associated with great capital expenditure. The up-to-date literature regarding M&As and tax focuses mainly on the valuation of net operating losses in M&As (Hayn 1989; Erickson 1998), synergies created by tax planning opportunities (Erickson & Wang 2007; Huizinga & Voget 2009), and the relation between M&A pricing and target shareholder taxation (Landsman & Shackelford 1995; Erickson 1998; Ayers *et al.* 2003). However, attention is paid mainly to the target's shareholder taxation, while little light is shed on the role played by the acquirer's tax position. In addition, tax uncertainty is studied merely in the context of M&A pricing, which is the relation between tax uncertainty and the takeover premium (Stomberg 2013), but how the acquirer's shareholders' wealth is affected by tax uncertainty remains undiscovered.

This chapter is designed to fill the gap in the literature by investigating the effect of the acquirer's pre-announcement tax uncertainty on the acquirer's performance. Consequently, this chapter not only identifies a channel through which tax uncertainty has a real effect on corporate investment by employing M&As as a testing instrument but also adds to the M&A literature by providing insights into how taxation affects shareholder wealth from the acquirer's perspective.

3.3.2. Hypotheses development

Prior research regarding tax uncertainty yields several results. First, tax uncertainty is argued to have a negative relation with a firm's market value (Drake *et al.* 2019). Second, tax uncertainty is found to increase firm risk (Hutchens & Rego 2015). Third, tax uncertainty gives rise to managers' precautionary behaviour (Hanlon *et al.* 2017; Jacob *et al.* 2019). Overall, it is clear that firm-level tax uncertainty has a real effect on corporate investment and firm value. However, the literature gap is that no channel through which tax uncertainty affects shareholder wealth has been identified. Since M&As are important corporate investment events associated with large capital expenditures, this chapter chooses them as a testing instrument to determine whether tax uncertainty has a significant impact on shareholder wealth through acquisitions. There are two reasons to choose M&As. First, taxation per se clearly plays a significant role in merger benefits (Hayn 1989; Erickson 1998), merger motivations (Erickson & Wang 2007; Huizinga & Voget 2009), and merger pricing (Landsman & Shackelford 1995; Ayers *et al.* 2003); however, few studies pay attention to the effect of acquirers' taxation on M&As. Second, while the aforementioned discussion highlights the meaningful consequences of tax uncertainty on corporate investment, how tax uncertainty affects M&A outcomes remains undiscovered. One exception is Stomberg (2013), who studies how a target's tax uncertainty affects the takeover premium. Therefore, this chapter aims to fill this gap by examining how the acquirer's tax uncertainty affects the acquisition outcomes, hence shedding light on how the acquirer's shareholder wealth is affected by its taxation and identifying a channel through which tax uncertainty has a real effect on corporate investment.

The following three hypotheses are proposed. First, since tax uncertainty is demonstrated to have a significant negative impact in determining the level and timing of corporate capital expenditure (Jacob *et al.* 2019), it is reasonable to suspect that tax uncertainty can reduce the probability of a firm initiating an acquisition. This logic can also be formalized differently from the perspective of corporate cash reserves. The prior literature suggests an association between the probability of initiating an acquisition and the cash reserve. According to Harford (1999), in a probit model used to study the determinants of a firm's probability of engaging in an acquisition, the coefficient estimate of cash deviation is 1.061 (significant at the 1% level), suggesting that the probability of initiating acquisitions is significantly determined by corporate cash reserves. In addition, it is reported that firms with higher tax uncertainty reserve more cash for precautionary purposes (Hanlon *et al.* 2017), which will make them invest the free cash flow more efficiently and prudently (Keynes 1937; Almeida *et al.* 2004; Han & Qiu 2007; Riddick & Whited 2009). Consequently, it is possible that a firm facing high tax uncertainty will hold more cash and be less likely to initiate acquisitions due to the precautionary motive of the manager. Either way, the following hypothesis is proposed.

H1: The probability of being an acquirer is negatively associated with the acquirer's pre-announcement tax uncertainty.

Second, cash reserves are argued to be positively related to tax uncertainty (Hanlon *et al.* 2017). Specifically, the estimated coefficients of tax uncertainty in regressions in which the dependent variable is cash-to-assets ratio are 0.741, 0.507, and 0.983 for overall, international, and U.S. domestic samples, respectively, and are all significant at the 1% level (Hanlon *et al.* 2017). Furthermore, the estimated coefficients of lagged tax uncertainty in regressions in which the dependent variable is the change in cash-to-assets ratio are 0.558 (significant at the 1% level), 0.572 (significant at the 1% level), and 0.589 (significant at the 10% level) for overall, international, and U.S. domestic samples, respectively (Hanlon *et al.* 2017).

On the other hand, previous studies document a significant relation between cash reserves and acquisitions. Most studies are consistent with the free cash flow hypothesis advanced by Jensen (1986), which posits a negative relation between the acquirer's corporate cash reserve and the acquisition returns. For example, according to Harford (1999), the coefficient estimates of the cash deviation (degree of cash reserves) of unexpected bidders are all negative, ranging from -11.1% to -20.8%, and significant at least at the 5% level. Consistently, focusing on successful tender offers from 1968 to 1980, Lang *et al.* (1991) report a significant negative relation between the bidder's return and free cash flow for low-q firms that is robust to 10 alternative proxies of cash flow derived from working capital, operating income, and net income plus depreciation. Employing the same proxies of cash holdings over the period of 1976 to 1986, McCabe and Yook (1997) find that cash bidders with a low Tobin's q and a large free cash flow that reinvest a high percentage of that cash flow earn positive abnormal announcement returns; however, cash bidders without such a free cash flow are indistinguishable from stock bidders in terms of announcement returns.

Schlingemann (2004), also focusing on cash transactions, confirms the negative relation between bidder gains and free cash flow, particularly for firms with poor investment opportunities, over the period from 1984 to 1998. Freund et al. (2003) report evidence consistent with these findings. However, contradictory evidence exists. For example, Smith and Kim (1994) find that acquisitions in which high-free cash flow bidders acquire targets with poor financial slack provide the highest return to bidders, targets, and the combined firms. More recently, cash-rich acquirers have been found to significantly outperform others in unpredicted acquisitions (Gao & Mohamed 2018), suggesting that acquirers with high cash reserves due to precautionary motives perform acquisitions that enhance shareholder wealth.

Previous studies highlight the explanatory power of precautionary theory in cash reserves' positive impact on acquirers' performance in acquisitions (Gao & Mohamed 2018), as well as in the positive relation between tax uncertainty and corporate cash reserves (Hanlon *et al.* 2017). Since the aim of this chapter is to investigate the role the acquirer's pre-announcement tax uncertainty plays in its post-announcement performance, it is suspected that tax uncertainty can have a positive effect on the acquirer's performance through its precautionary effect on corporate cash holdings.

H2: The acquirer's announcement abnormal returns are positively related to its pre-announcement tax uncertainty.

Third, it has been extensively documented that the bidder's announcement returns are manifested in its subsequent operating performance. According to Harford (1999), who argues that cash reserves have a negative effect on an acquirer's short-run announcement performance, the coefficients accounting for change in abnormal operating performance range from -2.0% (significant at the 1% level) to -0.9% (non-significant) for cash-rich firms depending on various matching criteria. This suggests that the market's negative evaluation of acquisitions made by cash-rich firms is realized at least partially through post-merger operating performance. Later, given asset purchase data from 1984 to 1996, Freund *et al.* (2003) use operating free cash flow scaled by the book value of assets as a proxy for free cash flow and pre-tax operating cash flow over the book value of total assets as a proxy for operating performance. The authors find that changes in operating performance are negatively related to the amount of free cash flow, with a more pronounced effect for asset purchasers with poor growth opportunities. On the other hand, the increase in combined value subsequent to bank mergers is realized mainly through cost savings (Houston *et al.* 2001). Similarly, the positive announcement returns to financially constrained unpredicted acquirers are manifested by positive post-announcement operating performance (Gao & Mohamed 2018). Since this chapter hypothesizes that the acquirer's tax uncertainty is positively related to its short-run announcement abnormal returns, the third hypothesis is proposed as follows.

H3: The acquirer's post-announcement operating performance is positively *related to its pre-announcement tax uncertainty.*

3.4. Data & Methodology

3.4.1. Sample selection

In this chapter, the U.S. M&A data will be obtained from the Thomson One database for the period from 1 January 1985 to 31 December 2017. In addition, the following criteria will be imposed:

1) The bidding company must be a publicly traded firm and included in the Center for Research in Security Prices (CRSP) and Compustat database so that the financial and accounting information required for analysis in this chapter can be obtained.
2) The target firms include those with public, namely, government owned, and those with investor, joint venture, mutually owned, public, private, subsidiary, and unknown status.
3) The deal value must exceed $1 million.
4) The deal must be completed.
5) The bidder must own more than 50% of the target upon deal completion.
6) All acquisition techniques are considered, namely, going private, leverage buyout, management buyout, management buy-in, liquidation, recapitalization, self-tender, spinoff, re-purchase, bankruptcy acquisition, exchange offer, and privatization.

7) Both acquirers and targets from the financial industry and energy and power industry are omitted.

There are a total of 28,758 deals over the sample period, and this amount decreases to 8,995 when the above filters are imposed. Table 3.1 summarizes descriptive statistics of the final sample.

[Insert Table 3.1 here]

Table 3.1 provides descriptive statistics of acquirer and deal characteristics. In terms of acquirer characteristics, it is evident that firms with high pre-announcement tax uncertainty have significantly higher Tobin's q than their peers with low pre-announcement tax uncertainty. Since tax expense is informative regarding earnings management (Dhaliwal *et al.* 2004; Gleason & Mills 2008) and Tobin's q is a proxy for managerial performance (Lang *et al.* 1989), this chapter suggests that higher volatility in earnings management is associated with better managerial performance, implying that volatility in tax expense can be attributed to managers' active engagement in earnings management through discretion in tax expense. In addition, firms with higher per-announcement tax uncertainty have significantly lower leverage ratio, operating performance, and firm size.

In terms of deal characteristics, firms with higher pre-announcement tax uncertainty are more likely to use stock as the sole payment method in a deal and are more likely to engage in friendly acquisitions. In contrast, they are less likely to pay with 100% cash; engage in hostile, diversifying or competing deals; acquire public targets; and initiate tender offers. These findings are largely consistent with the precautionary explanation of tax uncertainty (Hanlon *et al.* 2017) in that bidders with high tax uncertainty are less likely to be affected by factors decreasing the acquirer's gain. For example, public targets are associated with liquidity premiums (Fuller *et al.* 2002), hostile deals are associated with negative cumulative abnormal returns to the acquirer (Mitchell & Lehn 1990; Servaes 1991), competing acquisitions decrease the bidder's value (Agrawal & Jaffe 2003), and a conglomerate discount is discovered in acquisitions (Graham *et al.* 2002; Custodio 2014).

3.4.2. Tax uncertainty measures

In the empirical finance literature, the uncertainty measure is normally constructed by dividing the volatility of the target variable by its average value over the same measurement period, for example, stock return uncertainty, operating return uncertainty, and cash flow uncertainty (Kim & Sorensen 1986; Albrecht & Richardson 1990; Minton & Schrand 1999; Han & Qiu 2007; Chay & Suh 2009). Accordingly, the tax uncertainty measures employed in this chapter are constructed in the same spirit. This chapter constructs a measurement based on tax expense variables. The reason is that tax expense has been clearly identified by the literature as reflecting earnings quality (Phillips *et al.* 2003) and earnings management (Maydew 1997; Dhaliwal *et al.* 2004; Gleason & Mills 2008). On the other hand, while volatility in the effective tax rate (ETR) is argued to make managers behave more precautionarily and make corporate decisions accordingly (Hanlon *et al.* 2017; Jacob *et al.* 2019), the basement used to calculate tax uncertainty in those studies, which is ETR in various forms, cannot fully capture firm risk (Hasan *et al.* 2014; Guenther *et al.* 2017; Isin 2018). Consequently, given that volatility in cash flow can trigger precautionary behaviour (Opler *et al.* 1999; Bates *et al.* 2009), a volatility measure based on tax expense per se is also suitable for the examination of the precautionary motive in the decision-making process. Furthermore, the employment of tax expense instead of ETRs to construct a tax uncertainty measurement can shed light on the role played by firms' fundamental factors (i.e., earnings) in this process.

Three measures of tax uncertainty are used in this chapter. First is cash tax paid uncertainty (hereafter *TXPDU*), which is calculated as the volatility of annual cash tax paid over a three-year period prior to the acquisition announcement date scaled by the absolute value of the mean of annual cash tax paid over the same period. The reason for using cash tax paid is that it has been widely used to calculate volatility in the effective tax rate in the empirical accounting literature (McGuire *et al.* 2013; Guenther *et al.* 2017; Saavedra 2019). Specifically, firm i's *TXPDU* at year t is calculated as

$$TXPDU_{it} = \frac{\sqrt{[\sum_{t=1}^{N}(Cash\ tax\ paid_{it} - Avg.Cash\ tax\ paid_i)^2]/N}}{abs\left[\frac{1}{N}(\sum_{t=1}^{N} Cash\ tax\ paid_{it})\right]} \tag{3.1}$$

where N is the number of years of the calculation period, which is 3 in this case. For robustness check purposes, *TXPDU* is also calculated over a 5-year period prior to the acquisition announcement, in which case $N = 5$.

Second, a proxy of tax uncertainty derived from another measure of tax avoidance that has a potential impact on accounting earnings and is computable by taxation jurisdiction (Hanlon & Heitzman 2010) is employed, namely, current income tax uncertainty (hereafter *TXCU*). Specifically, it is the volatility of annual current income tax expense over a three-year period prior to the acquisition announcement date scaled by the absolute value of the mean of annual current income tax expense over the same period. It is calculated as

$$TXCU_{it} = \frac{\sqrt{[\sum_{t=1}^{N}(Current\ income\ tax_{it} - Avg.Current\ income\ tax_i)^2]/N}}{abs\left[\frac{1}{N}(\sum_{t=1}^{N} Current\ income\ tax_{it})\right]} \quad (3.2)$$

where N is the number of years of the calculation period, which is 3 in this case. For robustness check purposes, *TXCU* is also calculated over a 5-year period prior to the acquisition announcement, in which case $N = 5$.

Third, the above two measures of tax avoidance, namely, cash tax paid and current income tax expense, both reflect firm deferral strategies and do not necessarily have an impact on accounting earnings (Hanlon & Heitzman 2010). Therefore, another measure of tax uncertainty based on a complementary indicator of tax avoidance, total income tax, is chosen. Specifically, *TXTU*, which is the volatility of annual GAAP total income tax expense over a three-year period before the acquisition announcement date scaled by the absolute value of the mean of annual GAAP total income tax expense over the same period, is calculated as

$$TXTU_{it} = \frac{\sqrt{[\sum_{t=1}^{N}(Total\ income\ tax_{it} - Avg.Total\ income\ tax_i)^2]/N}}{abs\left[\frac{1}{N}(\sum_{t=1}^{N} Total\ income\ tax_{it})\right]} \tag{3.3}$$

where N is the number of years of the calculation period, which is 3 in this case. For robustness check purposes, *TXTU* is also calculated over a 5-year period prior to the acquisition announcement, in which case $N = 5$.

Finally, this chapter notes that the accounting literature suggests uncertain tax benefit (hereafter UTB) as a measure of tax uncertainty following the FIN 48 disclosure requirement (Hanlon *et al.* 2017). The reason is that firms currently generate tax benefit by engaging in tax avoidance activities; however, this benefit could be disallowed by taxation authority. Therefore, the firm records UTB as a potential liability to account to the taxation authority for additional tax payment in case the tax benefit is disallowed. Empirically, UTB is found to be informative of firms' tax sheltering (Lisowsky *et al.* 2013). Thus, this chapter employs the beginning balance of UTB scaled by the firm's total assets as a measure of tax uncertainty, following (Hanlon *et al.* 2017), and uses the ending UTB balance divided by the firm's total assets for robustness check purposes.

However, this measure of tax uncertainty is not used as an empirical proxy in this chapter for several reasons. One is that UTB is not available on Compustat until 2007, which significantly reduces the acquirer sample size. The other is that UTB is potentially upwards biased since the firm is required to assume that the tax authority knows each uncertain tax position taken by the firm (Hanlon *et al.* 2017). Another potential problem that may affect the quality of UTB data is that Compustat occasionally reports UTB as missing when there is actually recorded data (Lisowsky *et al.* 2013). Overall, the empirical taxation studies have not addressed UTB as a reliable measure (Hanlon & Heitzman 2010; De Simone *et al.* 2014), and UTB's relation with other firm characteristics has yet to be explored (Robinson *et al.* 2015; Ciconte *et al.* 2016a).

3.4.3. Empirical methods

3.4.3.1. H1

To test H1, the cumulative distribution function of the logit model used is

$$P(i,t) = 1/\left[1 + e^{-\beta \cdot x(i,t)}\right] \quad (3.4)$$

where $P(i,t)$ is the probability of firm i being an acquirer in year t, and $x(i,t)$ is the vector of control variables measured for firm i identical to those used in the following OLS regressions for H2 and will be defined in the next section. For robustness purposes, the probit model is also carried out to test H1.

3.4.3.2. H2

First, univariate analysis is carried out to compare cumulative abnormal returns (CARs) and other acquirer and deal characteristics between issuers with high and low tax uncertainty. The tax uncertainty level is defined relative to the sample median. For every variable, the difference between acquirers with high and low tax uncertainty will be calculated, and a significance test will be conducted on the calculated difference.

Second, the cross-sectional ordinary least square (OLS) regression is carried out to test H2, which is constructed as follows.

$$CAR_i = \alpha + \beta_1 \cdot Tax\ Uncertainty_i + \lambda \cdot Controls_i + \varepsilon_i \qquad (3.5)$$

where $Tax\ Uncertainty_{i_i}$ represents the tax uncertainty of firm i and $Controls_i$ represents the control variables for each sample firm. As in most M&A studies, the dependent variable is the 3-day cumulative abnormal returns to the issuers over the announcement period, denoted hereafter as CAR [0, +1]. Specifically, CAR is derived as follows. The short-run nominal return R_{it} of issuer i is calculated by daily data as

$$R_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right) \tag{3.6}$$

where P_t is firm i's share price at time t. The market-adjusted abnormal returns of firm i (Brown & Warner 1985) are determined within the three-day event window (-1, +1) as

$$AR_{it} = R_{it} - R_{mt} \tag{3.7}$$

where R_{mt} is the normal market return, calculated by the daily Standard & Poor's 500 index, where the market parameters are estimated from daily data over the window [-365, -28] relative to the announcement date. The CAR is the summation of abnormal returns over the event window:

$$CAR_{it} = \sum_{i=1}^{n} AR_{it} \tag{3.8}$$

Two sets of variables are controlled. First, a set of variables accounting for acquirer characteristics is considered. Maloney *et al.* (1993) find that the bidder's post-announcement returns are positively associated with the bidder's leverage and suggest that the reason is that the disciplinary effect posited by debt mitigates the negative effect suggested by the free cash flow hypothesis. However, the cash effect is found to be different from the leverage effect since leverage, although positive, has no significant impact on the bidder's post-announcement returns (Harford 1999). On the other hand, a study finds that the acquirer's post-announcement returns are negatively related to leverage (Gao & Mohamed 2018). Consequently, *Leverage* is added to the regression as a control variable and is calculated as the ratio of total debt, which is long-term debt plus current debt, to total shareholder equity. In addition, *M/B*, which is the market-to-book value calculated four weeks before the announcement, is controlled to account for the valuation effect. Pre-announcement operating performance is also documented to have a significant impact on the acquirer's short-run post-announcement returns; therefore, *Operating profit*, which is calculated as operating income before depreciation scaled by total assets four weeks prior to announcement, is considered. Following the argument that the acquirer's market value and deal value can explain a significant portion of post-announcement returns (Black *et al.* 2015), both *Bidder size*, which is the acquirer's market value measured four weeks before the deal announcement, and *Deal value* are included.

Second, along with *Deal value*, a series of deal characteristics is controlled. The form of payment is argued to have a significant effect on post-announcement returns; for example, Harford (1999) find that the coefficients of the variable representing all cash payments are all significant and positive. Other studies find that stock payment has a significantly negative effect on long-run bidder performance (Andrade *et al.* 2001; Oler

2008), or at least in conventional CARs, without purging the signalling effect of acquisitions (Golubov *et al.* 2016). Thus, two dummy variables, *Cash* and *Stock*, are examined. *Cash* takes the value of one if the deal is 100% paid in cash and zero otherwise. Similarly, *Stock* takes the value of one if the deal is 100% paid in stock and zero otherwise. The public status of targets is reported to have a significant impact on the acquirer's post-announcement returns (Fuller *et al.* 2002; Moeller 2005); thus, the dummy variable *Public target* is assigned the value of one if the target firm is publicly listed. The dummy variable *Competing bid* takes the value of one if the deal has more than one bidder in the wake of its reported negative impact on CARs (Agrawal & Jaffe 2003). In terms of the significant role of acquisition attitudes (Mitchell & Lehn 1990; Servaes 1991), two dummy variables are constructed. *Friendly* and *Hostile* are assigned the value of one if the deal is classified as friendly or hostile, respectively. Given that a tender offer is documented to have a positive impact on the acquirer's post-announcement returns (Rau & Vermaelen 1998; Agrawal & Jaffe 2003), the dummy variable *Tender offer* takes the value of one if the deal is a tender offer and zero otherwise. Following the argument that diversifying acquisition provides the acquirer with negative abnormal returns (Gao & Mohamed 2018) and related acquisitions outperformance (Seth 1990), the dummy variable *Diversify* takes the value of one if the acquirer took over a target in a different industry.

3.4.3.3. H3

Three operating performance measurements are used in this study: operating income before depreciation scaled by total assets (OP1), operating income after depreciation scaled by total assets (OP2), and ROA calculated as net income divided by total assets.

First, univariate analysis is carried out to compare the operating performance and other acquirer and deal characteristics between acquirers with high and low tax uncertainty. The tax uncertainty level is defined relative to the sample median. For every variable, the difference between acquirers with high and low tax uncertainty will be calculated, and a significance test will be conducted on the calculated difference.

Second, to study the relation between the acquirer's pre-announcement tax uncertainty and its post-announcement operating performance, the OLS methodology of Gao and Mohamed (2018) is followed to reveal cross-sectional implications:

$$OP_i^{Post} = \alpha + \beta_1 \cdot OP_i^{Pre} + \beta_2 \cdot HighTaxU_i + \varepsilon_i \tag{3.9}$$

In the regression, OP_i^{Post} and OP_i^{Pre} are operating performance measures of firm i for the post- and pre-announcement periods, respectively. Specifically, OP_i^{Post} is the 12-month post-announcement operating performance measured by various operating performance variables defined as in the previous section. On the other hand, two different measurements of OP_i^{Pre} are employed. Due to the availability of data for the target firms, these two measurements concern the firm characteristics of the acquirers incorporated into the pre-announcement operating performance. Specifically, OP_i^{Pre} is measured by the 12-month pre-announcement operating performance of the acquirers and the average of the first and second fiscal year operating performance of the acquirers prior to the announcement. These two measurements of OP_i^{Pre} reduce the sample sizes to 8,669 deals and 7,593 deals, respectively.

Furthermore, to better understand how deal and firm characteristics affect post-announcement operating performance, as well as the role played by tax uncertainty, another set of OLS regressions is performed following the specification below:

$$OP_i^{Post} = \alpha + \beta_1 \cdot Tax\ Uncertainty_i + \lambda \cdot Controls_i + \varepsilon_i \tag{3.10}$$

where OP_i^{Post} is defined as in the above paragraph. Deal characteristics controlled are cash payment dummy, stock payment dummy, public target dummy, multiple bidders dummy, acquisition attitude dummies, diversification dummy, and deal value. Firm characteristics controlled are market-to-book ratio, firm leverage, Tobin's q, and bidder size.

3.4.3.4. Endogeneity

The potential endogeneity inherent in the main independent variable may cause biased estimates (Heij *et al.* 2004; Verbeek 2008; Wooldridge 2015); however, empirical evidence has shown that two-stage least square (2SLS) can correct this problem (Boudoukh & Richardson 1993). Therefore, this chapter follows the 2SLS method by identifying appropriate instrumental variables for proxies of tax uncertainty.

A possible link between tax uncertainty and tax avoidance behaviour exists, according to the accounting literature. The underlying theory is the income tax evasion model developed by Allingham and Sandmo (1972), where the core determinant of evasion amount attempted is the tax payer's risk aversion, and equilibrium evasion is the point at which the marginal gain from expected tax savings is exactly offset by the marginal uncertainty due to evasion. Consequently, the company will choose the tax evasion that is more likely to be sustained to reduce the associated uncertainty (Slemrod & Yitzhaki 2002). This model is empirically supported by examining the relation between tax enforcement and a firm's tax avoidance behaviour (Hoopes *et al.* 2012). A recent study provides direct evidence that tax avoidance behaviour is positively related to tax uncertainty (Dyreng *et al.* 2018).

In addition, the literature identifies three channels explaining how tax avoidance can affect a firm's tax uncertainty. First, firms employing an intangible asset-based tax avoidance strategy can avoid tax by shifting income from high-tax to low-tax jurisdictions (Grubert & Slemrod 1998). For example, they can address intangible assets in low-tax jurisdictions but charge royalties to affiliates in high-tax jurisdictions (Kleinbard 2011; De Simone *et al.* 2016). The considerable complexity in the application process creates tax uncertainty, which is the cost the firm must bear to save tax (Dyreng *et al.* 2018). Second, multinational firms always avoid tax by locating subsidiaries in tax haven countries to shift income across jurisdictions via inter-company debt or leasing arrangements (Klassen & Laplante 2012), and possible challenges by authorities create uncertainty (Dyreng & Markle 2016). Third, the usage of complex tax shelters also increases tax uncertainty. Based on the tax shelter measurement of aggressive tax planning (Wilson 2009; Lisowsky 2010), firms that have engaged in tax shelters have significantly higher unrecognized tax benefit (Lisowsky *et al.* 2013), which is argued to be a kind of tax uncertainty.

Therefore, the empirical association between tax avoidance and tax uncertainty makes tax avoidance an ideal instrumental variable for tax uncertainty. The prior literature mainly proxies tax uncertainty by UTB, which is different from the tax uncertainty measures used in this chapter. Therefore, considering that the tax uncertainty measurement in this chapter is the mean-scaled volatility of tax expense over a certain period, this chapter employs the rolling standard deviation of cash ETR scaled by the average cash ETR over the same period, which is contemporaneous with the period used to calculate tax uncertainty. This is measured as the rolling standard deviation of tax expense over various pre-announcement periods as an instrumental variable. The cash ETR for the firm is calculated as follows.

$$Cash\ ETR_i = \frac{Cash\ taxes\ paid_i}{Total\ pre - tax\ accounting\ income} \tag{3.11}$$

Specifically, to instrument 3- and 5-year tax uncertainty, 3- and 5-year rolling standard deviations of cash ETR are employed and are deflated by the mean value of the cash ETR of each corresponding period.

3.5. Results

3.5.1. H1

3.5.1.1. Logit and probit regressions

The results of the logit estimation are shown in Table 3.2. The dependent variable is a dummy variable that takes the value of one if the bidding firm announces at least one bid in a given year and zero otherwise. The core independent variable, namely, *Tax uncertainty*, is the three long-term proxies defined in the previous section.

[Insert Table 3.2 here]

The results of the estimated coefficients of *Tax uncertainty* lend support to the argument in H1 that the likelihood of initiating an acquisition is negatively related to the acquirer's pre-announcement tax uncertainty, given that all coefficient estimates are negative and significant at the 1% level in Models (2) and (3). It is argued that this finding is consistent with prior studies. According to the precautionary explanation of tax uncertainty advanced by Hanlon *et al.* (2017), firms facing higher tax risk tend to behave precautionarily due to potential future cash outflows charged by tax authorities. Then, motivated by this precautionary concern, managers will perform more carefully and efficiently (Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009), as reflected by the reduced likelihood of engaging in acquisitions. Similarly, the finding is consistent with the recent finding that tax uncertainty has a real effect on corporate decisions in that it makes the firm delay or reduce large capital expenditures (Jacob *et al.* 2019).

In terms of control variables, the estimated coefficients of *Cash*, *Stock*, *Diversify*, *Deal value*, and *Operating profit* are all consistently positive and significant at the 1% level in the three model specifications; the estimated coefficients of *Public target*, *Hostile*, and *Tender offer* are also positive but statistically non-significant. In contrast, the estimated coefficients of *M/B* are negative and highly significant (all at the 1% level) in the three models, while the estimated coefficients of *Tobin's q* are negative but statistically non-significant. The findings suggest that the payment method (100% cash and 100% stock), higher operating rate of return, larger deals, and public targets in an unrelated industry are positively associated with the probability of a firm initiating an acquisition. On the other hand, a higher market-to-book ratio and higher managerial performance, as reflected in Tobin's q, are negatively related to this probability, while the latter does not play a significant role. Notably, the finding that operating profit has a positive impact on the firm's likelihood of engaging in an acquisition is consistent with Asquith (1983) and Roll (1986), supporting hubris theory, while the negative relation between market valuation (*M/B*) and acquisition likelihood is somewhat inconsistent with the market-timing explanation of acquisition (Shleifer & Vishny 2003). Finally, a leverage effect is detected in the determination of acquisition probability, given that the estimated coefficients of *Leverage* are all positive and significant at various levels across the three model specifications.

Probit regressions are performed using the same set of dependent and independent variables as that used in the logit test, and the results are reported in Table 3.3.

[Insert Table 3.3 here]

The estimated coefficients of *Tax uncertainty* are all negative across the three model specifications, while two of them are significant at the 1% level. The results are consistent with those obtained in the logit regressions and lend support to H1 in that the acquirer's pre-announcement tax uncertainty is negatively related to its probability of engaging in an acquisition bid. The estimated coefficients of the other independent variables remain unchanged from those in the logit regressions; the only exception is that *Tobin's q* gains 10% in its level of significance in Model (1).

3.5.1.2. Robustness tests

For robustness purposes, this chapter re-performs both logit and probit regressions by using tax uncertainty measures calculated over the alternative pre-announcement period, namely, the 5-year period. Tables 3.4 and 3.5 present the outcomes of the logit and probit regressions, respectively.

[Insert Table 3.4 here]

[Insert Table 3.5 here]

Basically, the results obtained in the previous regressions remain robust to the employment of a 5-year calculation period of tax uncertainty. Notably, in Model (1), for both the logit and probit regressions, there is a dramatic increase in the significance level of the estimated coefficient of *Leverage*, implying a stronger leverage effect.

3.5.2. H2

3.5.2.1. Univariate analysis

[Insert Table 3.6 here]

In Panel A, acquirers with higher tax uncertainty, measured by cash tax paid, earn CARs that are higher by as much as 0.3% around the announcement date than those of their peers with lower tax uncertainty, and this superior performance is significant at the 5% level. In Panel B, where tax uncertainty is calculated based on current income tax, firms with higher tax uncertainty experience 0.6% (significant at the 1% level) higher CARs than those with low tax uncertainty. In Panel C, the evidence is consistent, as acquirers with high tax uncertainty earn on average 0.2% higher CARs than those with low tax uncertainty when tax uncertainty is proxied by total income tax measurement.

3.5.2.2. Multivariate analysis

The univariate analysis in the previous section appears to support H2; however, it is essential to assess the cross-sectional relation between the acquirer's cumulative abnormal returns surrounding the announcement and other deal and firm characteristics. Therefore, multivariate analysis is conducted to reveal these relations. Table 3.7 reports the results from the OLS regressions that are specified in Section 4.

[Insert Table 3.7 here]

The results indicate that the acquirer's pre-announcement tax uncertainty is positively associated with its cumulative abnormal returns around the announcement, as is evident in the positive and significant estimates of coefficients across Models (1) to (3). Specifically, the estimated coefficients of tax uncertainty proxies vary from 0.0008 to 0.0017 across Models (1) to (3) and are all highly significant (two at the 1% level and one at the 5% level). Overall, this chapter confirms a significantly positive relation between the acquirer's short-run announcement gain and its pre-announcement tax uncertainty, which lends direct support to the notion in H2. This chapter explains the following aspects of this finding.

First, the positive relation is consistent with the argument that tax uncertainty is an opportunity cost of corporate investment when making capital expenditure decisions (Jacob *et al.* 2019). As a result, it is hereby suggested that when facing a high opportunity cost of corporate investment, as reflected in high tax uncertainty, the management will choose only those investment projects that can provide a sufficiently high rate of return to compensate for this high opportunity cost. In the context of M&As, these more profitable projects exist in the form of deals providing higher cumulative abnormal returns to the acquirer. Further, from the perspective of the aggregated level, the average CARs of the sample deals are also positive, by as much as 1%, as is evident in Table 3.6, and this level is arguably economically significant. Overall, this finding responds to the call for an investigation of the consequences of corporate investment opportunity costs in Section 3 by identifying a channel through which tax uncertainty has a real effect on shareholder wealth, more specifically, through acquisitions.

Second, it is documented in the prior literature that tax uncertainty captures firm risk as perceived by capital market participants (Hutchens & Rego 2015). For example, investors are found to negatively value tax uncertainty since they believe higher risk is involved in higher tax uncertainty, and this negative valuation even moderates the original positive valuation of benefits associated with tax avoidance (Drake *et al.* 2019). Other consistent evidence includes the findings of McGuire *et al.* (2013) and Guenther *et al.* (2017). Therefore, this chapter suggests that the positive relation reported between the acquirer's pre-announcement tax uncertainty and CARs reflects the market's compensation for the business risk borne by the acquirer.

Third, the above two arguments are under the traditional risk-and-return framework; however, behavioural explanations also exist. Specifically, this chapter suggests that tax uncertainty serves as a precautionary factor that motivates management to invest more prudently and efficiently. This suggestion is consistent with a recent accounting study that also indicates a potential channel for realizing the precautionary effect of tax uncertainty. Namely, Hanlon *et al.* (2017) confirm that managers accumulate a larger cash buffer in the wake of precautionary motivation generated by high tax uncertainty, while volatile earnings quality could be the underlying factor triggering precautionary concern. Since the firm's earnings quality is reflected by tax expense (Phillips *et al.* 2003), which is used to calculate tax uncertainty in this chapter, the uncertainty in tax expense captures the volatility in earnings quality. Furthermore, a high cash reserve could lead to the acquirer's better announcement performance in acquisitions because of the manager's precautionary behaviour (Gao & Mohamed 2018) or under other circumstances, such as a high reinvestment percentage of free cash flow (McCabe & Yook 1997) and when acquiring targets with poor financial slack (Smith & Kim 1994).

Fourth, this chapter develops a novel explanation that has not been documented in previous studies. Similar to the finding for the syndicated loan market (Saavedra 2019), the positive relation between the acquirer's pre-announcement tax uncertainty and its announcement gain indicates that tax uncertainty is incrementally informative of other priced factors in the M&A market, suggesting that tax uncertainty per se is understood by the market. Then, the question becomes what the tax uncertainty per se is informative of. Past studies confirm that tax expense is a result of earnings management for purposes such as meeting analysts' consensus forecasts (Dhaliwal *et al.* 2004; Gleason & Mills 2008). This chapter suggests that volatility in tax expense represents the quality of earnings management or managerial activity in terms of managing earnings to satisfy outside circumstances, such as meeting analysts' forecasts, reducing the likelihood of violating lending agreements, or avoiding regulatory intervention (Healy & Wahlen 1999). Specifically, the more volatile the tax expense is, the more actively the management engages in earnings management. Consequently, the positive association found between the acquirer's pre-announcement tax uncertainty and its announcement CARs implies that the acquirer is rewarded by active earnings management during the pre-announcement years and that the market positively values this earnings management through the acquisition announcement. While earnings management per se can sometimes be valued negatively by the market as a signal that managers are attempting to mislead the market by exploiting investors' naive extrapolation of earnings disclosures (Teoh *et al.* 1998a; Teoh *et al.* 1998b; Teoh *et al.* 1998c), this active engagement may be positively valued as an indicator of managerial capability. This is also consistent with the theory that investors ignore relevant earnings information and fail to react fully to earnings management behaviours until an event injects new information regarding future earnings (Sloan 1996). In this case, the acquisition may prophesy future elevated earnings.

The control variables also provide important findings. First, the use of 100% cash as the payment method is positively related to the acquirer's announcement returns, given that the estimated coefficients of *Cash* are all positive and significant at the 5% level across the three specifications. This is consistent with a number of previous findings; for example, the use of cash in acquisitions is positively associated with returns to the combined new entity (Servaes 1991) and to bidders (Travlos 1987; Harford 1999, 2005). The agreed-upon explanation is that using cash signals the acquirer's strong financial condition to the market. In contrast, the use of 100% stock as the payment medium is negatively related to the acquirer's announcement returns since the estimated coefficients of *Stock* are all negative in the three specifications and are all significant at the 10% level. This finding also gains support from prior research, such as stock-funded deals underperforming in comparison to cash-funded deals (Harford 2005) and stock payment being negatively related to the acquirer's announcement (Datta *et al.* 1992; Andrade *et al.* 2001), at least when the equity issuance signalling effect involved in the acquisition announcement is not purged (Golubov *et al.* 2016).

Second, the estimated coefficients of *Public target* are negative and significant at the 1% level across all three specifications, implying that acquiring a publicly listed target destroys the acquirer's announcement gain. This negative association is consistent with previous findings that buying public targets is significantly related to the bidder's negative returns in large-loss deals (Moeller *et al.* 2005). In addition, Fuller *et al.* (2002) document a negative relation between public targets and CARs and argue that this can be explained by the liquidity effect. Since public targets have greater attractiveness granted by open market trade, more feedback provided by professional arbitrageurs taking advantage of the disclosure requirement for public companies, and higher negotiation leverage entailed by larger firm size, acquirers can gain at best zero announcement returns for paying this 'liquidity premium' in acquiring public targets (Fuller *et al.* 2002).

Third, the estimated coefficients of *Tender offer* are all positive and significant at the 1% level in the three model specifications. This implies that deals in the form of tender offers provide acquirers with higher announcement returns, which is consistent with the prior literature in that tender offers provide higher bidder returns (Agrawal & Jaffe 2003) and outperform mergers regardless of whether the bidder is a glamour or value firm (Rau & Vermaelen 1998).

Fourth, the estimated coefficients of *Leverage* vary from 0.0075 to 0.0078 across the three model specifications and are all significant (or marginally significant) at the 1% level. This finding confirms a positive leverage effect in the acquirer's announcement returns, which is in line with the findings of Song and Walkling (2000) and Moeller *et al.* (2005); however, other studies, such as Harford (1999), also found leverage to be non-significant in determining the acquirer's announcement returns.

Finally, the estimated coefficients of *Bidder size* are all negative and significant at the 1% level in the three model specifications. This suggests that larger bidders suffer from lower announcement returns, which is in line with the prior literature (Moeller *et al.* 2005; Minnick *et al.* 2011). Pre-announcement operating profit is positively related to announcement returns since the coefficient estimates on *Operating profit* are significant at the 1% level in all three models. The coefficient estimates of *M/B* display no statistical significance in all three models, and their minor magnitude (-0.0004) suggests that they are economically non-significant as well. *Deal value* has positive and significant estimated coefficients in all the regression specifications.

Overall, H2, which proposes that the acquirer's pre-announcement tax uncertainty is positively related to its announcement returns, is empirically supported.

3.5.2.3. Robustness tests

The tax uncertainty measurement used in the previous section is calculated as the standard deviation of various levels of tax expense scaled by the mean value over the same three-year pre-announcement period. As described in Section 4, robustness checks are conducted to examine whether the relation between tax uncertainty and announcement returns remains robust when the pre-announcement calculation period is extended further beyond the announcement date. Consequently, this section re-calculates the tax uncertainty based on the 5-year pre-announcement period and re-performs the OLS regressions in Equation (3.5); the results are reported in Table 3.8.

[Insert Table 3.8 here]

In terms of the estimated coefficient of *Tax uncertainty*, the only difference from Table 3.7 lies in Model (1), where the magnitude of the coefficient estimate decreases from 0.0015 to 0.0013 and the significance level decreases from the 1% level to the 5% level. However, the robustness check does not waive the positive relation between the acquirer's pre-announcement tax uncertainty and its announcement returns obtained in the previous section, and the conclusion still stands. In addition, the estimate coefficients of all the independent variables regarding deal and acquirer characteristics remain robust from those in Table 3.7.

In summary, the robustness check confirms the positive association between the acquirer's pre-announcement tax uncertainty and its abnormal gains surrounding the announcement date. The explanations of this positive relation include the following:

(1) tax uncertainty captures the acquirer's business risk, which is understood and rewarded by the market; (2) tax uncertainty represents the opportunity cost of corporate investment, and the loss of this opportunity cost through investment is compensated for by higher returns; (3) volatility in earnings quality is realized by the acquirer's managers, who in turn become more precautionary and choose acquisitions that are value-enhancing; and (4) the market rewards active earnings management prior to the acquisition announcement. Notably, these explanations are not mutually exclusive, and various factors can be combined to affect the outcome of acquisitions. Broadly, the positive relation identifies a channel through which the acquirer's tax uncertainty has a real effect on shareholder wealth.

3.5.3. H3

For multivariate analysis, the first set of tests only distinguishes the acquirer's post-announcement performance by a dummy variable indicating the acquirer's tax uncertainty level relative to the sample median after controlling its pre-announcement operating performance. As explained in the methodology section, the pre-announcement operating performance is measured over two periods, namely, the 12-month period prior to the announcement and the 2-year period before the announcement. The second set of tests then examines the cross-sectional variation by including effects from a vector of control variables representing deal and acquirer characteristics.

3.5.3.1. Univariate analysis

[Insert Table 3.9 here]

In Panel A, where operating performance is measured as operating income before depreciation adjusted by the value of total assets, firms with higher 3-year pre-announcement tax uncertainty experience show significantly better operating performance during the 12-month period subsequent to the announcement date. This finding is consistent with H3. The results in Panel B and Panel C provide consistent evidence when the operating performance is proxied by operating income after depreciation adjusted by total assets and return on assets in that acquirers with high tax uncertainty have better post-announcement operating performance, while Panel C shows a decrease in the outperformance significance level from 1% to 5%. Overall, the evidence provides preliminary support for the argument in H3.

3.5.3.2. Multivariate analysis

Following the argument that operating performance itself is a function of firm characteristics and that the inclusion of firm characteristics as control variables can cause endogeneity problems (Healy *et al.* 1992), pre-announcement operating performance is inserted into the regression as the only control variable reflecting the impact of all firm-level factors. This method is consistent with the specifications used to study the evolution of operating performance around announcements (Healy *et al.*

1992; Harford 1999; Powell & Stark 2005; Gao & Mohamed 2018). The results of the OLS regression are presented in Table 3.10.

[Insert Table 3.10 here]

In Panel A, where the acquirer's pre-announcement operating performance is calculated as the average value of the 2-year period, the estimated coefficients of the *High tax uncertainty dummy* vary from 0.0952 to 0.2418 and are all highly significant (at the 5% level in Models (1) and (2) and at the 1% level in Model (3)), indicating a positive relation between the acquirer's pre-announcement tax uncertainty and its post-announcement operating performance. This chapter suggests that this positive relation lends support to the argument that the positive relation between the acquirer's pre-announcement tax uncertainty and its short-run announcement returns is manifested by its long-run post-announcement operating performance.

In addition, as suggested by Gao and Mohamed (2018), a constant in the above regression specifications captures the improvement in the abnormal operating performance over the pre-merger to post-merger period. Therefore, Panel A of Table 3.10 provides evidence that the acquirer's operating performance significantly improves through the acquisition, since the estimates of constant terms are all positive and significant at the 1% level. The findings suggest that the operating performance is improved following the acquisition, which is consistent with past research regarding increased operating performance in acquisitions (Cornett & Tehranian 1992; Healy *et al.* 1992; Kaplan & Weisbach 1992) but inconsistent with studies finding decreased operating performance subsequent to an acquisition announcement (Hogarty 1970; Dickerson *et al.* 1997; Sharma & Ho 2002; Guest *et al.* 2010). Furthermore, this improvement found in operating performance implies that the acquisitions in the current sample are value-enhancing corporate investments (Andrade *et al.* 2001; Houston *et al.* 2001; Linn & Switzer 2001), which coincides with the implication in the previous section that precautionary managers choose profitable investment projects when facing higher tax uncertainty, or the market simply rewards acquirers that bear high business risk, as reflected in tax volatility. Finally, the positive and significant coefficient estimates on *Pre-announcement acquirer OP* suggest that pre-announcement operating performance is predictive of post-announcement operating performance.

In Panel B, where the acquirer's operating performance is measured over the 1-year period prior to the announcement date, the estimated coefficients of the *High tax uncertainty dummy* vary from 0.0779 to 0.0955 and are significant at the 1% level in Models (1) and (2); however, they lose significance in Model (3), where operating performance is proxied by ROA. The results regarding abnormal operating performance (constant term) and pre-announcement operating performance remain the same as in Panel A in terms of both sign and significance level.

Table 3.11 presents the results from the OLS regressions where the dependent variable is the acquirer's 12-month post-announcement operating performance and the independent variable is the acquirer's pre-announcement tax uncertainty along with variables controlling for deal and firm characteristics.

[Insert Table 3.11 here]

In Table 3.11, the estimated coefficients of *Tax uncertainty* range from 0.0203 to 0.0336 and are all highly significant (at the 5% level with *p*-value < 0.0200). This reinforces the implication of the results in Table 3.10 that greater acquirer's pre-announcement tax uncertainty leads to better post-announcement operating performance, suggesting that the positive association between pre-announcement tax uncertainty and announcement returns is not an irrational reaction of the market but rather an upwards re-valuation of the acquirer, which is manifested in long-run post-announcement performance. This finding that the acquirer's short-run announcement returns are realized through the subsequent long-term operating performance is in line with a number of previous studies (Harford 1999; Houston *et al.* 2001; Freund *et al.* 2003; Gao & Mohamed 2018).

In terms of control variables, the results also lend support to the notion that short-term market reaction to acquisitions by bidders with high tax uncertainty is manifested by the association between long-term post-announcement operating performance and pre-announcement tax uncertainty. First, the estimated coefficients of *Stock* are all negative and significant at the 1% level in all the model specifications, suggesting that a 100% stock payment decreases post-announcement operating performance. This coincides with the argument that using stock as the sole payment method leads to a negative announcement market reaction to the bidder's share price (Andrade *et al.* 2001; Harford 2005; Golubov *et al.* 2016) and that this negative financial reaction is realized in subsequent operational outcomes. Additionally, it is consistent with the finding by Linn and Switzer (2001) that stock-financed deals have significantly lower operating performance than cash-financed deals.

Second, a strong leverage effect is detected, given that the estimated coefficients of *Leverage* are all negative and significant at the 1% level, implying that a higher acquirer's pre-announcement leverage ratio results in poorer long-term post-announcement operating performance. This cannot be explained as long-run operating performance manifesting the acquirer's short-run abnormal gain, since the prevalent theory posits that the acquirer's pre-announcement leverage is positively related to its announcement returns (Song & Walkling 2000; Moeller *et al.* 2005), or the relation is at most non-significant (Harford 1999). This chapter proposes a possible explanation. Given the widely agreed-upon existence of the target level of a firm's leverage (Titman & Wessels 1988; Rajan & Zingales 1995; Graham 1996; Hovakimian *et al.* 2001; Hovakimian *et al.* 2004) and that capital structure reverts back to the target level over time (Jalilvand & Harris 1984; Fama & French 2002; Kayhan & Titman 2007), the acquirer's management aims to adjust the leverage ratio to the pre-determined target level (Harford *et al.* 2009; Tao *et al.* 2017), which can be significantly decreased by the acquisition itself. However, the upwards adjustment to the target leverage ratio incurs adjustment costs (Leary & Roberts 2005; Flannery & Rangan 2006) that could come from the deteriorated operating performance.

Third, the estimated coefficients of *Diversify* are all negative across the three model specifications (all significant at the 1% level). This finding is consistent with the conglomerate discount argument in the early finance literature (Graham *et al.* 2002; Custodio 2014). For example, Reid (1971) documents that conglomerate firms show negative operating performance subsequent to acquisitions. Shih (1995) argues that the reason for this underperformance is that various business lines in a conglomerate have a smaller chance of meeting the operating performance target, which results in an even greater underperformance risk than that of concentrated firms. Consequently, conglomerate firms usually do not achieve the expected superior performance from diversification, and diversification through acquisitions is at best a means of defensive diversification (Melicher & Rush 1973). Furthermore, targets acquired by conglomerates are no more profitable than those acquired by concentrated firms (Melicher & Rush 1974). International evidence is found by Affleck-Graves *et al.* (1989). However, other reports find favourable results for diversified conglomerates. Weston and Mansinghka (1971) use various measures to find that the earnings performance of conglomerate firms is higher than that of their concentrated peers, but the difference is not statistically significant. In a Later study of an exhaustive sample over an extended period (1955-1987), 686 conglomerate firms are found to outperform 79 non-conglomerate firms over a 5-year period after acquisition completion (Agrawal *et al.* 1992). It is suggested that the reason that conglomerate firms outperform non-conglomerate firms is that the latter are concentrated in underperforming industries (Agrawal *et al.* 1992).

Finally, the estimated coefficients of Tobin's q are all positive, while they are significant in Models (1) and (2). This chapter suggests that this positive relation between Tobin's q and post-announcement operating performance demonstrates the acquirer's managerial performance (Lang *et al.* 1989), which also coincides with one of the explanations for H2, that managers with better earnings management quality choose value-enhancing acquisition deals.

3.5.3.3. Robustness tests

The tax uncertainty measurement used in the previous section is calculated as the standard deviation of various levels of tax expense scaled by the mean value over the same pre-announcement period, which is a three-year period. As for H2, robustness checks are conducted to examine whether the relation between tax uncertainty and post-announcement operating performance remains robust when the pre-announcement calculation period is extended further beyond the announcement date. Therefore, this section re-calculates tax uncertainty based on the 5-year pre-announcement period and re-performs the OLS regressions in Tables 3.10 and 3.11. The results are reported in Tables 3.12 and 3.13, respectively.

[Insert Table 3.12 here]

The estimated coefficients of the *High tax uncertainty dummy* are all positive in the six model specifications in Table 3.12 and are significant at the 1% level in five models and marginally significant at the 1% level (*p*-value=0.011) in the remaining model. This finding confirms the positive association between the indicator of high tax uncertainty and long-run post-announcement performance. Furthermore, the constant terms are all positive and significant at the 1% level, implying that the sample acquirers earn a positive abnormal operating performance via the acquisition deal.

[Insert Table 3.13 here]

It is evident in the above two tables that the results for H3 are not waived by the difference in the pre-announcement period employed to calculate the acquirer's tax uncertainty. The estimated five-year pre-announcement tax uncertainty ranges from 0.0324 to 0.0602 in all three model specifications in Table 3.13 and is significant at the 1% level. In comparison to the results shown in Table 3.11, there is an improvement in both the magnitude and the significance level.

Overall, two main results remain robust. First, the acquirer's pre-announcement tax uncertainty is positively related to the acquirer's long-run post-announcement operating performance. Second, the sample acquirers experience an average positive abnormal operating performance through the acquisition. In addition, the implications yielded by the control variables are not waived.

3.5.4. Endogeneity tests

According to the aforementioned analysis of endogeneity inherent in the tax uncertainty proxies and instrumental variables identified in Section 4, 2SLS regressions are performed to replicate the regressions in Tables 3.7 and 3.11 to examine whether the results for the relation between the acquirer's pre-announcement tax uncertainty and its announcement returns (H2) and its long-run post-announcement operating performance (H3) hold. The 2SLS results are presented in Tables 3.14 and 3.15 to replicate the results in Tables 3.7 and 3.11, respectively.

[Insert Table 3.14 here]

Table 3.14 confirms the positive impact of the acquirer's pre-announcement tax uncertainty on its announcement returns after correcting the potential endogeneity problem. Notably, the significance level of the estimated coefficients of *Tax uncertainty* remains high (marginally at the 1% level, *p*-value=0.013) in all three specifications, and the magnitude of the estimated coefficients increases greatly by 306% (0.0017 to

0.0069 in Model (2)) to 550% (0.0008 to 0.0052 in Model (3)), suggesting a more prominent effect after endogeneity is accounted for. All other control variables yield implications consistent with those in Table 3.7.

[Insert Table 3.15 here]

While the positive association between the acquirer's pre-announcement tax uncertainty and its long-run post-announcement operating performance is confirmed after the endogeneity problem in Table 3.15 is corrected, both the magnitude and significance level of the estimated coefficients of *Tax uncertainty* improve relative to those in Table 3.11, suggesting that the positive relation becomes stronger after the endogeneity problem in tax uncertainty measurement is solved. Furthermore, all implications generated by the results of the control variables remain the same as those in Table 3.11.

Overall, Tables 3.14 and 3.15 suggest that the results obtained in Section 5.3 and Section 5.4 are robust after endogeneity problems are taken into account.

3.6. Conclusion

This chapter examines three aspects of the relation between the acquirer's pre-announcement tax uncertainty and its acquisition characteristics, namely, the probability of engaging in an acquisition, financial returns surrounding the announcement date, and long-run post-announcement operating performance. On the basis of a comprehensive U.S. dataset, empirical evidence supports the acquirer's pre-announcement tax uncertainty having a significantly positive effect on its short-run announcement stock returns and long-term post-announcement operating performance. These findings are consistent with the application of precautionary theory (Keynes 1937) to tax uncertainty (Hanlon *et al.* 2017) in that firms facing greater tax uncertainty invest more carefully and choose value-enhancing acquisitions. Furthermore, the negative relation between the acquirer's pre-announcement tax uncertainty and its likelihood of initiating a bid coincides with the argument that volatile tax expense makes firms reduce and/or delay capital expenditures (Jacob *et al.* 2019), in this context, in the form of M&As.

H1 proposes that the relation between the acquirer's pre-announcement tax uncertainty and its probability of engaging in a bid is significantly negative, which is supported by the empirical results. This chapter explains this finding as managers becoming more precautionary by reserving more cash when experiencing volatile tax expense (Hanlon *et al.* 2017) and then investing more carefully only when value-enhancing projects emerge (Han & Qiu 2007; Bates *et al.* 2009). Consequently, precautionary acquirers are less likely to rush into an acquisition deal. This also coincides with a recent finding about the real effect of tax uncertainty on corporate investment in that tax uncertainty reduces or delays firms' capital expenditures (Jacob *et al.* 2019) and even investment at the individual employee level (Edmiston 2004).

However, this finding is contradictory to the argument of Niemann (2004) that tax rate uncertainty has an ambiguous impact on both financial and real investment and that of Niemann (2011) that tax uncertainty actually encourages corporate investment, but only when tax uncertainty is small relative to cash flow uncertainty.

H2 proposes that acquirers facing higher pre-announcement tax uncertainty reap greater abnormal returns around the announcement date. The empirical results lend support to this argument. This result is consistent with the traditional risk-and-return framework in the finance literature. Since higher tax uncertainty represents high opportunity costs for corporate investment (Jacob *et al.* 2019) and captures high business risk (Hutchens & Rego 2015), the market compensates for it in the form of greater announcement returns in the context of acquisitions. This finding is also in line with the precautionary explanation that acquirers with high tax uncertainty become more precautionary and select only acquisition deals that the market perceives as value-increasing.

H3 proposes that the acquirer's high pre-announcement cash flow uncertainty leads to its improved long-term post-announcement operating performance. This hypothesis is supported empirically in that 12-month post-announcement operating performance is significantly positively related to the bidder's pre-announcement cash flow uncertainty at the 1% level, regardless of the pre-announcement period chosen and the operating performance proxies selected. This further reinforces the argument in H2 that the acquirer's greater announcement financial gain arising from higher pre-announcement tax uncertainty is realized through enhanced operating performance in the long run following the announcement (Harford 1999; Houston *et al.* 2001; Freund *et al.* 2003; Gao & Mohamed 2018).

In addition, the control variables provide meaningful implications. *Cash* implies that the use of cash as the sole acquisition payment method significantly improves the announcement returns, which is consistent with previous studies (Travlos 1987; Servaes 1991; Harford 1999, 2005). One explanation is that the use of cash signals the market that the acquirer's financial and operational conditions are good. *Stock* is negatively related to the announcement, which may be explained as the market perceiving that the acquirer is exploiting the overvalued equity as the payment medium and consequently reacting negatively to the acquisition (Shleifer & Vishny 2003; Rhodes-Kropf & Viswanathan 2004). *Public target* is also negatively associated with the acquirer's announcement returns and can be justified by the liquidity effect since public targets enjoy higher leverage in acquisition negotiations due to their larger size granted by the open market (Fuller *et al.* 2002). *Tender offer* is positively associated with the acquirer's announcement returns, which is consistent with the prior literature (Rau & Vermaelen 1998; Agrawal & Jaffe 2003). *Bidder size*, in line with previous studies, is negatively related to the bidder's announcement returns (Minnick *et al.* 2011). *Operating profit* positively and significantly explains the acquirer's announcement returns, suggesting that the ability to generate operating income is positively valued by the market. Finally, this chapter observes a leverage effect: pre-announcement leverage is positively related to the acquirer's announcement gain (Song & Walkling 2000) but negatively related to the acquirer's long-run post-deal operating performance.

In conclusion, this chapter provides four explanations of the impact of the acquirer's pre-announcement tax uncertainty on acquisition characteristics. First, tax uncertainty is an opportunity cost of corporate investment (Jacob *et al.* 2019) since the firm needs to reserve cash for unforeseeable future tax charges; thus, the acquirer's high announcement returns serve as compensation for this opportunity cost. Second, tax uncertainty captures business risk (McGuire *et al.* 2013; Hutchens & Rego 2015; Guenther *et al.* 2017; Drake *et al.* 2019), and the observed positive association of cumulative abnormal returns upon acquisition announcement with tax uncertainty is a justification of the high business risk borne by the acquirer. It is suggested that the source of this business risk could be earnings quality (Phillips *et al.* 2003), among other possible sources. An alternative explanation is behavioural in that volatile tax expense triggers the manager's precautionary motive, which becomes dominant in the acquisition decision-making process; thus, the manager carefully selects the value-enhancing acquisition. Another alternative explanation is newly proposed by this chapter: tax uncertainty represents earnings management quality, more volatile tax expense represents more active engagement in earnings management, and this behaviour is rewarded by the market through re-valuation upon acquisition announcement. These four explanations are not mutually exclusive, and various factors could be combined to explain the positive relation between the acquirer's pre-announcement tax uncertainty and announcement returns. However, given the finding in H1 that higher tax uncertainty is related to a lower probability of engaging in an acquisition, it appears that the precautionary explanation is more likely. If tax uncertainty merely captures business risk and opportunity cost or is only a proxy of the managerial capability of earnings management, there is no reason for the acquirer to decrease the probability of engaging in an acquisition. Thus, this chapter concludes that precautionary theory is dominant over other explanations, which could contribute to the formation of the observed positive relation between the acquirer's pre-announcement tax uncertainty and announcement returns. Finally, the results of H3 suggest that the market's positive re-valuation of firms with high tax uncertainty is realized through their long-run operating performance, implying that the market's reaction is rational.

This chapter contributes to the literature in the following ways. First, prior studies about the effect of uncertainty on acquisition performance focus on the market-level divergence of opinion (Miller 1977; Asquith 1983; Chatterjee *et al.* 2012; Bhagwat *et al.* 2016; Li & Tong 2018). This chapter links a certain type of firm-level uncertainty to acquisition characteristics, namely, tax uncertainty and announcement returns. By documenting that managers facing greater tax uncertainty invest more efficiently and select value-increasing acquisitions, this study yields meaningful implications for individual firms in analysing their forthcoming acquisitions or making decisions about large corporate investment in general. Second, as an extension of the recent study of Jacob *et al.* (2019), this chapter identifies a channel through which tax uncertainty exerts a real effect on corporate investment and explains the consequence of tax uncertainty on shareholder wealth in the context of M&As. Third, this chapter also updates the precautionary theory literature (Keynes 1937; Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009) from the perspective of tax expense. Finally, this chapter also contributes to accounting studies by providing evidence that tax expense is economically meaningful and informative of tax uncertainty, especially under the current situation of the lack of a consensus on how to measure tax uncertainty. In addition, consistent with Hanlon and Heitzman (2010) argument that tax accounting research has a comparative advantage over tax studies in finance and economics, this chapter confirms that the disclosure of income tax expense in financial statements contains information regarding a firm's past earnings and future firm value specifically revealed by the acquisition announcement. How this information can be incorporated into share price and whether the information yields similar implications for other corporate events remain for future research.

3.7. Tables for Chapter 3

Table 3. 1 – Summary statistics

This table displays summary statistics on acquirer and deal characteristics. The sample consists 8955 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. Acquirer characteristics include cash reserve, market-to-book ratio, leverage, Tobin q, operating profit, and acquirer size. Operating profit is deflated by total assets. Deal characteristics include payment method (cash and stock), public target, competing bid, deal attitude (friendly and hostile), tender offer, diversifying deal, and deal value. Deal value is taken natural log. The sample is divided into two groups (Low and High) based on acquirer's pre-announcement tax uncertainty which is 3-year standard deviation in annual cash tax paid deflated by the mean value over the same period. All continuous variables are winsorized at the 1% and 99% levels. Student's t-tests are conducted to test differences between means for acquirers with high and low pre-announcement cash flow uncertainty. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	**Pre-announcement tax uncertainty**		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Acquirer Characteristics					
M/B	mean	3.780	3.805	3.768	0.036
	n	8955	2687	6268	
Leverage	mean	0.265	0.254	0.270	-0.016***
	n	8955	2687	6268	
Tobin Q	mean	3.067	3.179	3.018	0.161***
	n	8955	2687	6268	
Operating Profit	mean	0.147	0.117	0.159	-0.042***
	n	8955	2687	6268	
Bidder Size	mean	6.418	5.683	6.733	-1.050***
	n	8949	2683	6266	
Deal Characteristics					
Cash	mean	0.351	0.287	0.379	-0.092***
	n	8955	2687	6268	
Stock	mean	0.125	0.155	0.112	0.043***
	n	8955	2687	6268	
Public Target	mean	0.149	0.118	0.163	-0.045***
	n	8955	2687	6268	
Competing Bid	mean	0.009	0.004	0.011	-0.006***

	n	8955	2687	6268	
Friendly	mean	0.993	0.995	0.992	0.003**
	n	8955	2687	6268	
Hostile	mean	0.002	0.001	0.003	-0.002**
	n	8955	2687	6268	
Tender Offer	mean	0.043	0.028	0.050	-0.022***
	n	8955	2687	6268	
Diversify	mean	0.397	0.373	0.407	-0.034***
	n	8955	2687	6268	
Deal Value	mean	3.882	3.476	4.055	-0.579***
	n	8955	2687	6268	

Table 3. 2 – Logit regressions of acquirer's likelihood of engaging into acquisitions

The table reports Logit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 8955 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 3-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu3	txcu3	txtu3
Tax uncertainty	-0.0063	-0.0130***	-0.0100***
	(0.233)	(0.001)	(0.000)
Cash	0.2006***	0.1908***	0.1846***
	(0.000)	(0.000)	(0.000)
Stock	0.4216***	0.4482***	0.4365***
	(0.000)	(0.000)	(0.000)
Public Target	0.0598	0.0354	0.0313
	(0.133)	(0.367)	(0.416)
Competing Bid	-0.0907	-0.1067	-0.0652
	(0.462)	(0.381)	(0.585)
Friendly	-0.0924	-0.1407	-0.1266
	(0.562)	(0.370)	(0.413)
Hostile	0.1407	0.1296	0.0396
	(0.623)	(0.645)	(0.886)
Tender offer	0.0901	0.1284**	0.0942
	(0.170)	(0.047)	(0.138)

Diversify	0.0886***	0.0778***	0.0671***
	(0.000)	(0.001)	(0.004)
Deal value	0.1694***	0.1383***	0.1310***
	(0.000)	(0.000)	(0.000)
M/B	-0.0064**	-0.0097***	-0.0062**
	(0.039)	(0.002)	(0.042)
Leverage	0.0647*	0.1296***	0.0806**
	(0.055)	(0.000)	(0.012)
Tobin's Q	-0.0074	-0.0006	-0.0012
	(0.149)	(0.905)	(0.813)
Operating profit	1.3082***	1.2129***	1.2242***
	(0.000)	(0.000)	(0.000)
Bidder size	0.0000***	0.0000***	0.0000***
	(0.000)	(0.000)	(0.000)
Constant	-1.9861***	-1.921***	-1.9403***
	(0.000)	(0.000)	(0.000)
Observations	8955	8955	8955

Table 3. 3 – Probit regressions of acquirer's likelihood of engaging into acquisitions

The table reports Logit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 8955 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 3-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu3	txcu3	txtu3
Tax uncertainty	-0.0037	-0.0065***	-0.0053***
	(0.222)	(0.002)	(0.000)
Cash	0.1141***	0.1083***	0.1044***
	(0.000)	(0.000)	(0.000)
Stock	0.2473***	0.2623***	0.2553***
	(0.000)	(0.000)	(0.000)
Public Target	0.0347	0.0202	0.0180
	(0.131)	(0.372)	(0.416)
Competing Bid	-0.0549	-0.0634	-0.0391
	(0.442)	(0.367)	(0.570)
Friendly	-0.0552	-0.0837	-0.0745
	(0.549)	(0.357)	(0.402)
Hostile	0.0876	0.0796	0.0281
	(0.598)	(0.626)	(0.860)
Tender offer	0.0541	0.0759**	0.0561
	(0.155)	(0.042)	(0.126)

Diversify	0.0530***	0.0464***	0.0403***
	(0.000)	(0.001)	(0.003)
Deal value	0.0929***	0.0752***	0.0705***
	(0.000)	(0.000)	(0.000)
M/B	-0.0038**	-0.0055***	-0.0036**
	(0.037)	(0.002)	(0.042)
Leverage	0.0348*	0.0708***	0.0438**
	(0.073)	(0.000)	(0.017)
Tobin's Q	-0.0049*	-0.0010	-0.0015
	(0.100)	(0.734)	(0.602)
Operating profit	0.7760***	0.7276***	0.7343***
	(0.000)	(0.000)	(0.000)
Bidder size	0.0000***	0.0000***	0.0000***
	(0.000)	(0.000)	(0.000)
Constant	-1.1642***	-1.1284***	-1.1383***
	(0.000)	(0.000)	(0.000)
Observations	8955	8955	8955

Table 3. 4 – Logit regressions of acquirer's likelihood of engaging into acquisitions robustness check

The table reports Logit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 8955 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu5	txcu5	txtu5
Tax uncertainty	-0.0012	-0.0238***	-0.0047**
	(0.834)	(0.000)	(0.020)
Cash	0.1990***	0.1880***	0.1846***
	(0.000)	(0.000)	(0.000)
Stock	0.4217***	0.4394***	0.4348***
	(0.000)	(0.000)	(0.000)
Public Target	0.0587	0.0353	0.0305
	(0.140)	(0.362)	(0.428)
Competing Bid	-0.0952	-0.1056	-0.0680
	(0.440)	(0.380)	(0.569)
Friendly	-0.0936	-0.1252	-0.1288
	(0.557)	(0.421)	(0.404)
Hostile	0.1396	0.1410	0.0343
	(0.626)	(0.613)	(0.901)
Tender offer	0.0941	0.1138*	0.0957
	(0.151)	(0.075)	(0.131)

Diversify	0.0876***	0.0732***	0.0659***
	(0.000)	(0.002)	(0.005)
Deal value	0.1635***	0.1348***	0.1305***
	(0.000)	(0.000)	(0.000)
M/B	-0.0075**	-0.0090***	-0.0059*
	(0.015)	(0.004)	(0.052)
Leverage	0.0916***	0.1159***	0.0747**
	(0.006)	(0.000)	(0.019)
Tobin's Q	-0.0059	0.0008	-0.0021
	(0.240)	(0.877)	(0.666)
Operating profit	1.3432***	1.1773***	1.2651***
	(0.000)	(0.000)	(0.000)
Bidder size	0.0000***	0.0000***	0.0000***
	(0.000)	(0.000)	(0.000)
Constant	-1.9939***	-1.9140***	-1.9459***
	(0.000)	(0.000)	(0.000)
Observations	8955	8955	8955

Table 3. 5 – Probit regressions of acquirer's likelihood of engaging into acquisitions robustness check

The table reports Logit regressions to estimate acquirer's likelihood of initiating one or more bid(s) in a given year. The sample consists 8955 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is a dummy variable who takes the value of one if the acquirer engages into one or more acquisition(s) in a given sample year. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu5	txcu5	txtu5
Tax uncertainty	-0.0006	-0.0124***	-0.0025**
	(0.857)	(0.000)	(0.026)
Cash	0.1132***	0.1065***	0.1043***
	(0.000)	(0.000)	(0.000)
Stock	0.2473***	0.2571***	0.2543***
	(0.000)	(0.000)	(0.000)
Public Target	0.0339	0.0202	0.0175
	(0.140)	(0.368)	(0.430)
Competing Bid	-0.0576	-0.0629	-0.0410
	(0.420)	(0.365)	(0.551)
Friendly	-0.0559	-0.0748	-0.0758
	(0.544)	(0.404)	(0.394)
Hostile	0.0872	0.0851	0.0252
	(0.600)	(0.599)	(0.875)
Tender offer	0.0564	0.0675*	0.0571
	(0.138)	(0.068)	(0.119)

Diversify	0.0524***	0.0437***	0.0396***
	(0.000)	(0.001)	(0.003)
Deal value	0.0899***	0.0729***	0.0702***
	(0.000)	(0.000)	(0.000)
M/B	-0.0044**	-0.0051***	-0.0034*
	(0.015)	(0.004)	(0.053)
Leverage	0.0495***	0.0635***	0.0403**
	(0.010)	(0.001)	(0.028)
Tobin's Q	-0.0041	-0.0002	-0.002
	(0.160)	(0.955)	(0.470)
Operating profit	0.7981***	0.7054***	0.7557***
	(0.000)	(0.000)	(0.000)
Bidder size	0.0000***	0.0000***	0.0000***
	(0.000)	(0.000)	(0.000)
Constant	-1.1691***	-1.1241***	-1.1407***
	(0.000)	(0.000)	(0.000)
Observations	8955	8955	8955

Table 3. 6 – Univariate analysis

This table reports acquirer's value-related measures on the sample of 8955 deals. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on three tax uncertainty measures. Specifically, the standard deviation of cash tax paid, current income tax, and total income tax over 3-year pre-announcement period scaled by the mean value of each tax expense measurement over the same period are employed in Panel A to Panel C, respectively. Market-adjusted model is employed to calculate cumulative abnormal returns, where the abnormal return is calculated as the difference between actual firm return and the Standard & Poor's 500 index return. CAR [-1, +1] represent cumulative abnormal returns (CARs) to acquirers during the 3-day event window around the announcement date. The 3-day CAR is winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Ex ante uncertainty		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A: txpdu3					
CAR3	mean	0.010	0.012	0.009	0.003^{**}
	n	8955	2687	6268	
Panel B: txcu3					
CAR3	mean	0.010	0.014	0.008	0.006^{***}
	n	8955	2283	6672	
Panel C: txtu3					
CAR3	mean	0.010	0.012	0.009	0.002^{*}
	n	8955	2299	6656	

Table 3. 7 – OLS regressions of acquirer short-term performance on pre-announcement tax uncertainty

The table reports OLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 8949 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 3-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu3	**txcu3**	**txtu3**
Tax uncertainty	0.0015***	0.0017***	0.0008**
	(0.007)	(0.000)	(0.033)
Cash	0.0032**	0.0032**	0.0032**
	(0.038)	(0.038)	(0.041)
Stock	-0.0044*	-0.0043*	-0.0043*
	(0.064)	(0.066)	(0.066)
Public Target	-0.0215***	-0.0215***	-0.0216***
	(0.000)	(0.000)	(0.000)
Competing Bid	0.0012	0.0010	0.0011
	(0.877)	(0.892)	(0.890)
Friendly	-0.0136	-0.0139	-0.0134
	(0.168)	(0.160)	(0.174)
Hostile	-0.0186	-0.0184	-0.0183
	(0.297)	(0.302)	(0.305)
Tender offer	0.0143***	0.0145***	0.0143***
	(0.000)	(0.000)	(0.000)

Diversify	0.0009	0.0009	0.0009
	(0.512)	(0.525)	(0.530)
Deal value	0.0028***	0.0028***	0.0028***
	(0.000)	(0.000)	(0.000)
M/B	-0.0004	-0.0004	-0.0004
	(0.177)	(0.177)	(0.165)
Leverage	0.0078***	0.0075**	0.0077**
	(0.010)	(0.013)	(0.011)
Tobin's Q	-0.0003	-0.0003	-0.0003
	(0.417)	(0.426)	(0.442)
Operating profit	0.0264***	0.0301***	0.0264***
	(0.002)	(0.000)	(0.002)
Bidder size	-0.0046***	-0.0046***	-0.0046***
	(0.000)	(0.000)	(0.000)
Constant	0.0391***	0.0383***	0.0394***
	(0.000)	(0.000)	(0.000)
Observations	8949	8949	8949
Adjusted R Square	0.021	0.022	0.021
Year fixed effect	Yes	Yes	Yes

Table 3. 8 – OLS regressions of acquirer short-term performance on pre-announcement tax uncertainty robustness check

The table reports OLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 8949 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 5-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu5	**txcu5**	**txtu5**
Tax uncertainty	0.0013**	0.0019***	0.0008**
	(0.050)	(0.003)	(0.011)
Cash	0.0032**	0.0032**	0.0032**
	(0.038)	(0.036)	(0.037)
Stock	-0.0043*	-0.0044*	-0.0042*
	(0.068)	(0.059)	(0.074)
Public Target	-0.0215***	-0.0215***	-0.0215***
	(0.000)	(0.000)	(0.000)
Competing Bid	0.0012	0.0011	0.0012
	(0.874)	(0.885)	(0.875)
Friendly	-0.0134	-0.0137	-0.0134
	(0.174)	(0.165)	(0.174)
Hostile	-0.0184	-0.0185	-0.0186
	(0.304)	(0.300)	(0.298)
Tender offer	0.0143***	0.0142***	0.0142***
	(0.000)	(0.000)	(0.000)

Diversify	0.0009	0.0009	0.0009
	(0.507)	(0.518)	(0.516)
Deal value	0.0028***	0.0028***	0.0028***
	(0.000)	(0.000)	(0.000)
M/B	-0.0004	-0.0004	-0.0004
	(0.173)	(0.176)	(0.160)
Leverage	0.0078***	0.0073**	0.0076**
	(0.010)	(0.016)	(0.012)
Tobin's Q	-0.0003	-0.0004	-0.0003
	(0.421)	(0.398)	(0.433)
Operating profit	0.0255***	0.0288***	0.0271***
	(0.003)	(0.001)	(0.002)
Bidder size	-0.0046***	-0.0045***	-0.0046***
	(0.000)	(0.000)	(0.000)
Constant	0.0391***	0.0380***	0.0390***
	(0.000)	(0.000)	(0.000)
Observations	8949	8949	8949
Adjusted R Square	0.021	0.021	0.021
Year fixed effect	Yes	Yes	Yes

Table 3. 9 – Univariate analysis of operating performance (12-month post-announcement)

This table reports acquirer's post-announcement operating profit on the sample of 8669 deals. First, the values for the full sample is presented. Next, the full sample is split into two sub-samples based on acquirer's pre-announcement tax uncertainty, which is standard deviation of total tax paid over 3-year prior to announcement scaled by the mean value over the same period. Three measurements of operating performance are used through Panel A to Panel C, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. All continuous variables are winsorized at the 1% and 99% levels. The Student's t-test is used to test for statistical significance. For brevity, we do not report the t-statistics. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

		Full Sample	Ex ante uncertainty		
			High (1)	**Low (2)**	**Difference (1) - (2)**
Panel A					
OP1	mean	0.675	0.758	0.646	0.112***
	n	8669	2226	6443	
Panel B					
OP2	mean	0.700	0.784	0.670	0.114***
	n	8669	2226	6443	
Panel C					
ROA	mean	0.972	1.081	0.935	0.146**
	n	8669	2226	6443	

Table 3. 10 – OLS regressions of acquirer post-announcement operating performance on pre-announcement high tax uncertainty dummy

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 8669 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in three various ways. Specifically, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement acquirer OP* is the average value of acquirer's operating performance over the first- and the second-year prior announcement in Panel A, and the correspond acquirer's operating performance in each model specification calculated over 12-month period prior announcement in Panel B. *Tax uncertainty* is standard deviation of total tax paid over 3-year prior to announcement scaled by the mean value over the same period. *High tax uncertainty dummy* takes the value of one if the tax uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: Two-year avg. prior to announcement	**Model (1)**	**Model (2)**	**Model (3)**
	OP1	**OP2**	**ROA**
Pre-announcement acquirer OP	0.3865***	0.3894***	0.2899***
	(0.000)	(0.000)	(0.000)
High tax uncertainty dummy	0.0952**	0.0986**	0.2418***
	(0.049)	(0.047)	(0.003)
Constant	0.4276***	0.4386***	0.6914***
	(0.000)	(0.000)	(0.000)
Observations	7593	7593	7593
Adjusted R square	0.117	0.117	0.080
Panel B: One-year prior to announcement			
Pre-announcement acquirer OP	0.4703***	0.4567***	0.3772***

	(0.000)	(0.000)	(0.000)
High tax uncertainty dummy	0.0779**	0.0793**	0.0955
	(0.022)	(0.026)	(0.105)
Constant	0.3675***	0.3888***	0.6102***
	(0.000)	(0.000)	(0.000)
Observations	8669	8669	8669
Adjusted R square	0.154	0.149	0.114

Table 3. 11 – OLS regressions of acquirer post-announcement operating performance on pre-announcement tax uncertainty

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 8669 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in three various ways. Specifically, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. *Tax uncertainty* is the standard deviation of total tax paid over 3-year prior to announcement scaled by the mean value over the same period. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OP1	**OP2**	**ROA**
Tax uncertainty	0.0203**	0.0204**	0.0336**
	(0.015)	(0.019)	(0.017)
Cash	0.0353	0.0369	0.0205
	(0.322)	(0.320)	(0.735)
Stock	-0.4079***	-0.4158***	-0.7408***
	(0.000)	(0.000)	(0.000)
Public Target	0.0746	0.0842	0.056
	(0.192)	(0.157)	(0.562)
Competing Bid	-0.1873	-0.2036	-0.1275
	(0.287)	(0.266)	(0.668)
Friendly	0.2702	0.2655	0.6033
	(0.234)	(0.262)	(0.116)
Hostile	-0.0943	-0.1086	-0.1711
	(0.820)	(0.802)	(0.808)

Tender offer	-0.0495	-0.0477	0.0522
	(0.596)	(0.624)	(0.741)
Diversify	-0.2221***	-0.2309***	-0.3758***
	(0.000)	(0.000)	(0.000)
Deal value	0.0557***	0.0561***	0.1080***
	(0.000)	(0.000)	(0.000)
M/B	0.0109*	0.011*	0.0195*
	(0.088)	(0.099)	(0.071)
Leverage	-0.6996***	-0.7293***	-1.0326***
	(0.000)	(0.000)	(0.000)
Tobin's Q	0.0308***	0.0320***	0.0259
	(0.001)	(0.001)	(0.109)
Bidder size	-0.0113	-0.0123	0.0045
	(0.316)	(0.295)	(0.812)
Constant	0.4113*	0.4516*	0.2358
	(0.082)	(0.067)	(0.556)
Observations	8669	8669	8669
Adjusted R Square	0.032	0.032	0.028
Year fixed effect	Yes	Yes	Yes

Table 3. 12 – OLS regressions of acquirer post-announcement operating performance on pre-announcement high tax uncertainty dummy robustness check

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 8669 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in three various ways. Specifically, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. *Pre-announcement acquirer OP* is the average value of acquirer's operating performance over the first- and the second-year prior announcement in Panel A, and the correspond acquirer's operating performance in each model specification calculated over 12-month period prior announcement in Panel B. *Tax uncertainty* is standard deviation of total tax paid over 5-year prior to announcement scaled by the mean value over the same period. *High tax uncertainty dummy* takes the value of one if the tax uncertainty is greater than the sample median, and zero otherwise. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

Panel A: Two-year avg. prior to announcement	**Model (1)**	**Model (2)**	**Model (3)**
	OP1	**OP2**	**ROA**
Pre-announcement acquirer OP	0.3851***	0.3880***	0.2890***
	(0.000)	(0.000)	(0.000)
High tax uncertainty dummy	0.1427***	0.1478***	0.1994***
	(0.001)	(0.001)	(0.006)
Constant	0.4146***	0.4253***	0.6891***
	(0.000)	(0.000)	(0.000)
Observations	7593	7593	7593
Adjusted R square	0.118	0.118	0.079
Panel B: One-year prior to announcement			

Pre-announcement acquirer OP	0.4690***	0.4554***	0.3763***
	(0.000)	(0.000)	(0.000)
High tax uncertainty dummy	0.1029***	0.1103***	0.1504**
	(0.003)	(0.002)	(0.011)
Constant	0.3620***	0.3818***	0.5971***
	(0.000)	(0.000)	(0.000)
Observations	8669	8669	8669
Adjusted R square	0.155	0.149	0.115

Table 3. 13 – OLS regressions of acquirer post-announcement operating performance on pre-announcement tax uncertainty robustness check

The table reports OLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 8669 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in three various ways. Specifically, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. *Tax uncertainty* is the standard deviation of total tax paid over 5-year prior to announcement scaled by the mean value over the same period. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OP1	**OP2**	**ROA**
Tax uncertainty	0.0324***	0.0331***	0.0602***
	(0.000)	(0.000)	(0.000)
Cash	0.0385	0.0401	0.0262
	(0.280)	(0.280)	(0.664)
Stock	-0.4049***	-0.4128***	-0.7357***
	(0.000)	(0.000)	(0.000)
Public Target	0.0759	0.0856	0.0581
	(0.184)	(0.150)	(0.548)
Competing Bid	-0.1797	-0.1959	-0.1131
	(0.306)	(0.284)	(0.703)
Friendly	0.2721	0.2675	0.6076
	(0.230)	(0.258)	(0.113)
Hostile	-0.1022	-0.1166	-0.1846
	(0.805)	(0.787)	(0.792)

Tender offer	-0.0527	-0.051	0.0466
	(0.572)	(0.600)	(0.768)
Diversify	-0.2213***	-0.2302***	-0.3744***
	(0.000)	(0.000)	(0.000)
Deal value	0.055***	0.0554***	0.1067***
	(0.000)	(0.000)	(0.000)
M/B	0.0108*	0.0108	0.0193*
	(0.091)	(0.103)	(0.073)
Leverage	-0.7079***	-0.7378***	-1.0487***
	(0.000)	(0.000)	(0.000)
Tobin's Q	0.0310***	0.0323***	0.0263
	(0.001)	(0.001)	(0.103)
Bidder size	-0.0083	-0.0092	0.0107
	(0.461)	(0.434)	(0.575)
Constant	0.3728	0.4116*	0.1552
	(0.115)	(0.095)	(0.698)
Observations	8669	8669	8669
Adjusted R Square	0.034	0.033	0.030
Year fixed effect	Yes	Yes	Yes

Table 3. 14 – 2SLS regressions of acquirer announcement return on pre-announcement tax uncertainty

The table reports 2SLS regressions to estimate acquirer's 3-day announcement returns. The sample consists 8943 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 3-day cumulative abnormal stock returns. *Tax uncertainty* is the standard deviation of acquirer's cash tax paid, current income tax expense, and total income tax expense over 3-year period prior to announcement scaled by the absolute value of mean over the same period in specification (1) to (3), respectively. *Tax uncertainty* is instrumented by tax avoidance behaviour which is calculated as the 3-year standard deviation of cash effective rate (Cash ETR) scaled by the mean of Cash ETR over the same period. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	txpdu3	**txcu3**	**txtu3**
Tax uncertainty	0.0073**	0.0069**	0.0052**
	(0.013)	(0.013)	(0.013)
Cash	0.0033**	0.0033**	0.0030*
	(0.032)	(0.037)	(0.051)
Stock	-0.0049**	-0.0046**	-0.0049**
	(0.039)	(0.050)	(0.039)
Public Target	-0.0214***	-0.0217***	-0.0222***
	(0.000)	(0.000)	(0.000)
Competing Bid	0.0018	0.0011	0.0013
	(0.813)	(0.887)	(0.865)
Friendly	-0.0139	-0.0149	-0.0128
	(0.161)	(0.135)	(0.200)
Hostile	-0.0191	-0.0181	-0.0171
	(0.287)	(0.314)	(0.342)

Tender offer	0.0147***	0.0151***	0.0148***
	(0.000)	(0.000)	(0.000)
Diversify	0.0011	0.0009	0.0009
	(0.460)	(0.524)	(0.552)
Deal value	0.0028***	0.0029***	0.0029***
	(0.000)	(0.000)	(0.000)
M/B	-0.0003	-0.0003	-0.0003
	(0.276)	(0.255)	(0.225)
Leverage	0.0072**	0.0062**	0.0067**
	(0.019)	(0.048)	(0.030)
Tobin's Q	-0.0005	-0.0004	-0.0005
	(0.247)	(0.306)	(0.291)
Operating profit	0.0411***	0.0526***	0.0477***
	(0.000)	(0.000)	(0.000)
Bidder size	-0.0042***	-0.0042***	-0.0041***
	(0.000)	(0.000)	(0.000)
Constant	0.0304***	0.0292**	0.0282**
	(0.007)	(0.011)	(0.015)
Observations	8943	8943	8943
Year fixed effect	Yes	Yes	Yes
First stage result			
F statistic	345.5570	195.693	287.623
Prob. > F	0.0000	0.0000	0.0000
Adj. R Square	0.082	0.080	0.094

Table 3. 15 – 2SLS regressions of acquirer post-announcement operating performance on pre-announcement tax uncertainty

The table reports 2SLS regressions to estimate acquirer's 12-month post-announcement operating performance. The sample consists 8663 deals over the period of 1985-2017. To be included in the sample, the deal must be completed, domestic U.S. mergers and acquisitions, and with deal value over $1 million. Acquiring firms are required to be publicly listed firms and have data available on CRSP and Compustat. Target firms include all public status. In addition, all acquirers and targets from financial (SIC 6000-6999) and energy and power (SIC 4900-4999) industries are excluded. The dependent variable is acquirer's 12-month post-announcement operating performance calculated in three various ways. Specifically, *OP1* is calculated as operating income before depreciation scaled by total assets, *OP2* is calculated as operating income after depreciation scaled by total assets, and return on assets (*ROA*) is calculated as net income divided by total assets. *Tax uncertainty* is the standard deviation of total tax paid over 3-year prior to announcement scaled by the mean value over the same period. *Tax uncertainty* is instrumented by tax avoidance behaviour which is calculated as the 3-year standard deviation of cash effective rate (Cash ETR) scaled by the mean of Cash ETR over the same period. Control variables are defined as in section 3.4. All continuous variables are winsorized at the 1% and 99% levels. P-value is indicated in parentheses. Significance at the 1%, 5% and 10% levels is denoted by ***, ** and * respectively.

	Model (1)	**Model (2)**	**Model (3)**
	OP1	**OP2**	**ROA**
Tax uncertainty	0.1404***	0.1457***	0.2473***
	(0.001)	(0.001)	(0.000)
Cash	0.0343	0.0358	0.0184
	(0.342)	(0.341)	(0.763)
Stock	-0.4261***	-0.4348***	-0.7731***
	(0.000)	(0.000)	(0.000)
Public Target	0.0617	0.0709	0.0333
	(0.287)	(0.241)	(0.735)
Competing Bid	-0.1748	-0.1907	-0.1054
	(0.325)	(0.303)	(0.726)
Friendly	0.2946	0.2910	0.6468*
	(0.200)	(0.224)	(0.097)

Hostile	-0.0609	-0.0738	-0.1117
	(0.885)	(0.866)	(0.875)
Tender offer	-0.0363	-0.0340	0.0756
	(0.701)	(0.730)	(0.637)
Diversify	-0.2222***	-0.2310***	-0.3759***
	(0.000)	(0.000)	(0.000)
Deal value	0.0564***	0.0568***	0.1092***
	(0.000)	(0.000)	(0.000)
M/B	0.0114*	0.0115*	0.0205*
	(0.077)	(0.087)	(0.061)
Leverage	-0.7235***	-0.7542***	-1.0756***
	(0.000)	(0.000)	(0.000)
Tobin's Q	0.0336***	0.0350***	0.0309*
	(0.001)	(0.001)	(0.060)
Bidder size	0.0068	0.0066	0.0367
	(0.603)	(0.628)	(0.095)
Constant	0.1450	0.1739	-0.2383
	(0.571)	(0.514)	(0.583)
Observations	8663	8663	8663
Year fixed effect	Yes	Yes	Yes
First stage result			
F statistic	372.9360	270.4380	182.0700
Prob. > F	0.0000	0.0000	0.0000
Adj. R Square	0.063	0.063	0.060

General conclusion

This thesis investigates how firm-level uncertainty affects corporate event outcomes. The previous literature has already highlighted the importance of uncertainty in the context of asset pricing, both theoretically (Miller 1977; Morris 1996) and empirically (Diether *et al.* 2002; Bali *et al.* 2017; Liu *et al.* 2017; Brenner & Izhakian 2018) and in event studies regarding M&As (Asquith 1983; Chatterjee *et al.* 2012) as well as equity offerings (Miller & Reilly 1987; Ling & Ryngaert 1997; Houge *et al.* 2001; Jens 2017). However, firm-level uncertainty has largely been ignored. This thesis extends the existing literature by focusing on how certain types of firm-level uncertainty affect the decision-making process and the outcomes of major corporate events. Chapter 1 is about how the acquirer's pre-announcement cash flow uncertainty affects the acquirer's acquisition outcomes; Chapter 2 studies the role of pre-issuance valuation uncertainty in explaining the underpricing of the secondary equity offering; and Chapter 3 regards how tax expense uncertainty determines the acquirer's performance.

The impact of macro-level uncertainty on M&As has received academic attention in recent years in areas such as market-level uncertainty about firm prospects (Duchin & Schmidt 2013), interim risk due to total market volatility (Bhagwat *et al.* 2016), divergence of opinion in analyst forecasts (Moeller *et al.* 2007), and policy and regulatory uncertainties (Desai & Stover 1985; Bonaime *et al.* 2018). However, the effect of firm-level uncertainty on acquisition outcomes has yet to be discovered. Therefore, Chapter 1 selects cash flow uncertainty as a testing instrument owing to its association with precautionary corporate cash reserves (Opler *et al.* 1999). By exploring the direct relation between the acquirer's pre-announcement cash flow uncertainty and the acquirer's around-announcement and post-announcement performance, Chapter 1 finds that higher cash flow uncertainty is negatively related to the bidding firm's propensity to initiate an acquisition but is positively related to the acquirer's announcement financial performance and long-run post-announcement operating performance. It is suggested in Chapter 1 that cash flow uncertainty exerts an effect on acquisition characteristics through the manager's precautionary reaction to volatile cash flows; in other words, the acquirer's manager becomes more careful and invests more efficiently by selectively engaging in value-enhancing acquisitions.

However, while Chapter 1 lends direct support to precautionary theory (Keynes 1937), it notes that the agency explanation (Jensen 1986) is not completely ruled out since the positive precautionary effect of cash flow uncertainty is mitigated at a minor but statistically significant magnitude by the cash reserve volume, suggesting the large corporate cash holdings still provide the manager with room to pursue interests not aligned with those of the shareholders. Nevertheless, Chapter 1 finds that the cash reserve per se does not destroy shareholder value via acquisitions, which is inconsistent with previous findings (Lang *et al.* 1991; Harford 1999; Schlingemann 2004) but is in line with recent research (Gao & Mohamed 2018).

Chapter 2 examines how the seasoned equity offering issuer's pre-issuance valuation uncertainty can explain the stylized fact of SEO underpricing (Asquith & Mullins Jr 1986; Masulis & Korwar 1986) and resolve the *new issues puzzle* (Loughran & Ritter 1995, 1997). Chapter 2 finds that the issuer's pre-issuance valuation uncertainty is negatively related to short-run abnormal gains, long-run post-issuance stock returns, and long-term operating performance. It is argued that the reported negative association between the issuer's *ex ante* uncertainty and abnormal gains surrounding issuance is supportive of the adverse selection explanation (Leland & Pyle 1977) of SEO underpricing since uninformed investors demand a greater discount of the reservation price due to their awareness of the fact that they can purchase the offering only when informed investors perceive the issuer's stock to be overvalued. In addition, using valuation uncertainty as an indicator of overvaluation, Chapter 2 avoids the problematic matching-firm process, which cannot properly account for the dynamics of the issuer's risk exposure (Eckbo *et al.* 2000). Hence, the negative relation between the issuer's *ex ante* uncertainty and long-run financial and operating performance resolves the *new issues puzzle* (Loughran & Ritter 1995) through the lens of uncertainty; in other words, the underlying reason for SEO long-term underperformance is due to the issuer's pre-issuance overpricing.

Responding to the call to align theories and evidence between accounting and applied economics (Maydew 2001; Gentry 2007; Shevlin 2007), Chapter 3 investigates the effect of the acquirer’s tax expense uncertainty on acquisition characteristics. It is found that the acquirer’s pre-announcement tax expense uncertainty is negatively related to the bidding firm’s likelihood of engaging in the acquisition but is positively related to the acquirer’s short-run abnormal gains surrounding the announcement as well as the long-run operating performance subsequent to the announcement. Chapter 3 explains the findings, as tax expense uncertainty containing information regarding managers’ earnings management ability; while earnings management per se may be negatively valued by the market (Teoh *et al.* 1998a; Teoh *et al.* 1998b), this managerial capability could be positively valued. In addition, according to the precautionary explanation, it is plausible that tax expense uncertainty exerts an impact on the acquirer’s value by the cash reserves accumulated due to the manager’s precautionary reaction to a volatile tax position (Hanlon *et al.* 2017). Either way, Chapter 3 extends the recent finding that tax uncertainty has a real effect on corporate investments (Jacob *et al.* 2019) by identifying a channel through which tax uncertainty affects corporate investment decisions and shareholder value, specifically, via M&As.

Overall, this thesis provides new empirical evidence about how corporate event outcomes are affected by the subject’s pre-event uncertainty at the firm level. Specifically, in the contexts of M&As as well as equity offerings, cash flow uncertainty, pre-issuance valuation uncertainty, and tax expense uncertainty are tested and shown to have significant impacts on firms’ around- and post-event announcement performance.

This thesis yields several implications for both research and practice. First, it reveals that the acquirer's firm-level pre-announcement cash flow uncertainty (both long-term and short-term) has a significant impact on its acquisition performance. While the existing literature regarding uncertainty and M&A outcomes and activities generally focuses on market- and/or industry-level uncertainty, this thesis implies that further attention could be paid to various firm-level uncertainties and the underlying factors they capture. Additionally, the uncertainty of both the acquirers and targets should be investigated, as in a recent study that examines the relation between the target's information uncertainty and its valuation (Li & Tong 2018). For practitioners in the industry, this thesis suggests that an investment banker hired by the target could leverage the acquirer's pre-announcement cash flow uncertainty in the negotiation of the deal price. For example, the acquirer's higher pre-announcement cash flow uncertainty may imply that the target is selected by the precautionary acquirer manager because it is value-enhancing for the acquirer; thus, a higher transaction price may be achieved.

Second, the thesis provides new evidence regarding the underlying reason for SEO issuance underpricing as well as long-run post-issuance underperformance. While the existing literature fails to distinguish between adverse selection (Leland & Pyle 1977) and signalling (Myers & Majluf 1984) theories in explaining SEO underpricing, this thesis suggests that pre-issuance valuation uncertainty could serve as a proper proxy for the adverse selection phenomenon. For investors, this thesis provides an *ex ante* indicator to evaluate the upcoming issuance discount, which is potentially meaningful for portfolio management.

Third, the thesis also finds that accounting figures are informational about corporate investments. By aligning the literature of accounting and empirical finance, this study demonstrates that the acquirer's pre-announcement tax expense uncertainty contains information regarding earnings management activeness and triggers the manager's precautionary motive, which in turn affects the acquisition outcomes. Hence, this thesis advances in the direction of incorporating more accounting theories and evidence into empirical finance to explain economic phenomena. Financial practitioners and analysts may be inspired by this thesis to pay extra attention to the dynamics of tax expense over a certain period rather than restricting the lens to reported tax figures in discrete years.

This study can be extended in a number of aspects. First, it pertains only to U.S. corporate events, but different markets are significantly distinct. For example, the capital of the People's Republic of China is significantly different from that of the U.S. market. State-owned enterprises in China enjoy a significant advantage in obtaining banking resources (Thomas & Ji 2006), while private sector firms face tight credit constraints (Poncet *et al.* 2010), difficulties in going public to raise funds (Lee *et al.* 2019), and a need for informal financing channels (Allen *et al.* 2005). In addition, China has a high household and government saving rate (Morck *et al.* 2008), while firms generally have a low dividend pay-out ratio (Sun & Tong 2003); as a result, Chinese firms are theoretically likely to make value-destroying acquisitions due to excess amounts of accumulated cash (Jensen 1986) rather than distributing the cash to shareholders (La Porta *et al.* 2000). Thus, it is valuable to examine whether the uncertainty-corporate event relation identified in this thesis remains robust in the Chinese scenario and, more broadly, in other distinct country samples. Naturally, cross-border deals could also be included.

Second, this thesis fails to split the sample according to the financial constraint faced by different firms. Financial constraint magnifies the negative relation between corporate cash reserves and the quality of local government (Chen *et al.* 2014), which in turn could reduce the sensitivity of investment to cash flow. Furthermore, financial constraint is found to have a direct impact on the cash flow sensitivity of cash (Almeida *et al.* 2004) and corporate cash policy (He & Wintoki 2016). Theoretical precautionary studies also show that firms facing a high financial constraint are more likely to accumulate cash in fear of a future adverse cash flow situation (Froot *et al.* 1993; Han & Qiu 2007), and these findings have been empirically supported (Faulkender & Wang 2006; Pinkowitz & Williamson 2007). Additionally, financial constraint is reported to be an influential factor in the relation between the bidder's cash reserves and acquisition outcomes (Gao & Mohamed 2018). In sum, since a significant part of the results of this thesis is based on managers' precautionary motivation, it may be fruitful for future research to examine how financial constraint affects or even alters the relation between any firm-level uncertainty and corporate event characteristics. A popular way to measure financial constraint in previous studies is the Whited-Wu index (Whited & Wu 2006).

Third, the part of this thesis pertaining to M&As considers only the effect of the acquirer's firm-level uncertainty on its subsequent performance. Future research may investigate how such uncertainty affects deal characteristics, such as the target's valuation multiple received from the acquirer, bid premium, and deal completion. Another possible research direction is how the target's pre-announcement uncertainty is related to the deal characteristics and the acquirer's performance.

Fourth, in addition to studying operating performance following the acquisition announcement, it may be useful to study how the acquirer's pre-announcement uncertainty is linked to its long-run post-announcement stock returns. Extra effort could be made to control for the structural break in the acquirer's long-term performance; in other words, the effect of uncertainty should be distinguished from that of other factors that are critical in the integration process during the post-acquisition period, such as corporate governance factors (Masulis *et al.* 2007) and employment policies (Datta 1991; Siegel *et al.* 2019).

Fifth, the findings of this thesis can be developed in conjunction with one of the newest findings in the literature, namely, abnormal idiosyncratic volatility prior to an information-intensive event (Yang *et al.* 2020). While this thesis does not differentiate pre-event uncertainty according to various underlying factors, Yang *et al.* (2020) argue that unusual price variations (quoted as information risk in their work) due to informed trading activities before information-intensive events are priced in expected stock returns to compensate for the potential loss of uninformed investors. One could tease the abnormal uncertainty caused by the trading of informed investors out of the simple pre-event firm-level uncertainty and examine the effects of both abnormal uncertainty (caused by informational corporate events) and normal uncertainty (reflecting a firm's fundamental risk and investors' and managers' overreactions to firm-specific information) on corporate event outcomes. The measurement of information risk constructed by Yang *et al.* (2020) calculates the difference between idiosyncratic volatility over the short period before the event and over the normal period.

Finally, while this thesis focuses on M&As and SEOs, the behavioural bias and its influence on managers' and investors' decision making when facing uncertainty could also be at work in other corporate events, such as debt offerings, initial public offerings, dividend pay-outs, and stock splits. Further efforts should be made to reveal a general pattern of how pre-event firm-level uncertainty affects corporate decisions. The extent to which this conjecture aligns with the data is open for future discussion.

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