Derivative Usage and M&As

Submitted by Xiao Sun

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Copyright Statement

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Abstract

This thesis examines the impact of derivative usage on the decision of M&As and the return to the acquirers. I use a probit regression to estimate the likelihood of acquisition announcement for derivative users and non-users, and the result shows that derivative users are more likely to make acquisitions than non-users. Regarding the announcement returns, M&As made by derivative users are lower than non-users, but the result from OLS regressions shows no evidence that the difference is attributable to derivative usage. The possible explanation is that derivative usage reduces stock return volatility, therefore derivative usage does not surprise shareholders. Additional test on sub-samples does not show evidence that COVID-19 affects the relation between derivative usage and announcement returns. Finally, the probit regression on derivative usage and method of payment shows that derivative users are less likely to use pure cash payment in transactions. The result implies that derivative users may prefer external financing when undertaking M&AS.

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1. Introduction

1.1. Background

The effect of risk management on firm value has received considerable attention among researchers. According to Bartram (2019), 65.1% of US firms use derivatives for various purposes and there is a growing trend that non-financial firms hold derivatives. The primary reason for using derivatives is to reduce the exposure to risks. Firms hold derivatives to hedge against the exchange risks, interest risks and commodity risks, therefore, exhibit lower stock return volatility (Alexandridis et al., 2021; Bartram, 2019). With risk management programs, firms have smooth earnings and cash flows, which enables them to undertake investment activities, such as M&As. While if the M&A is a positive NPV project, it would benefit the shareholders of the acquiring firms. Otherwise, if the M&A is a pet project of the managers, the deal would benefit the managers at the expense of shareholders. Therefore, derivative usage links to the company's strategic decision and is also reflected in the performance of M&As.

Previous literature shows mixed evidence on the influence of risk management on firm value. On one hand, derivative usage reduces cash flow volatility (Froot et al., 1993; Smith & Stulz, 1985), and lowers the cost of external financing (Campello et al., 2011; Chen & King, 2014), thereby facilitating effective investment (Géczy et al., 1997; Lin & Smith, 2007; Sun et al., 2022). Froot et al. (1993) show that risk management enables firms to reduce cash flow volatility by generating additional cash when there is a shortage in the supply of internally generated funds, thereby providing a solution to underinvestment problems. On the other hand, derivative usage generates free cash flow which allows managers to waste resources without monitoring from the

external market (Tufano, 1998). Thus, risk management provides opportunities to managers to facilitate the protection of the projects to enhance their own value at the expense of shareholders' interests. If derivative usage encourages investment, examining the impact of derivatives on M&A activities can provide a channel for understanding the real effect of risk management. In this thesis, I will investigate the relation between derivative usage and the likelihood of making acquisitions, and examine how derivative usage affects the performance and payment method of M&As.

1.2. Motivation for the Study

Derivatives are widely used across the world today. Holding derivatives helps firms lower their exposure to risks and the likelihood of financial distress. According to the study by Bartram (2019), 60.5% of firms in their sample use derivatives, especially for countries with higher foreign exchange rate risk and higher financial risk. Moreover, by providing financial slack, firms can invest in projects that otherwise could be precluded from the firm (Géczy et al., 1997). Therefore, derivative usage not only reduces risks and smooths earnings but also mitigates underinvestment problems caused by agency conflict between shareholders and creditors (Froot et al., 1993).

The primary motive for companies to engage in M&As is to achieve synergy through acquisition. However, firms also make acquisitions due to agency motives (Bruner, 1988; Jensen, 1986; Morck et al., 1990; Seth et al., 2000) and those acquisitions made by entrenched managers reduce the firm value at the expense of shareholders. As discussed, derivatives provide firms with the opportunity to invest when there is a shortage of internally generated funds, and also reduce the cost of external financing. Managers can use the cash flow or debt capacity generated by

derivatives to pursue self-interested goals through M&As. The free cash flow theory (Jensen, 1986) suggests that self-interested managers can use free cash flow to undertake value-destroying mergers. Since risk management provides firms with sufficient funds to undertake projects and managers may invest in the projects to benefit themselves, the valuation effect may be different between derivative users and non-users, and the effect may be different for firms with different degrees of agency problems.

In terms of the derivatives and firm value, previous literature shows mixed evidence. Allayannis and Weston (2001) and Nelson et al. (2005) show a positive relation between derivative usage and firm value, while Jin and Jorion (2006) show a negative relation. Fauver and Naranjo (2010) show that a negative relation exists among firms with greater agency and monitoring problems. It remains unclear how derivatives affect a firm's decision on M&As, and the impact on firm value through M&A activities.

Moreover, a firm's choice of payment of method can also receive a different stock market response. It is generally believed that acquisitions with equity payments underperform deals with cash payments since stock payment sends the signal that the acquiring firm's stocks are overvalued (Faccio & Masulis, 2005; Travlos, 1987). When derivative users make acquisitions, their stock return performance is also affected by the choice of payment method. While previous literature rarely explicitly examines the links between derivative usage and the financing decision of the bidders, this thesis aims to investigate the impact of derivate usage on the choice of method of payment, which will fill the research gap.

Some recent empirical literature attempt to investigate the impact of financial hedging on corporate investment. For example, Alexandridis et al. (2021) examine a sample of 1738 US M&As from 1998 to 2012 and find that 61.1% of acquirers are derivative users. They conclude that derivative users are more likely to pay cash and use external borrowing when making acquisitions, and the financial flexibility from hedging exacerbates the agency cost, leading to an overinvestment problem. In their research, the CEO's exposure to the stock price is used as a measure of agency problems. The study indicates that financial derivative usage is partially driven by managerial compensation, thereby the agency cost arising from financial hedging could be exaggerated when CEO has excessive exposure to share price. Their finding provides some agency explanations for derivative usage and M&A performance. Nevertheless, the stock return performance was not addressed in the study. Also, the sample size is limited and mainly focused on the 5th and 6th merger waves[1]. Therefore, no previous literature analysed the impact of derivative usage and the bidder returns.

As discussed above, there is a linkage between derivative usage and firm investment, but there are few studies explicitly examining the relation between derivative usage and the decision of making acquisitions, and the impact of derivative usage on acquirers' announcement returns. In addition, how derivative usage affect the choice of payment method in M&As remains unclear. Therefore, examining the M&A activities of derivative users and non-users could provide some insight on risk management for non-financial firms.

[1] Martynova and Renneboog (2008) summarised the 6th merger wave as: Wave 1(1890s-1903), Wave 2(1910s-1929), Wave 3(1950s-1973), Wave 4(1981-1989), Wave 5 (1993-2001) and Wave 6 (2003-2008).

1.3. Research Question

1.3.1 Relationship between Derivative Usage and the Likelihood of M&A Transactions

Derivatives are used by non-financial firms to reduce the exposure to risks and meanwhile, with lower cash flow volatility compared to firms without derivatives, derivative users have fewer worries than non-users. Moreover, smooth earnings are favoured by creditors, implying better credit ratings and lower costs of borrowing. All of these provide opportunities for derivative users to invest M&As. Therefore, the first research question in this thesis is: Does derivative usage affect a firm's choices of bidding?

1.3.2. Derivative Usage and the Announcement Returns

Derivative usage could mitigate the underinvestment problems mentioned by Myers (1977), therefore, derivative users may have better performance of M&As than non-users due to effective investment. However, the potential agency problems indicated by Tufano (1998) associated with risk management, could also negatively affect shareholder return. Therefore, the second research question is: Does derivative usage affect the performance of M&As?

1.3.3. Derivative Usage and Method of Payment of M&As

Derivative users have better access to internally generated cash flows when there is a shortage of funds compared to non-users, therefore, they are less financially constrained and less reliant on equity payment. If a firm's choice of payment method

in M&As could receive a different stock market reaction, then acquirers may choose the way that benefits the shareholders. Therefore, the third research question is: Does derivative usage affect the choice of method of payment?

1.4. Main Findings

To answer research question 1, I use a probit regression on a sample of US firms from 2009 to 2021 to estimate the likelihood of making acquisitions of derivative users and non-users. The result shows that derivative users are more likely to become acquirers in M&As compared to non-users, consistent with the literature that derivative usage facilitates higher magnitude of investments (Géczy et al., 1997; Lin & Smith, 2007; Sun et al., 2022).

Regarding research question 2, I use a univariate analysis and OLS regressions to examine the impact of derivative usage on announcement returns. The result shows that non-users on average have higher announcement returns and higher standard deviations of abnormal returns compared to derivative users, however, the result of OLS regressions does not exhibit evidence that the difference was contributed by the derivative usage. Further, additional tests on subsamples show that COVID-19 does not change the result for the full sample.

Finally, for research question 3, I use probit regressions to predict the likelihood of using a different method of payment in M&As. The result shows that derivative users are less likely to use cash payments compared to non-users. The results show some evidence that supports the theory in risk management, that non-financial firms use derivatives to reduce the exposure to risks and reduce underinvestment problems. Derivative users have better access to the external market and lower costs of external

financing. However, it remains unclear if derivative usage is linked to agency problems and affects the short-term stock return performance through agency problems.

1.5. Contribution

In this study, I use a large sample of 7183 US M&As for the period 2010-2021, which is the post-financial crisis period, to examine the impact of derivative usage on the firm's investment choice, payment method in M&A transactions and the valuation effect of M&As. By analysing these, the study shed a light on the value of derivative usage through the channel of M&As. The study fills in the gap between literature in risk management and corporate takeovers, by providing evidence on the impact of derivative usage and investment decision, and the acquirers' abnormal returns. Also, the study explicitly examines the impact of derivative usage on the choice of method of payment, which provide evidence on the financing decision of M&As.

1.6. Organisation of the Thesis

The thesis is organised as follows. In section 2, I provide critical analysis of the literature regarding risk management, derivate usage and M&A decisions of the corporations. In section 3, I discuss the hypotheses. In section 4, I present the data and methodology. In section 5, I provide a discussion of the results. In Section 6, I conclude the thesis with a brief summary of the main findings, limitations of the research and suggestions for further research.

2. Literature Review

This section discusses the theoretical and empirical literature on risk management and M&As. I first review the literature on derivative usage, including the motives of holding derivatives, the types of derivatives, derivatives and investment, and how derivatives affect firm value. Then I discuss the factors that affect M&A performance, including the motives, the valuation effect and the methods of payment.

2.1. Derivative Usage

2.1.1. Motives for Using Derivatives

There are many reasons for non-financial firms to use derivatives. Risk management theory indicates that the primary reason for derivative usage is to reduce the exposure to risks and prevent the firms from financial distress. Also, there are other reasons for firms to use derivatives, such as to increase debt capacity, facilitate investment and secure managerial jobs and benefits. In this section, I provide critical analysis of the literature on derivatives.

2.1.1.1. Cash Flow Volatility and Financial Distress

The traditional theoretical motive for companies using derivatives is to reduce cash flow volatility and lower the probability of financial distress (Froot et al., 1993; Mayers & Smith, 1982; Shapiro & Titman, 1986; Smith & Stulz, 1985). In an imperfect capital market, raising external capital is costly. When firms enter financial distress, managers could engage in gambling investment activities that transfer wealth from debtholders to shareholders (Jensen & Meckling, 1976). The increased cost of financial distress

causes sales decline and shrinking market value of equity, particularly pronounced in concentrated industries (Opler & Titman, 1994). Rountree et al. (2008) show that investors favour smooth cash flows by providing evidence of a negative relationship between cash flow volatility and shareholder value. They find that a 1% increase in cash flow volatility leads to a 0.15% decrease in firm value. Cash flow volatility also increases a firm's likelihood of seeking external financing and the costs of debt and equity (Minton & Schrand, 1999). Therefore, non-financial firms have the incentive to smooth cash flows and earnings.

Nowadays, most non-financial companies use derivatives to reduce cash flow volatility, thereby easing the cost of financial distress and lowering the probability of bankruptcy. Smith and Stulz (1985) suggest that hedging reduces the deadweight costs associated with financial distress and alleviates the problems associated with bond default, thereby mitigating agency problems between shareholders and bondholders. Hedging provides firms with sufficient internal funds in an imperfect capital market, thereby enabling them to take advantage of attractive investment opportunities (Froot et al., 1993). This is similar to the precautionary motive for companies holding cash (Acharya et al., 2012; Han & Qiu, 2007; Opler et al., 1999; Palazzo, 2012). The empirical literature has shown evidence that hedgers are less sensitive to cash flow than non-hedgers, thereby mitigating the negative effect of cash flow volatility. For example, Berkman and Bradbury (1996) examine a sample of New Zealand firms and show that derivative usage is consistent with the theoretical models. Guay and Kothari (2003) test a sample of 234 large US non-financial companies and find some evidence that derivative users benefit from hedging when sensitivity to cash flow and market value is high, although the magnitude is small and potentially implies alternative explanations to the traditional risk management theory. Beneda (2013)

examines a sample of 17781 firm-year observations and suggests that cash flow hedging smooths reported earnings. Altuntas et al. (2017) use a sample of insurance companies and show that derivative users' firm values are less sensitive to cash flow volatility. Hahnenstein et al. (2021) empirically examine 189 German companies and their finding is consistent with the financial distress costs theory of risk management.

Although there might be other purposes for companies to use derivatives, the primary motive for using derivatives is to hedge against risk. Since non-financial firms have no competitive advantage in predicting financial risks, therefore, eliminating exposure to the risks such as exchange rates and interest rates is sensible (Bartram, 2006). Hedging provides a firm competitive advantage by allowing them the greater ability to take operational risks (Bartram, 2019).

2.1.1.2. Debt Capacity and Tax Shields

The Modigliani and Miller (1963) theorem on capital structure demonstrates that with the existence of interest tax shields, the value of a levered firm is higher than an unlevered firm. The optimal debt-equity ratio is the level which minimises the weighted average cost of capital. Since using derivatives lower the probability of financial distress for the company, hedging could increase the optimal debt-equity ratio and also the tax shields associated with the debt (Leland, 1998; Myers, 1984; Ross, 1998; Stulz, 1996). Therefore, companies increase debt capacity by using derivatives, which results in higher tax shield, ultimately, reduces tax liabilities. Moreover, smoothing taxable income also lowers the expected tax payment for firms facing convex tax schedules (Nance et al., 1993; Smith & Stulz, 1985). Further, Bessembinder (1991)

suggests that hedging allows firms to meet their obligations which eventually improves the contract terms that the firms can negotiate with the creditors.

The recent empirical literature provides evidence on the effect of hedging on debt capacity and tax shields. Graham and Rogers (2002) suggest that companies hedge increase debt capacity and interest deductions, although no evidence supports the tax deduction effect for companies with convex tax functions. Lin et al. (2008) find that hedging is positively related to leverage. They also find evidence consistent with Smith and Stulz (1985) that firms with convex tax schedules hedge more than others, in order to lower the volatility of taxable income. Campello et al. (2011) test derivative users' accessibility to credit and find that hedging firms pay lower interest spreads and have more favourable terms in loan agreements than non-hedging firms, thus allowing better investments. Chen and King (2014) examine a sample of 2797 US firms and conclude that hedging is associated with a lower cost of debt, and the effect is consistent across industries. Alexandridis et al. (2021) examine derivative usage and M&A activities and the result indicates that corporate hedging decreases the borrowing cost for the acquiring companies. From the perspective of capital structure, reducing the cost of debt and taking advantage of tax savings serve as a motive for derivative usage for corporations.

2.1.1.3. The Underinvestment Problem

The underinvestment problem provides an incentive for hedging. The problem is proposed by Myers (1977), who indicates that levered firms may forgo positive NPV projects if the value of the investment goes to shoring up the debtholders' position, leaving little or no return to shareholders. Consequently, such behaviour leads to the

loss of the overall value of the firm. Myers (1977) and Smith et al (1990) also point out that it is costly and impractical to solve this problem by adjusting debt contracts.

One argument is that the imbalance between supply and investment demands for funds shifts investment away from the optimal level. Risk management enables firms to better align their demands and internal supply of funds thereby reducing the imbalance. Bessembinder (1991) indicates that derivative usage reduces agency costs by shifting individual future states from default to non-default outcomes, thereby increasing the proportion of future states in which equity holders are the residual claimants, reducing the incentives for underinvesting. Froot et al. (1993) point out that hedging enables a stable supply of internal cash flow which alleviates the underinvestment problem.

Empirical literature in risk management supports the theory of the underinvestment problem. Using R&D as a proxy for growth opportunities, Nance et al. (1993), Gay and Nam (1998), Allayannis and Ofek (2001), Graham and Rogers (2002), Lin et al. (2008), Choi et al. (2013) find a positive relation between R&D and hedging, supporting the view that derivative usage reduces underinvestment problem. However, when using the book-to-market ratio as a proxy, many empirical literature (Allayannis & Ofek, 2001; Graham & Rogers, 2002; Lin et al., 2008; Nance et al., 1993) provides no supporting evidence. In addition, other literature, for example, Deshmukh and Vogt (2005) test hedging firms' sensitivity to cash flow, suggesting that investment spending is less sensitive to cash flow for hedgers than non-hedgers. The finding is consistent with the underinvestment hypothesis that hedging reduces the cash flow volatility and the reliance on external financing. Overall, theory and evidence support that corporate hedging mitigates agency costs between shareholders and bondholders by reducing underinvestment problems.

2.1.1.4. Managerial Risk Aversion

Researchers argue that managerial risk aversion is an incentive for using derivatives. Some agency models demonstrate that managers are reluctant to take risks even those increase firm value because of career concerns (Amihud & Lev, 1981; Hirshleifer & Thakor, 1992). Compared with shareholders who can diversify their portfolios in capital markets, managers of non-financial firms are relatively less diversified. Stulz (1984), Smith and Stulz (1985) and Stulz (1996) argue that managers have an incentive to lower their exposure to firm-specific risk because their career is tied to the company. Firm-level hedging can alleviate conflicts of interest by linking management compensation to share price (Campbell & Kracaw, 1987; Han, 1996). Therefore, closely held firms or firms with multiple classes are more likely to use derivatives (Tufano, 1996).

The recent empirical literature provides evidence on how managerial risk aversion affects companies' hedging policies. For example, Rogers (2002) investigates the risk-taking incentives of CEOs from stock and option holdings in relation to derivative holdings and the evidence suggests a negative relation. This implies that managerial risk-taking incentives are an important determinant of corporate risk management. Abdel-Khalik (2007) examines CEO risk aversion and the volatility of earnings and operating cash flow and finds a negative relation. The author indicates that CEOs are undiversified investors in the firm, which provides an incentive to reduce earnings volatility. Bodnar et al. (2019) analyse international data and suggest that risk-averse executives prefer to work at firms that engage in hedging activities. Moreover, they find that when executive compensation is stronger tied to stock and options, the company has a higher propensity to engage in risk management. Haar and Gregoriou

(2021) argue that commodity hedging should take cognisance of both market conditions and the degree of risk aversion. Overall, the literature suggests that risk aversion of managers is an important incentive for them to use derivatives.

2.1.2. Derivative Types and Usage Across the World

Empirical literature analyse derivative usage of the US and across the world. Nelson et al. (2005) examine over 5700 US public firms from the period 1995 to 1999 and constructed a sample of 14,518 firm-year observations. They find that 21.6% of firms in their sample hedged with derivatives. The derivatives are classified as currency derivatives, interest rate derivatives and commodity derivatives. Their sample shows that 57% of hedgers use currency derivatives, 53.7% of hedgers use interest rate derivatives and 21.8% use commodity derivatives, and 26.8% of firms use multiple derivative types. They suggest that the type of derivatives varies across industries, for example, commodity hedges are largely used in mining and oil industries, while currency and interest rate derivatives are widely used in multiple industries.

Bartram et al. (2009) provide international evidence on derivative usage by examining 7319 companies in 50 countries in 2000 and 2001, including the US. Their sample accounts for 80% of the global market capitalisation of non-financial firms. In their sample, 60.3% of firms are derivative users. Among the hedgers, 45.2% of firms use foreign currency derivatives, 33.1% use interest rate derivatives and 10% use commodity derivatives. They also find that derivatives are widely used in utility and chemicals industries and least used in consumer goods and miscellaneous (mostly service) industries. Their analysis of international data is consistent with the finding of Nelson et al. (2005) of US data, that foreign currency derivatives are the most widely

used type of derivatives across industries and commodity derivatives are the least used type of derivatives but are predominantly used by oil and utility companies.

Recent empirical literature from Bartram (2019) examines a sample of 6896 non-financial firms in 47 countries, which consists of all firms with accounting data in 2000 or 2001 in the Thomson Analytic database. The sample represents 76.8% of the global market capitalisation of non-financial firms. The sample is a similar sample with his previous paper by Bartram et al. (2009) and the usage of different types of derivatives is roughly the same. While in this paper, the author indicates that derivative usage is more frequent in developed countries than in non-OECD countries and less popular in the US compared to non-US firms. This is consistent with the finding of Nelson et al. (2005). However, other researchers use different US samples to show a higher proportion of derivatives users among non-financial firms. They suggest that the use of derivatives shows an increasing trend among non-financial firms in the US. For example, Fauver and Naranjo (2010) use a sample of 1746 firms from 1991-2000 and find that above 50% of non-financial firms use derivatives. Gay et al. (2011) show that over 50% of firms in their sample used at least one type of derivatives in the period 1992-2006 and the period 2002-2004.

2.1.3. Derivative Usage and Investment

Derivative usage could affect a firm's decision on making investments because hedging enables non-financial firms to generate smooth cash flows and less exposure to risks in bad times. Therefore, derivative usage could encourage firms to undertake investment activities. By undertaking the M&As, the acquirers could benefit from the synergies due to economies of scale and higher market power. Moreover, with better access to external financing and a lower cost of borrowing compared to non-users,

derivative users could generate higher performance in stock returns than non-users. While because of smooth earnings and financial slack provided by hedging, derivative usage also provides opportunities for managers to make M&As due to agency motive and managerial overoptimism, leading to negative stock market response.

Existing literature shows some evidence about the relationship between derivative usage and corporate investment. For instance, Géczy et al. (1997) find that firms with good investment opportunities and tight financial constraints are likely to use currency derivatives, implying that hedging reduces cash flow volatility that might otherwise preclude firms from investing. Lin and Smith (2007) show that firms with good investment opportunities increase their investment by hedging, while those with poor investment opportunities use derivatives to increase their leverage. Lin et al. (2008) argue that when firms become more efficient at risky investments, they will borrow less, invest more in risky assets and undertake more hedging programs. The finding suggests that hedging, financing and investment decisions are jointly determined. Campello et al. (2011) show that corporate hedging policies are valued by creditors and eventually translate into gains by facilitating investment. Sun et al. (2022) find that derivative usage increases investment efficiency, prevalent among firms with strong financial constraints, high informational asymmetry and weak corporate governance. Therefore, the majority of previous studies suggest that derivative usage facilitates effective investment.

2.1.4. Derivative Usage and Firm Value

Empirical studies provide evidence on the relationship between derivative usage and firm value. Some studies show a positive relationship between derivative usage and

firm value. Allayannis and Weston (2001) use a sample of 720 large firms and find a positive relationship between the use of foreign currency derivatives and firm value. Nelson et al. (2005) show that derivative users outperform other securities by 4.3%. Lin et al. (2009) point out that derivative usage can alleviate information asymmetry and thus well used derivatives positively affect the firm value in M&A. Chen et al. (2017) show derivative users receive higher announcement returns in cross-border M&As and with high deal completion probabilities and better post-merger performance than non-users. Bartram (2019) concludes that derivative usage reduces corporate risk and increases the firm value by analysing an international sample of 6896 non-financial firms from 47 countries. Sun et al. (2022) show that risk management increases firm value by providing evidence of the positive effect of corporate hedging on cash policy. While others document either no relation or negative relation between derivative usage and firm value. For example, Jin and Jorion (2006) test 119 U.S. oil and gas producers and find no relation between derivative usage and firm value. Fauver and Naranjo (2010) use a sample of 1746 firms and find derivative usage negatively influences firm value in firms with greater agency and monitoring problems.

2.2. Mergers and Acquisitions

2.2.1. Motives for M&As

Trautwein (1990) indicates several theories of merger motives, such as efficiency, monopoly, valuation, empire building, process, raider and disturbance theory. Later on, Berkovitch and Narayanan (1993) suggest three major motives for M&As: synergy, agency and hubris. The study suggests using the correlation between targets and total gains as a method of distinguishing among these competing hypotheses. They argue

if synergy is the motive, the correlation is positive, if agency is the motive, the correlation is negative, and zero if hubris is the motive.

A volume of the literature suggests that synergy is the primary reason for takeovers. Empirical literature such as Eun et al. (1996), Seth et al. (2000), Seth et al. (2002), Kiymaz and Baker (2008), Dutordoir et al. (2014), Brahma et al. (2018) provide supporting evidence on the synergy hypothesis. Moreover, survey papers also show the predominant motive for M&As is achieving operating synergy. According to a survey of CFOs of US firms by Mukherjee et al. (2004), the primary reason for companies engaging in M&A activities is to gain synergy. A study of Indian managers Rani et al. (2016) shows a similar point of view that achieving operating synergy is the major reason for undertaking acquisitions.

While literature also provides evidence on agency motives and hubris motives for mergers. For example, the free cash flow hypothesis on acquisitions (Jensen, 1986) indicates that managers are likely to use excess cash to make acquisitions instead of paying dividends. While Bruner (1988) indicates bidders are relatively more financial slack than other firms before acquisition, and the combination of slack-rich bidders and slack poor targets create value, therefore, the use of excess cash and debt capacity provides a motive for mergers. Morck et al. (1990) show that managerial objectives, as a driver of acquisitions lead to a reduction in firm value. Consistent with the agency hypotheses, Harford (1999) shows that cash-rich firms are likely to make value-destructive acquisitions. Seth et al. (2002) also find that value-destroying acquisitions are driven by managerialism. Ismail (2011) finds that management self-interests result in overpaying targets by the acquiring firms. Nguyen et al. (2012) investigate a sample of 3520 M&As in the US and conclude that 59% of them are related to agency motives or hubris. Gormley and Matsa (2016) examine managers'

actions after antitakeover legislation and find that they tend to take value-destroying actions that reduce stock volatility and distress. Gul et al. (2020) find that overconfident CEOs with high CSR engagement in low CEO ownership firms are likely to make acquisitions, supporting the agency theory.

2.2.2. Valuation Effect of M&As

The M&As literature shows mixed evidence of the value creation in M&As. Martynova and Renneboog (2008) reviewed the five merger waves in the 20th century and summarised the findings of the empirical literature. A larger number of studies show that target firms benefit from M&A activities (Franks & Harris, 1989; Graham et al., 2002; Lang et al., 1989; Servaes, 1991) with a range from 14% to 44%, while the gains to acquiring firms are questionable. On average, the acquiring firms' announcement returns are not significantly different from zero (Dennis & McConnell, 1986; Schwert, 1996). In terms of the 6th merger wave started in 2003, Alexandridis et al. (2012) show that acquiring firms had an average 1.5% abnormal loss during the 3-day event window at the announcement and there are more losers than winners in their sample. Moreover, the long-term return is -9.1% 3 years following the announcement. While for the post-2009 period, Alexandridis et al. (2017) find that acquiring firms receive positive and significant abnormal returns, indicating that hubristic behaviour has diminished.

Researchers show that some firm characteristics affect the return of acquiring firms. For example, Moeller et al. (2004) find that there is a size effect associated with acquisitions. The shareholders of small acquirers outperform big acquirers. Lang et al. (1991) find that bidder returns are negatively related to cash flow for firms with low

investment opportunities. Heron and Lie (2002) find that acquiring firms' market-to-book ratio is positively associated with post-acquisition operating performance.

Empirical evidence suggests that negative bidder returns were associated with agency problems. Consistent with the free cash flow hypothesis (Jensen, 1986), Harford (1999) shows that firms with excess cash are more likely to make acquisitions and these acquisitions are value-decreasing. Schlingemann (2004) finds a negative and significant relation between bidder returns and internally generated cash flows. Gaspar et al. (2005) suggest that the investment horizon of institutional shareholders impacts bidder returns. Acquiring firms with a short investment horizon receive negative announcement returns, indicating that firms with weak monitoring from short-term shareholders allow managers to make value-decreasing acquisitions. Masulis et al. (2007) find that acquiring firms with more antitakeover provisions receive lower announcement returns, implying that firms less subject to market disciplinary power are more likely to engage in empire-building M&As, leading to the destruction of shareholder value. Harford et al. (2012) show that entrenched managers of acquiring firms are likely to acquire public targets, use all equity offers and overpay the targets, resulting in lower announcement returns and post-acquisition operating performance. Becher et al. (2020) argue that during easy money periods, deal transactions by large firms show value decreases and the effect is prevalent among firms with large agency costs.

Nevertheless, some empirical studies including Martynova and Renneboog (2009), Lin and Lin (2014) and Gao (2015) find no evidence supporting the agency explanation for negative acquirer returns.

2.2.3. Method of Payment

Previous literature shows that methods of payment affect bidding firms' announcement returns. For example, Travlos (1987) argues that acquiring firms using stock payment show significant losses at the announcement, regardless of deal types. While firms using cash payment earn normal rates of return at the announcement. The results support the signalling hypothesis that deals using stock payment convey negative information that the acquiring firm is overvalued. Martin (1996) indicates that many reasons affect the method of payment in M&As, including the characteristic of the bidder and target, also the characteristics of the environment. The author finds the mode of acquisition and the investment opportunities are the two most important characteristics affecting the choice. Tender offers are likely to be financed by cash while acquiring firms with good investment opportunities tend to use stocks. Heron and Lie (2002) examine the relationship between methods of payment and operating performance, and the result shows no evidence of the information on payment methods on the operating performance. Instead, they find that operating performance is improved for M&As which high market-to-book ratios firms acquiring low market-to-book ratio targets. Faccio and Masulis (2005) examine a sample of European M&As and suggest that acquiring firms' corporate governance and corporate control concerns affect the choice of payment methods. When bidders have good access to bank financing, cash payment is likely. Stock payment is more likely when the target is under acquiring firm's control. While other literature, for example, Moeller et al. (2004) find that M&As have positive abnormal returns regardless of the payment methods.

Recent papers provide alternative explanations for the effect of payment methods on M&As. For example, Martynova and Renneboog (2009) show that many

factors affect the choice of financing decision, including the bidder's pecking order preferences, growth potential, and corporate governance. Chen et al. (2011) argue that the strategic timing of acquisition announcement determines the effect of payment methods. Dutta et al. (2013) examine a sample of Canadian domestic and cross-border acquisitions, showing that stock financed deals exhibit positive significant announcement returns but no evidence of long-term operating performance. They interpret the result as the market correction in subsequent periods for overreaction for cross-border acquisitions finance by stock. Karampatsas et al. (2014) argue that the choice of payment methods in M&As is affected by the credit rating level. Bidders are more likely to use cash payments when they have a high credit rating level. Dang et al. (2021) examine the country-specific uncertainty on the choice of payment methods in M&As. They find that acquirers are more likely to use non-cash payments when the host country has a high level of uncertainty.

To sum up, previous literature generally examines two aspects of the payment methods in M&As: First, the choice of payment methods. The choice of payment methods is affected by the characteristics of acquirers and targets, and also the environment. Second is the effect on shareholders' return, and most studies show a negative announcement effect for deals with stock payment, supporting the signalling hypothesis.

2.3. Summary

As discussed above, firms have incentives to use derivatives, including reducing cash flow variation, increasing debt capacity, and reducing underinvestment problems. Derivatives are also used by undiversified managers to reduce their risks. Among the

derivative instruments, currency derivatives, interest rate derivatives and commodity derivatives are the three major types, of which currency derivatives are the most widely used type. Previous research also indicates that derivative usage increases investment efficiency and increases firm value.

In terms of M&As, synergy is the primary reason for acquisitions, while evidence also suggests that some M&As are driven by agency and hubris motives. It is generally believed that M&As create value for target firms' shareholders, while the evidence for acquiring firms is mixed. Some firm characteristics, such as size, market-to-book ratio and cash level affect the bidders' performance. Many researchers argue that the negative announcement returns of the bidder are due to agency problems, while others find no supporting evidence. Some researchers suggest that cash-paid M&As experience higher announcement returns than stock-paid deals and multiple factors affect the acquiring firm's financing choice of M&As.

3. Hypotheses

3.1. Relationship between Derivative Usage and the Likelihood of M&A Transactions

The first question is to test the likelihood of bidding of derivative users and non-users. Derivative usage reduces cash flow variation and provides a solution to underinvestment problems. Myers (1977) indicates that managers may forgo positive NPV projects if the expected benefits only suffice to repay debt claimants. Bessembinder (1991), Froot et al. (1993), Clifford and Smith (1995), and Tufano (1996) argue that derivative usage reduces the imbalance between supply and investment demands for funds, alleviating underinvestment problems as mentioned in Myers

(1977). Moreover, derivative usage reduces the reliance on external financing (Deshmukh & Vogt, 2005), enabling firms to undertake investment activities. As cash flow volatility is negatively related to investment (Minton & Schrand, 1999), derivative usage reduces cash flow volatility that might otherwise preclude firms from investing (Géczy et al., 1997).

Also, Jensen (1986) shows that firms with free cash flow are likely to make acquisitions. Later empirical literature in M&As such as Harford (1999), Nguyen et al. (2012), and Gul et al. (2020) provides further evidence on the likelihood of bidding. These findings suggest that self-interest managers have the incentive to conduct M&As for empire building. Hedging provides financial slack; therefore, derivative users have sufficient funds when there is a shortage in the supply of internally generated funds, avoiding the monitoring from the external market (Diamond, 1984; Easterbrook, 1984). Consequently, the supply of internally generated funds enables entrenched managers to undertake M&As that might be restricted by loan covenants (Bharadwaj & Shivdasani, 2003; Nini et al., 2009). Therefore, from both perspectives, the first hypothesis is as follow:

H1: Derivative users are more likely to conduct M&As than non-users.

3.2. Derivative Usage and the Announcement Returns

The second question is to test the relation between derivative usage and bidder announcement returns. Myers (1977) mentions that underinvestment problems lead to a loss in the market value of the firm, and such loss will transfer to the current shareholders of the firm. Bessembinder (1991), Froot et al. (1993), Clifford and Smith (1995) and Tufano (1996) show that risk management alleviates underinvestment

problems by ensuring firms continue to invest in value-enhancing projects without resorting to the expensive capital market. According to the pecking order theory (Myers, 1984; Myers & Majluf, 1984), with the existence of informational symmetry, firms first rely on internal sources of funds than debt and equity. The financing choice of takeover is consistent with the pecking order theory (Martynova & Renneboog, 2009). Since hedging produces smoother cash flow and financial slack when the market is tight, using derivatives enables firms to invest in projects with growth opportunities. Empirical literature such as Allayannis and Weston (2001), Nelson et al. (2005), Lin et al. (2009), Chen et al. (2017), Bartram (2019), Sun et al. (2022) suggest that derivative usage is positively related to firm value. Based on the discussion above, bidding firms with derivative usage may have higher announcement returns than non-users.

H2a: Derivative users have higher announcement returns than non-users in M&As.

On the other hand, the free cash flow theory (Jensen, 1986) illustrates that firms with excess free cash flow are likely to conduct value-destroying acquisitions. Derivative usage enables firms to generate internal funds without access to expensive external financing (Tufano, 1996). Since the external market provides monitoring to managers (Diamond, 1984; Easterbrook, 1984), derivative users are less monitored by creditors and shareholders compared to non-users. Tufano (1998) argues that risk management generates excess free cash flow without the monitoring of the external capital market, thereby can be used by managers for their private interests. Thus, derivative usage provides opportunities to managers to facilitate the protection of the projects to enhance their value at the expense of shareholders' interests. Such bids made by derivative users may receive lower announcement returns than non-users.

H2b: Derivative users have lower announcement returns than non-users in M&As.

3.3. Derivative Usage and Method of Payment of M&As

The third question is to test the relation between derivative usage and payment method. The pecking order theory (Myers, 1984; Myers & Majluf, 1984) indicates that due to informational asymmetry, the cost of external financing is higher than internally generated funds, firms prefer internally sources of funds, then debt and equity. Martynova and Renneboog (2009) suggest that acquiring firms will first use internal sources of funds in takeovers, consistent with the pecking order theory. Since derivative usage reduces cash flow volatility, provides financial slack and reduces the reliance on external markets (Deshmukh & Vogt, 2005), acquiring firms with derivatives are more likely to use cash as a payment method.

H3a: Derivative users are more likely to use cash as a payment method for M&As.

However, derivative usage lowers borrowing costs because it reduces cash flow volatility, enabling firms with better access to external financing. Derivative users have better credit ratings and lower interest spreads (Campello et al., 2011) compared to non-users, therefore, with a lower cost of external financing and a better investment. Recent empirical literature Alexandridis et al. (2021) provide additional evidence that derivative users are linked to more external financing than non-users. Therefore, I have the following hypothesis.

H3b: Derivative users are more likely to use non-cash payment methods for M&As.

4. Data and Methodology

4.1. Data

First, I collect the US M&As data from Refinitiv Eikon for the sample period 2010-2021. Both the acquirers and targets are US firms. Financial firms are excluded from both acquirers and targets. The Deal Status must be 'Completed' and the Deal Value is greater than 1 million. The public status of the acquiring firms is 'Public'. After the screening procedure, there are 9,663 M&As left. Deal characteristics such as 'Deal Value', 'Consideration Offered' and 'Percentage of Shares Owned after Transaction' are collected from Refinitiv Eikon. The criteria for the sample section is displayed as follow:

Field Name	Operator	Description	Hits
Deal Status	Include	Unconditional,Completed	
Nation Classification(T,A)	Include	United States	
M&A TRBC Activity(T,A)	Include	(All sectors exclude financial services)	
M&A Type	Include	Disclosed Dollar Value Deal	
Public Status(A)	Include	Public	
Date Announced	Custom	01 Jan 2010 and 31 Dec 2021	
Acquiror Nation	Include	United States	
Target Nation	Include	United States	
Deal Value(USD,Millions,Do Not Keep N/A)	Greater Than or Equal	1.00	9663

Figure 1. Sample Selection

Second, derivative usage data are collected from DataStream. There are five items were considered: 'Derivative Assets – Current', 'Derivative Assets Non-Current, Thermo Fisher' – 'Derivative Liabilities-Current', 'Derivative Liab - Non-Current', 'Unrealised Valn G/L-Hdgs/Derts'. A derivative user is defined as: a firm with at least one record in the five items, otherwise, the firm is a non-user. The stock return data of the acquiring firms are collected from DataStream. Abnormal return is calculated as the difference between the actual return and the expected return based on S&P

Composite Index using the market model (CAPM). The event window is (-1,+1), which is the sum of the three-day abnormal returns from one day before the announcement and one day after the announcement. The financing data for control variables are collected from DataStream, which includes ‘Total Assets’, ‘Cash and Short-Term Investments’, ‘Market-to-Book Value’ and ‘Long-Term Debt’. Firms with missing data key items such as ‘Total Assets’ and ‘Cash and Short-term Investments’ are excluded. Finally, I construct a sample of 8506 M&As with financial data available, of which 7183 with the data of the three-day cumulative abnormal returns.

Finally, I collect other financial data for a sample of US firms from 2009 to 2021 to predict the likelihood of making acquisitions. The firms are first collected from Refinitiv Eikon, with the following requirement: The firm is not in the financial services industry. The firm should be listed in an exchange in the US and with a currency of ‘US Dollar’. The type of Equity is “Ordinary Shares”. Then I collect a sample of 8942 firms, with the information of deal characteristics, such as deal value and considerations offered. Using the sample of firms, I expend the firms to firm-year observations by including the time series data items such as 'Total Assets, reported', 'Total Current Assets', 'Total Current Liabilities, ‘Total Revenue’, ‘Total Common Shares Outstanding’, ‘Price Close’ and ‘P/E Daily Time Series Ratio’. Derivatives data for the sample is collected using the following standardized balance sheet items ‘Current Derivative Liabilities – Hedging, Supplemental’, ’Current Derivative Liabilities-Speculative/Trading, Supplemental’, ‘Non-Current Derivative Liabilities – Hedging, Supplemental’ and ‘Current Derivative Liabilities-Speculative/Trading, Supplemental’. After excluding missing data and matching the acquiring firms using 6-digit CUSIP, I have a sample of 58,594 firm-year observations. The number of acquiring firms is reduced because

some firms do not have 6-digit CUSIP, also because firms with multiple M&As in the same year are counted as one observation.

4.2. Methodology

4.2.1. Relationship between Derivative Usage and the Likelihood of M&A Transactions

In order to address research question 1, I use a probit regression similar to Harford (1999) to estimate the likelihood of bidding for derivative users and non-users. The equation is:

$$Bidder_{i,t}(0,1) = \alpha + \beta_1 Derivatives_{i,t-1} + \beta_2 Sales\ growth_{i,t-1} + \beta_3 Noncash\ working\ capital_{i,t-1} + \beta_4 Leverage_{i,t-1} + \beta_5 M/B_{i,t-1} + \beta_6 P/E_{i,t-1} + \beta_7 Size_{i,t-1} + \varepsilon_{i,t} \quad (4.2.1)$$

where *Bidder* is the dependent variable which takes on the value of 0 for non-bidders and the value of 1 for bidders. A dummy variable *Derivatives* takes on a value of 0 for no derivative usages and the value of 1 for derivative users will be included. Several firm characteristics indicated by Harford (1999) are included as additional controls: *Sales growth* is the annual sales growth from the prior fiscal year. *Noncash working capital* is current assets minus current liabilities, minus cash, normalized by total assets. *Leverage* is the ratio of the book value of debt to the market value of equity. *M/B* is the ratio of the market value of equity to the book value of equity. *P/E* is the stock price at the end of the year divided by earnings per share for that year. *Size* is proxied by the natural logarithm of total assets.

4.2.2. Derivative Usage and the Announcement Returns

To examine research question 2, I first use univariate analysis on the three-day cumulative abnormal returns at the announcement period to examine the different stock market responses to the M&As made by derivative users and non-users. By comparing the mean CAR (-1, +1) of the two groups, and a t-test on the two group's mean, I attempt to examine research question 2 through the test.

I also use multivariate regressions on CAR is used to examine the influence of derivative usage on the stock return performance of M&As. Equation 4.2.2 is shown below:

$$CARs_{i,t} = \alpha + \beta_1 Derivatives_{i,t-1} + \beta_2 Relative\ value_{i,t-1} + \beta_3 Cash_i + \\ + \beta_4 Share100_i + \beta_5 Cash\ ratio_{i,t-1} + \beta_6 Size_{i,t-1} + \beta_7 BM_{i,t-1} + \beta_8 Lev_{i,t-1} + \varepsilon_{i,t} \quad (4.2.2)$$

where the dependent variable is *Cumulative Abnormal Returns (CARs).* CAR(-1,+1) is the cumulative abnormal return from day -1 to day +1 relative to the bid announcement for bidding firms. A dummy variable *Derivatives* takes on a value of 0 for no derivative usages and the value of 1 for derivative users will be included. I follow (Fauver & Naranjo, 2010) to include the characteristics of the M&As and firm characteristics are included as independent variables of the regression. *Relative value* is used to control the transaction size. It defines as deal value to the sum of deal value and the acquiring firm's market value of equity. *Cash* is a dummy variable, which is one if the acquisition is financed entirely with cash and the value of zero otherwise. If the bidder has not acquired 100% of the target's shares, it is likely that the overall effect on abnormal returns would be weakened. The dummy variable *Share100* is set to one for these bidders, and zero for bidders who acquire a majority, but less than

100% of shares. *Cash ratio* is the ratio of cash and short-term investment to total assets. As suggested by Harford (1999), the announcement returns of the acquisition are affected by the level of cash. *Size* is the natural logarithm of total assets. *Size* is used because previous literature, e.g., Moeller et al. (2004) find that the acquirer's size affects the bidder's returns. *BM* is the acquirer's book to market ratio, defines as the book value of common equity divided by the market value of common equity. The book-to-market ratio is a proxy of growth opportunity, which could affect the stock market's response to the deal. *Lev* is total long-term debt normalized by total assets.

4.2.3. Derivative Usage and Method of Payment of M&As

To address research question 3, I employed a probit regression to predict the likelihood of using cash or other payment methods. See equation 4.2.3.:

$$Cash_{i,t} = \alpha + \beta_1 Derivatives_{i,t-1} + \beta_2 Relative\ value_{i,t-1} + \beta_3 Share100_i + \beta_4 Cash\ ratio_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 BM_{i,t-1} + \beta_7 Lev_{i,t-1} + \varepsilon_{i,t}$$

(4.2.3)

where the dependent variable is a binary variable, *Cash*. It equals one if the deal is using cash payment, and zero otherwise. M&As financed by equity and the mix of cash and equity are classified as non-cash payments. The control variables are the same as the multivariate regression.

Variable	Definition	Source
Bidder	0 for non-bidders and the value of 1 for bidders	Refinitiv Eikon
Derivatives	0 for no derivative usages and the value of 1 for derivative users. Derivative users available data of one of the following: Derivative Assets – Current', 'Derivative Assets Non-Current, Thermo Fisher' – 'Derivative Liabilities-Current', 'Derivative Liab - Non-Current', 'Unrealised Valn G/L-Hdgs/Derts'	DataStream
Sales growth	Annual sales growth from the prior fiscal year	Refinitiv Eikon
Noncash working capital	Current assets minus current liabilities, minus cash, normalized by total assets	Refinitiv Eikon
Leverage	Ratio of the book value of debt to the market value of equity	Refinitiv Eikon
M/B	Market value of equity to the book value of equity	Refinitiv Eikon
P/E	Stock price at the end of the year divided by earnings per share for that year	Refinitiv Eikon
Size	Natural logarithm of total assets	Refinitiv Eikon
CAR (-1, +1)	Cumulative abnormal return of the acquiring firm from t-1 to t+1, using the benchmark of S&P 500 Composite Index.	DataStream
Relative value	Ratio of deal value to the sum of deal value and the acquiring firm's market value of equity	Refinitiv Eikon
Share100	1 if the percentage of shares hold is 100% after the transaction and 0 otherwise	Refinitiv Eikon
Cash ratio	Equals 1 if the percentage of shares hold is 100% after the transaction and 0 otherwise	DataStream
Size	Natural logarithm of total assets	DataStream
BM	Book value of equity divided by market capitalisation	DataStream
Lev	Book value of debt over its market value of equity	DataStream

Figure 2: Definition of Variables

5. Results

5.1. Summary Statistics

Table 1 Panel A reports the summary statistics of M&A Deals. The table reports a sample of 8981 U.S. M&As between 2010 and 2021. The CAR (-1, +1) is the cumulative abnormal return using the market model, S&P Composite Index as a benchmark. The mean CAR of the full sample is 0.138 and the median is 0.0025. Therefore, on average, the acquiring firms generate an abnormal return not significantly different from zero. The result is consistent with the findings during the five merge waves in the 20th century (Dennis & McConnell, 1986; Martynova & Renneboog, 2008; Schwert, 1996), while not supporting the result from Alexandridis et al. (2012) who find that acquiring firms had an average 1.5% abnormal loss during the 3-day event window. The mean deal value is 724.0466 million U.S. dollars, and the median is 348.383 million dollars. Therefore, the distribution for deal value is positively skewed. Within the deals, 57.99% use cash as a method of payment for the entire deal, and in 96.55% of transactions, the acquiring firms gained 100% shares after the M&As.

Table 1 Panel C shows the sample distribution of the M&As. The number of deals increased significantly during the period after the 2008 Financial Crisis, while the wave began to fade in 2016 and the number of deals reached the bottom in 2020 during the COVID-19 Crisis. It is not surprising that the number of deals reached the lowest in 2020, as most companies experience liquidity shortages due to reduced revenue during the COVID-19 period. As internally generated funds are the main source of financing for takeovers, and cash payment account for 57.99% of all deals

in the sample, the shortage of cash could be a possible explanation for the reduction in M&A activities.

Table 1: Panel A. Summary Statistics of M&A Deals

This table reports summary statistics. I use a sample of 8981 U.S. M&As from 2010 to 2021. *Deal Value* is the value of the transaction of the M&As in millions of US Dollars. *CAR (-1,+1)* is the cumulative abnormal return of the acquiring firm, using the benchmark of the S&P 500 Composite Index. *Derivatives* is a dummy variable, it equals 1 if an acquirer is a derivative user, and equals 0 if an acquirer is a non-user. *Relative value* is the ratio of deal value to the sum of deal value and acquirer's market value of equity. *Cash* is a dummy variable, which equals one if the method of payment is cash, and equals zero otherwise. *Share 100* is a dummy variable, which equals 1 if the percentage of shares hold is 100% after the transaction and zero otherwise. *Cash ratio* is the ratio of cash to total assets. *Size* is the natural logarithm of acquirers' total assets. *BM* is the acquirer's book to market ratio, defines as the book value of common equity divided by the market value of common equity. *Lev* is total long-term debt normalized by total assets.

Variable	Mean	25^{th}	Median	75^{th}	Std dev
CAR (-1, +1)	0.138	-0.5314	0.0025	0.7178	1.5247
Derivatives	0.3968	0	0	1	0.4893
Deal value	724.0466	20	83.6	348.383	3580.2834
Relative value	0.001	0	0.0001	0.0002	0.0143
Cash	0.5799	0	1	1	0.4936
Share100	0.9655	1	1	1	0.1825
Cash ratio	0.1648	0.0228	0.0786	0.2116	0.2139
Size	13.7089	12.6095	14.0385	15.3091	2.6735
BM	0.5015	0.2451	0.4444	0.7246	0.5626
Lev	0.2714	0.0627	0.2537	0.4194	0.2285

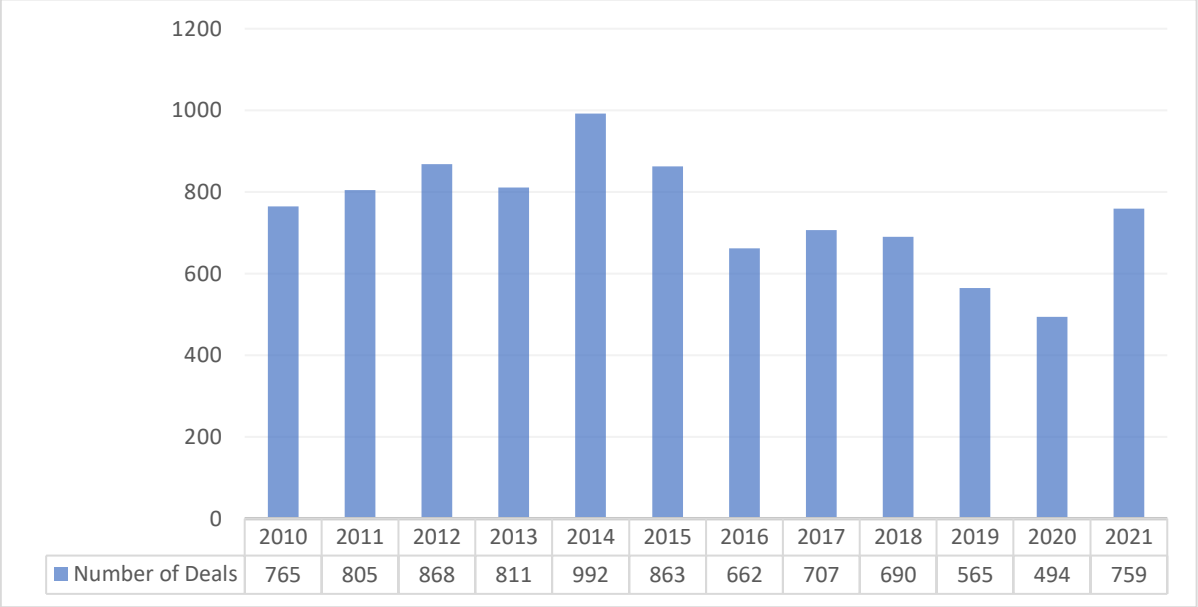
Table 1: Panel B. Correlations Matrix

	CAR (-1, +1)	Derivatives	Relative value	Cash	Share 100	Cash ratio	Size	BM	Lev
CAR (-1, +1)	1.0000								
Derivatives	-0.0274	1.0000							
Relative value	0.0080	-0.0080	1.0000						
Cash	-0.0488	0.0245	-0.0416	1.0000					
Share 100	0.0032	-0.0237	-0.0074	0.0034	1.0000				
Cash ratio	0.0393	-0.1439	0.1061	-0.2109	0.0410	1.0000			
Size	-0.0985	0.2232	-0.1793	0.2360	-0.0075	-0.3328	1.0000		
BM	-0.0353	-0.0073	-0.0152	0.0169	0.0168	-0.0435	0.0865	1.0000	
Lev	0.0302	-0.0106	0.0762	-0.0153	-0.0005	0.0461	-0.0717	-0.0042	1.0000

Table 1: Panel C. Sample Distribution

Announcement Year	Number of Deals	Percent	Derivative Users (Percentage)	Cash Payment (Percentage)
2010	765	8.52	44.71	57.39
2011	805	8.96	49.94	57.89
2012	868	9.66	50.35	63.48
2013	811	9.03	45.87	62.39
2014	992	11.05	39.92	61.49
2015	863	9.61	40.90	57.71
2016	662	7.37	38.82	62.84
2017	707	7.87	39.04	66.20
2018	690	7.68	41.59	60.72
2019	565	6.29	38.23	57.17
2020	494	5.50	41.30	56.07
2021	759	8.45	29.12	50.72
Total	8981			

Figure 1: Sample Distribution



5.2. Relationship between Derivative Usage and the Likelihood of M&A Transactions

Table 2 Panel A reports a sample of U.S. non-financial firms during the period from 2010 to 2021. The companies are classified as a bidder in that fiscal year if it has undertaken at least one deal with a transaction value larger than 1 million US dollars, otherwise, it is classified as a non-bidder. The sample contains 54,990 firm-year observations for non-bidders and 7,309 firm-year observations for bidders.

Table 2 Panel B reports the results of the probit regression on making acquisitions. The dependent variable is the binary variable, Bidder. By including the dummy variable ‘Derivatives’ as an independent variable, we can predict the likelihood of being acquirers for derivative users and non-users. Column 2 shows the results for the probit regression, without the year fixed effects and column 4 shows the results for the regression with the year fixed effects. The coefficient estimates for the dummy variable ‘Derivatives’ is 0.1182 in the baseline regression and 0.1311 in the fixed effect regression. Both of the estimates are statistically significant at 1% level. The result suggests that firms with derivative usage are more likely to become bidders in M&As, consistent with Hypothesis 1. This is not a surprising result as derivative usage provides financial slack to firms and mitigates underinvestment problems (Froot et al., 1993; Géczy et al., 1997). Also, from the agency perspective, firms with free cash flow are likely to make acquisitions instead of paying out to shareholders (Jensen, 1986). Therefore, evidence shows that derivative users are more likely to make acquisitions than non-users. The result from the probit regression is consistent with the finding of Alexandridis et al. (2021) who find that financing hedging increases the probability of announcing an M&A deal.

The coefficient estimates of the control variables also show some interesting facts. Sales growth is the growth rate of revenue during fiscal year t-2 to fiscal year t-1. The coefficient of 'Sales Growth' is 0.0716 in the baseline regression in column 2 and 0.1244 in the model with year-fixed effects in column 4. The result can be interpreted as companies with higher sales growth during the previous fiscal year are more likely to make acquisitions than companies with lower sales growth. This is consistent with the free cash flow theory (Jensen, 1986) and the prediction of Harford (1999) that cash-rich firms are more likely to make acquisitions. While it is not determined whether the acquisitions are driven by agency motives, using excess cash could be a potential explanation (Bruner, 1988). With the increased sales, companies have a higher level of free cash flow, and managers can easily use the resources for M&As for empire building. The coefficients for non-cash working capital in both column 2 and column 4 are insignificant. The coefficient estimates for Leverage are negative and statistically significant in both baseline regression and the fixed effect regression. The finding is consistent with the finding of Alexandridis et al. (2021) who also find a negative coefficient in their logit regressions and bivariate probit regressions. The result implies that highly levered firms are likely to make an investment, consistent with the agency theory of debt (Myers, 1977) that when there is a conflict of interest between shareholders and bondholders, the firm may forgo positive NPV projects.

In terms of the estimates for the market-to-book ratio and P/E ratio, both measures are proxies for growth. Market-to-book ratio is a forward-looking measure of the firm value, which reflects the investor's expectation and growth potential. The result from the probit regressions in column 2 and column 4 shows positive coefficients for the variable M/B, which can be interpreted as a firm with a high market-to-book ratio are more likely to become a bidder of an M&A deal. Similarly, firms with a high

P/E ratio have a higher probability of bidding. The result implies that when firms have great growth potential, they are more likely to make acquisitions. In addition, the coefficient of Size is positive and significant at 1% level, indicating that larger firms are more likely to become acquirers. The result is consistent with the estimate by Alexandridis et al. (2021) that size increases the possibility of bidding.

Overall, the results from the probit regression provide some evidence that supports the theory in risk management, that derivative users benefit from the reduced cash flow variation and alleviate underinvestment problems. It is undetermined whether the M&As made by derivative users are driven by agency motives at the current stage.

Table 2: Panel A. Predicting Bidders

The table reports the sample distribution of bidders and non-bidders. Bidder is defined as a firm that has undertaken at least an acquisition with a deal value greater than 1 million US dollars, otherwise, the firm is defined as a non-bidder.

Bidder	Freq.	Percent
0	54,990	88.27
1	7,309	11.73

Table 2: Panel B. Predicting Bidders

The table reports the probit regression on making acquisitions. The dependent variable is *Bidder*, which takes on the value of 0 for non-bidders and the value of 1 for bidders. A dummy variable *Derivatives* takes on a value of 0 for no derivative usages and the value of 1 for derivative users will be included. Several firm characteristics are included as additional controls: *Sales growth* is the annual sales growth from the prior fiscal year. *Noncash working capital* is current assets minus current liabilities, minus cash, normalized by total assets. *Leverage* is the ratio of the book value of debt to the market value of equity. *M/B* is the ratio of the market value of equity to the book value of equity. *P/E* is the stock price at the end of the year divided by earnings per share for that year. *Size* is the natural logarithm of total assets, reported. *, **, and *** stand for statistical significance at 10%, 5%, and 1% levels.

(1)	(2)	(3)	(4)	(5)
	Coefficients	z	Coefficients	z
Derivatives	0.1182***	5.48	0.1311***	5.74
Sales growth	0.0716***	3.6	0.1244***	6.06
Non-cash working capital	0.0487	1.57	0.0344	1.09
Leverage	-0.0051***	-3.8	-0.0059***	-4.37
M/B	0.0140***	5.89	0.0194***	7.82
P/E	0.0045***	12.78	0.0051***	13.87
Size	0.1112***	33.45	0.1171***	34.44
Constant	-3.9210***	-56.97	-9.0178	5.74
Year Fixed Effects	No		Yes	
N	58,594		58,594	
Pseudo R-square	0.0789		0.1132	

5.3. Derivative Usage and the Announcement Returns

Table 3 reports the stock return performance of the acquiring firms. In panel A, I list the distribution of derivative users and non-users. Among the sample, 58.1% of acquirers do not use derivatives, while 41.9% have derivatives. Derivative users show an increasing trend compared with the sample of Nelson et al. (2005) between 1995 and 1999 who find that 21.6% of firms are derivative users. While the sample of Bartram et al. (2009) show that 64.9% and Bartram (2019) shows 65.1% of US firms are derivative users. However, the sample size of Bartram et al. (2009) is 2231 and the sample size of Bartram (2019) is 2076 and mainly large market cap firms. The difference is possible due to the different sample sizes.

Table 3 Panel B reports the univariate analysis on CAR (-1, +1). The CAR is the 3-day cumulative abnormal return based on the market model using S&P Composite Index as a benchmark. The table compares the mean of CAR (-1, +1) between derivative users and non-users. The mean CAR (-1, +1) for derivative users is 0.1036, while for non-users is 0.3069. A t-test has been performed, and the result shows the difference between the two groups' means is statistically significant. Derivative users have a positively skewed distribution. Finally, the standard deviation of the CAR (-1, +1) for derivative users is higher than for non-users, implying that investors are not surprised by the M&As announced by non-users.

Table 3 Panel C reports the results of the linear regression on CAR (-1, +1). The dummy variable, Derivatives is included in the regression. Column 2 reports the result without a yearly fixed effect and column 4 reports the result with a yearly fixed effect. The coefficients for the dummy variable ‘Derivatives’ in the basic model and fixed effects model are not statistically significant. Although non-users on average

have a higher three-day CAR during the announcement, the result from the multivariate regressions indicates that the difference between user and non-user groups is not different from zero. The interesting fact is that the CAR (-1, +1) of non-users are positively skewed and the sample has a large dispersion, and the potential explanation is that derivatives reduce the exposure to unsystematic risk. The risk reduction effect of derivatives has been discussed by Bartram (2019), who finds that derivative users have lower stock return volatility.

Regarding the estimates of control variables, only the coefficients of Size and BM are statistically significant. The coefficients of Size in both the basiline model and fixed effect model are negative and significant, indicating that large acquirers underperform small acquirers. The result is consistent with previous literature on the size effect on bidder return, for example, Moeller et al. (2004) find that small acquirers received 2 percent higher abnormal returns than large acquirers. The coefficients of BM are negative and significant in both column 2 and column 4. Book-to-market ratio can be used as a proxy for growth opportunities, therefore, high book-to-market ratio firms underperformed low book-to-market ratio firms in the acquisition, indicating that acquires with low growth opportunities receive lower announcement returns. This is consistent with Lang et al. (1989) and Lang et al. (1991) that acquirers with high Tobin's Q gain significantly more than acquirers with low Tobin's Q.

In addition, the estimates for the dummy variable, Cash, are insignificant in both column 2 and column 4, showing that using cash and other payment method does not make any difference in announcement returns. The coefficients of Cash ratio in both regressions are insignificant, however, since the cash ratio is the ratio of cash to assets, rather than the cash deviation used in Harford (1999), the effect of cash richness on announcement returns is not determined.

To sum up, the univariate analysis shows some evidence supporting Hypothesis 2b that derivative users have lower announcement returns than non-users in M&As. However, the multivariate regression does not show a negative relation between derivative usage and the three-day cumulative abnormal return.

Table 3: Panel A. Derivative Usage

The table reports summary statistics. I use a sample of 8981 U.S. M&As from 2010 to 2021. *Derivatives* is a dummy variable, it equals 1 if an acquirer is a derivative user, and equal 0 if an acquirer is a non-user.

Derivatives	Freq.	Percent
0	5,218	58.1
1	3,763	41.9
Total	8,981	100

Table 3: Panel B. Univariate Analysis on CAR (-1, +1)

The table reports the CAR (-1,+1) of derivative users and non-users. The CAR (-1, +1) is winsorized to 5% and 95%. A t-test is performed on the difference of group mean. *, **, and *** stand for statistical significance at 10%, 5%, and 1% levels.

Variable		N	Mean	p25	p50	p75	SD
CAR	USER	3363	0.1036	-0.5314	0.0035	0.6225	2.204
CAR	NONUSER	5143	0.3069	-0.5317	0.0022	0.7974	2.9067
diff			0.2033***				

Table 3. Panel C. Regression on CAR (-1, +1)

CAR (-1,+1) is the cumulative abnormal return of the acquiring firm, using the benchmark of S&P 500 Composite Index. *Derivatives* is a dummy variable, it equals 1 if an acquirer is a derivative user, and equals 0 if an acquirer is a non-user. *Relative Value* is the ratio of deal value to the sum of deal value and the acquiring firm's market value of equity. *Cash* is a dummy variable, which equals 1 if the method of payment is cash, and equals 0 otherwise. *Share100* is a dummy variable, which equals 1 if the percentage of shares hold is 100% after the transaction and 0 otherwise. *Cash ratio* is the ratio of cash to total assets. *Size* is the natural logarithm of acquirers' total assets. *B/M* is the book-to-market ratio, defined as the book value of equity divided by market capitalisation. *Leverage* is the acquirer's book value of debt over its market value of equity. *, **, and *** stand for statistical significance at 10%, 5%, and 1% levels.

(1)	(2)	(3)	(4)	(5)
CAR (-1, +1)	Coefficients	t	Coefficients	t
Derivatives	-0.0328	-0.91	-0.0339	-0.93
Relative value	-0.4412	-0.24	-0.5656	-0.31
Cash	-0.0460	-1.24	-0.0418	-1.12
Share 100	-0.0213	-0.22	-0.0176	-0.18
Cash ratio	-0.0472	-0.47	-0.0610	-0.61
Size	-0.0401***	-5.12	-0.0408***	-5.17
BM	-0.0777**	-2.33	-0.0751**	-2.24
Lev	0.1228	1.38	0.1466	1.64
Constant	0.7529***	5.15	0.8774***	5.54
Year Fixed Effects	No		Yes	
N	7,183		7,183	
Adjusted R-square	0.01		0.01	

5.4. Derivative Usage and Method of Payment of M&As

Table 4 reports the probit regression on the method of payment. Cash is the binary variable, which equals 1 if an M&A is paid by cash and equals 0 if it is using other payment methods (e.g., equity) or a mix of cash and other payment methods. The coefficient of derivatives is -0.1151 in the baseline regression and -0.1311 in the fixed effect regression. Both parameters are statistically significant at 1% level. The result shows that derivative users are less likely to use cash payments compared to non-users, therefore contrary to the finding of Deshmukh and Vogt (2005). The potential explanation is the cash generated through risk management programs is used for other activities (e.g., R&D) rather than M&As. Another possible explanation is that derivative usage reduces stock return volatility (Bartram, 2019), therefore when using equity as a method of payment, the negative impact on the share price due signalling effect has been offset by the positive impact of derivative usage. As Alexandridis et al. (2021) indicate that derivative users have better access to external financing than non-users, those firms are more likely to use external financing than internally generated funds. If derivative usage could reduce the information asymmetry between shareholders and the external market, investors believe that the shares are not overvalued, then using equity as a payment method would not negatively affect the shareholders of the acquirer.

Regarding the control variables, the coefficient of relative value is negative and statistically significant in both column 2 and column 4, indicating that when the deal value is relatively large compared to the acquirer's size, the acquirer is less likely to use cash payment only. If the free cash flow is not sufficient to fund the M&As, firms will issue equity or use a mix of cash and equity as a payment method. The parameter of Share 100 loses its significance, therefore, no evidence shows that firms prefer any

method of payment to gain control of the target. In terms of the Cash ratio, it has negative coefficient estimates in both the basic and fixed effect regression, implying that firms with a higher level of cash are less likely to use cash payments in M&As. Therefore, they are more likely to use equity or a mixed payment of equity and cash. The potential explanation for this interesting fact is that firms accumulate cash for precautionary motives, instead of wasting the resources in M&As for empire building. The coefficient of Size is positive and significant in both regressions, showing that large firms are more likely to use cash payments than small firms. Moreover, firms with high book-to-market ratios are more likely to use cash payments than those with low book-to-market ratios. The possible explanation for this is that growth stocks are likely to be overvalued, therefore managers prefer to use stock or a mix of stock and cash as payment methods. Finally, the coefficient estimates of the variable Lev, is positive and significant, indicating that highly levered firms are more likely to use cash payment, instead of equity or other payment methods. When firms have high leverage, the cost of external financing increases, therefore, using external financing is expensive for those firms. As Martynova and Renneboog (2009) argue, the financing decision for takeovers follows the pecking order, that acquirers first use the internally generated fund and then external sources of fund. The finding is consistent with the previous literature that when external financing is costly, acquirers first use internal sources of cash. Therefore, the result provides some evidence to support Hypothesis 3b that derivative users are likely to use non-cash payments compared to pure cash payments.

Table 4 Method of Payment

The table reports the probit regression on the method of payment. The dependent variable is *Cash,* which equals 1 if the deal is using cash payment and 0 otherwise. M&As financed by equity and the mix of cash and equity are classified as non-cash payments. *Derivatives* is a dummy variable, it equals 1 if an acquirer is a derivative user, and equal 0 if an acquirer is a non-user. *Relative Value* is the ratio of deal value to the sum of deal value and the acquiring firm's market value of equity. *Share100* is a dummy variable, which equals 1 if the percentage of shares hold is 100% after the transaction and zero otherwise. *Cash ratio* is the ratio of cash to total assets. *Size* is the natural logarithm of acquirers' total assets. *B/M* is the book-to-market ratio, defined as the book value of equity divided by market capitalisation. *Leverage* is the acquirer's book value of debt over its market value of equity. *, **, and *** stand for statistical significance at 10%, 5%, and 1% levels.

(1)	(2)	(3)	(4)	(5)
Cash	Coefficients	z	Coefficients	z
Derivatives	-0.1151***	-3.57	-0.1311***	-4.02
Relative value	-36.3970***	-6.11	-36.5767***	-6.11
Share100	0.0737	0.86	0.0725	0.84
Cash ratio	-0.8851***	-9.88	-0.8620***	-9.58
Size	0.0885***	12.3	0.0908***	12.5
BM	0.1030***	3.48	0.1003***	3.35
Lev	0.3052***	3.82	0.3135***	3.9
Constant	-0.9409***	-7.08	-1.1222***	-7.81
Year Fixed Effects	No		Yes	
N	7183		7183	
Pseudo R-square	0.0642		0.0677	

5.5. Impact of COVID-19

As discussed in the previous sections, the primary motive for non-financial firms using derivatives is to reduce risks. With the COVID-19 crisis, there are significant changes to the macroeconomic environment. Derivative users may benefit from using derivatives by maintaining smooth cash flows, therefore are more resilient and capable of undertaking M&As during a period of liquidity shocks. If derivative usage facilitates effective investment during or after the post-COVID-19 crisis, M&As made by derivative users could receive higher announcement returns.

In order to capture the impact of the COVID-19 crisis, I divide the sample into 2 subsamples. I define before-COVID-19 for M&As announced on or before 2019, while M&As announced in 2020 and 2021 are classified as post-COVID-19. The subsample analysis aims to compare the impact of derivative usage on announcement returns of the two periods of time. The dependent variable is CAR (-1, +1) and the independent variables are the same as in Table 3.

The result is displayed in Table 5. Column 2 reports the baseline regressions for the before-COVID-19 period and column 4 reports the post-COVID-19 period. By dividing the samples into subgroups, the parameters show the same sign as the estimates in the pooled sample in Table 3. The coefficient of the dummy variable Derivatives is negative and insignificant in all columns, in both the pre-2020 sub-sample and the sub-sample between 2020 and 2021, indicating that derivative users do not outperform non-users during and after the COVID-19 crisis. The possible explanation is that derivative users have less stock return volatility than non-users, therefore, no surprise the non-users during period of high stock market volatility.

Regarding the control variables, the constant is positive and significant in both sub-sample regressions, implying on average positive announcement returns for the acquirers' shareholders. Size remains negative and significant, showing the negative size effect associated with takeovers. Acquisitions made by large firms underperformed the acquisition made by small firms. The sign and significance for BM in both column 2 and column 4 are similar to the result in Table 3, indicating that acquirers with high growth potential receive higher announcement returns. The yearly fixed effect regressions in column 6 and column 8 exhibit similar results as the baseline regression, and the pooled sample regressions in Table 3.

To sum up, with the test on sub-samples, there is no significant difference between derivative users and non-users on the abnormal returns before and after the COVID-19 crisis. Shareholders of the acquiring firms do not receive superior short-term abnormal returns if the firm use derivatives.

Table 5. The Impact of COVID-19 – Sub Samples

CAR (-1,+1) is the cumulative abnormal return of the acquiring firm, using the benchmark of S&P 500 Composite Index. *Derivatives* is a dummy variable, it equals 1 if an acquirer is a derivative user, and equals 0 if an acquirer is a non-user. *Relative Value* is the ratio of deal value to the sum of deal value and the acquiring firm's market value of equity. *Cash* is a dummy variable, which equals one if the method of payment is cash, and equals zero otherwise. *Share100* is a dummy variable, which equals 1 if the percentage of shares hold is 100% after the transaction and 0 otherwise. *Cash ratio* is the ratio of cash to total assets. *Size* is the natural logarithm of acquirers' total assets. *B/M* is the book-to-market ratio, defined as the book value of equity divided by market capitalisation. *Leverage* is the acquirer's book value of debt over its market value of equity. *, **, and *** stand for statistical significance at 10%, 5%, and 1% levels.

CAR (-1, +1)	2010-2019		2020-2021		2010-2019		2020-2021	
	Coefficients	t	Coefficients	t	Coefficients	t	Coefficients	t
Derivatives	-0.0157	-0.4200	-0.0505	-0.4300	-0.0284	-0.7500	-0.0750	-0.6300
Relative Value	1.9456	0.9200	-4.9531	-1.1900	1.9610	0.9300	-5.1410	-1.2300
Cash	-0.0315	-0.8200	-0.0852	-0.7300	-0.0337	-0.8700	-0.0890	-0.7600
Share 100	-0.0848	-0.8400	0.2671	0.8700	-0.0804	-0.8000	0.2516	0.8200
Cash Ratio	-0.1346	-1.2700	0.1828	0.6500	-0.1334	-1.2500	0.1974	0.7000
Size	-0.0400***	-4.9300	-0.0655***	-2.6800	-0.0381***	-4.6700	-0.0648*	-2.6600
BM	-0.0724*	-1.7500	-0.1500	-1.4300	-0.0799*	-1.9000	-0.1349	-1.2800
Lev	0.0797	0.8700	0.3276	1.2100	0.1089	1.1800	0.3428	1.2600
Constant	0.7857***	5.1300	0.9992**	2.0900	0.7299***	4.4300	0.9333*	1.9500
Year Fixed Effects	No		No		Yes		Yes	
N	6104		1796		6104		1796	
Adjusted R-square	0.01		0.02		0.01		0.02	

6. Conclusion

6.1. Findings and Discussion

This thesis examines derivative usage and its impact on M&As. Through the investigation and empirical analysis, the main findings are as follows:

First, derivative users are more likely to be acquirers in M&As. Firms with hedging have lower cash flow volatility compared to non-users, with a lower cost of external financing, which alleviates underinvestment problems caused by agency problems between shareholders and creditors. Such an effect enables firms with sufficient funds to undertake M&As. This is consistent with the theory in risk management that hedging reduces cash flow volatility and enables effective investment.

Second, derivative users on average have lower announcement returns than non-users, however, the standard deviation of share returns is also smaller than non-users. Using multivariate regression, I do not find evidence that announcement return is associated with derivative usage. However, the result supports that derivative usage reduces stock return volatility for acquiring firms, consistent with the risk management theory that hedging reduces risk exposure. Moreover, there is no evidence showing that COVID-19 has changed the difference of shareholder returns between derivative users and non-users.

Third, derivative users are less likely to use cash payments compared to non-users. The possible explanation for this result is that derivative usage reduces the cost associated with external financing, therefore, offsetting the negative impact of equity financing on M&A announcement returns.

Overall, the evidence suggests that derivative usage enables firms undertake investment through M&As and reduces the stock return volatility for the acquirers. However, the evidence is mixed in determining the impact of derivative usage and abnormal returns through a 3-day event window. Derivative users are less likely to use cash payment in takeovers, compared to non-users, the reasons remain unclear but possibly due to the risk reduction effect of derivatives, eliminating the negative price response to equity payment. Therefore, the payment method has less impact on the value of the acquirer's shareholders.

6.2. Limitations

There are some limitations when conducting the research.

The first limitation is regarding to data and sampling. In this thesis, the sample period is 2010-2021, which is the period after the 2008 financial crisis. There was a growing awareness of risk management among non-financial firms and the proportion of derivative users has increased significantly. According to Bartram (2019), firms alter the size and timing of hedging to adjust positions, therefore, it is not sufficient to simply analyse the effect of whether the firm has derivatives. Therefore, it is not sufficient to simply analyse the effect of whether the firm has derivatives. It is worthwhile to examine the size and magnitude of using derivatives on M&A performance. Moreover, the thesis does not consider the impact of different types of derivatives (e.g., foreign currency derivatives, interest rate derivatives or commodity derivatives) on M&As. The details are recorded in 10-K fillings, however, due to the sample size, I did not use hand-collect data from 10-K fillings.

Secondly, in terms of measurement, only CAR (-1, +1) is used as a measure of announcement returns in the thesis. Alternative event windows or longer event periods (e.g., 365 days) may display different results. Also, in this study, the CAR is calculated using the market model, while alternative models, e.g., Fama and French three-factor models could bring different conclusions.

Finally, although my research models include several deal, firm-specific variables and year fixed effects, the result may be biased due to endogeneity issues, such as omitted variables and reverse causality.

6.3. Further Research

Further research can explore the following directions.

First, given the fact that derivatives are widely used by non-financial firms today, investigating the difference between derivative users and non-users may not fully capture the impact of risk management on firm value. The gap in literature could be filled by examining the magnitude of using derivatives and the impact of different types of derivatives. In addition, researchers could also extend the analysis to the long-term operating performance of the combined firm.

Second, the long-term impact of COVID-19 on derivative usage was not addressed in this study. However, given the dramatic changes in the macroeconomic environment, particularly the liquidity shortage during the COVID-19 crisis, it is interesting to explore the changes in derivative usage and the firm value in the long-term. Moreover, with the global energy crisis, there might be growing awareness of using commodity derivatives. Researchers could also explore the impact of the structure of derivatives on firm value.

Third, with the recent development in financial markets and financial technology, also the impact of COVID-19, cryptocurrency derivative markets have seen massive increases and played an important role in our daily life. Non-financial firms may use cryptocurrency derivatives for hedging or speculation. Researchers can extend the research on common financial derivatives (e.g., foreign currency derivatives, interest rates derivatives and commodity derivatives) to cryptocurrency derivatives, to discover the real impact of the revolutionary financial technology.

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