Overvaluation and M&A payment: Evidence from Japan

Abstract

Based on the debt capacity theory and pecking order theory, this paper examines the effect of equity overvaluation on the choice of payment method in mergers and acquisitions (M&A) in the Japanese market. Using a sample of 3,052 M&A deals from 2006 to 2023, our Probit regression analysis shows that equity overvaluation significantly positively influence the cash payments. This relationship remains robust after using different proxies for equity overvaluation and controlling for various deal and firm level variables as well as industry and year fixed effects. Our path analysis provides further evidence that debt issuance is an important mechanism through which equity overvaluation affects cash payment. The results hold after considering potential endogeneity issues using propensity score matching and instrumental variable methods. Unlike the previous view of utilizing overvalued equity for stock payments, our evidence support that Japanese firms use overvalued equity to enhance their debt capacity and thus choose cash payments. This study contributes to the literature on M&A payment methods by highlighting the unique financing behavior of Japanese firms and has important policy implications for the health of M&A in the current market.

Keywords: Overvaluation; M&A payment; Financing; debt issuance

1. Introduction

Mergers and acquisitions (M&A) have played a crucial role in resource allocation and value creation in society (Alexandridis et al., 2017)。And the method of payment in M&A has been a focal point of academic interest as a critical element of the transaction process (Rhodes-Kropf & Viswanathan, 2004, 2004; Kanungo, 2021; Tsai et al., 2021; Di Giuli, 2013; Klitzka et al., 2022; Yang et al., 2019). The choice of payment method not only has significant financial implications for the M&A entities but also offers opportunities to validate various theories in the field of corporate finance.

Cash and stock are two widely used methods of payment. Some previous studies have demonstrated the influence of market valuations on the choice of payment method (Di Giuli, 2013; Dong et al., 2006; Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003). These studies suggest that acquirers utilize their overvalued stock as a means of payment in acquisitions, acquiring target companies at a lower cost. It is generally believed that target companies should not accept stock offer when the acquirer's valuation is excessively high, yet evidence indicates that this is not always the case (Shleifer & Vishny, 2003)。On the other hand, Eckbo et al. (2018) and Klitzka et al. (2022) present different evidence. They articulate and substantiate the hypothesis of rational payment design, finding that overvalued acquirers are less likely to pay solely with stock.

Whether acquirers utilize their overvalued equity to purchase target companies, or whether there are alternative uses for overvalued equity, has been a topic of debate and conflicting results in previous literature. We revisited this research question from a financing perspective. The market timing hypothesis posits that firms make external financing decisions based on the current state of the securities market, implying that firms resort to equity financing when stock prices are overvalued and repurchase equity when stock prices are undervalued (Baker & Wurgler, 2002)。Therefore, based on market timing theory, Shleifer and Vishny (2003) argue that both the decision to acquire and the means of payment depend on market timing, with stock acquisitions specifically used by overvalued bidders. However, equity overvaluation is also linked to another significant factor in acquisitions, which is debt financing. Although not as prevalent

as equity issuance, Dong et al (2012) provide evidence that equity overvaluation can also lead to debt issuance. Furthermore, according to the debt capacity theory (Myers, 1977), firms not only issue more stock during periods of high sentiment but also more debt (S. Li et al., 2023). We examine the role of equity overvaluation, considering that the source of financing is a crucial factor influencing the method of payment in acquisitions (Karampatsas et al., 2014; Martynova & Renneboog, 2009; Uysal, 2011; Vermaelen & Xu, 2014), particularly how it impacts the choice of payment method through enhanced debt financing capabilities.

Japan's unique corporate governance and financing environment offers a distinctive opportunity to study overvaluation and M&A payment methods from a financing perspective. Firstly, Japanese companies have long-standing and deep relationships with banks. Historically, Japanese banks have been the primary source of corporate financing, providing not only loans but also participating in corporate governance. Although this has been moderated with the rise of the securities market, banks still play a crucial role in corporate governance. This bank-dominated financing model is uncommon in Western markets, and examining the financing behavior of Japanese companies can reveal different strategies and outcomes. Secondly, Japan's lending rates have been low for an extended period, providing companies with cheaper financing options. This low-interest-rate environment encourages Japanese companies to rely more on debt financing to meet their capital needs rather than issuing new equity. Seifert and Gonenc (2008), after studying companies in the United States, United Kingdom, Germany, and Japan, found evidence supporting the pecking order theory only in Japan. Jarallah et al. (2019) hold a similar view, indicating that the financing behaviors and patterns of Japanese non-financial and Tokyo Stock Exchange listed companies from 1991 to 2015 conform to the basic pecking order model, where internal financial deficits drive external debt financing. Lastly, unlike other markets, most investors in the Japanese market are individual investors. Due to information asymmetry and the complexity of evaluating corporate value, individual investors' investment behaviors are more susceptible to the signaling effects of equity issuance. When a company issues new shares, this decision can be perceived as a negative signal, indicating that the management believes the company's stock is overvalued, which can more easily lead to a decline in stock prices.

Our study makes several key contributions. Firstly, based on the Debt Capacity Theory and Pecking Order Theory, this research expands on the existing literature regarding equity overvaluation and M&A payment methods. Utilizing data from the Japanese market, we argue that equity overvaluation leads to cash payments. Contrary to most previous studies, we posit that companies do not directly use overvalued equity as payment to target companies. Instead, we propose that overvalued equity enhances a firm's debt capacity, which in turn leads to a preference for cash payments. Secondly, this research extends the understanding of the relationship between financing and M&A payment methods. We argue that debt financing is the primary channel through which equity overvaluation influences the method of payment, as it increases the firm's capacity to issue debt, making cash payments more favorable. To date, most studies have not examined this issue from a financing perspective. Although Klitzka et al. (2022) and Eckbo et al. (2018) found that overvalued acquirers are less likely to pay solely with stock, they did not explore the firm's financing strategies. Thirdly, our research provides practical insights into the unique financing behavior of Japanese firms. Given the distinct characteristics of the Japanese market, our findings have significant implications for corporate finance practitioners and policymakers. The strong ties between Japanese companies and banks, persistently low borrowing rates, and the prevalence of individual investors make the Japanese market unique. Our study not only contributes to academic literature but also offers actionable strategies for financial management and policy formulation in Japan and similar markets.

2. Literature review and Hypothesis development

Previous researcher has consistently shown significant interest in the choice of payment methods agreed upon by acquirers and target companies in M&A (Faccio & Masulis, 2005; Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003; Tsai et al., 2021)。This interest stems not only from the subsequent impact of payment choices on both parties involved in the merger but also because these choices provide numerous opportunities for empirical validation of various theories.

Previous research has identified several determinants of payment methods in mergers and acquisitions. Regarding the condition of the acquiror firms, Martin (1996) posits that firms with more available cash tend to use cash more frequently as a payment method in acquisitions. Faccio and Masults (2005) share a similar argument, suggesting that bidders with limited funds are more likely to opt for stock-financed transactions. Financial leverage is also a crucial factor affecting corporate decisions; firms with higher leverage are less likely to use cash as a payment method (Uysal, 2011). Furthermore, Karampatsas et al. (2014) examined the relationship between credit ratings and choice of payment method, concluding that debt capacity appears to dictate the choice of cash payments. In more recent research, de Bodt et al. (2022) argue that financial constraints are a primary factor prompting acquirers to include stock in payment methods in recent transactions. Across these studies, a common theme emerges: firms with adequate funds or the ability to secure financing are more inclined to use cash payments, highlighting the critical role of funding in the choice of payment method by corporations.

2.1 Overvaluation and M&A payment

One of the significant factors influencing corporate M&A decisions is the pricing efficiency of the capital markets. Previous researchers have noted that equity overvaluation has various impacts on acquisitions. Baker and Wurgler (2002) were among the first to propose the market timing theory, suggesting that companies decide their financing strategies based on the current state of the capital markets, particularly financing through equity issuance when stock prices are overvalued and repurchasing shares when undervalued. Shleifer and Vishny (2003) associated M&A activity with stock market overvaluation. Their research interprets the payment methods in acquisitions based on the misvaluation of merging firms' stock markets, arguing that rational acquirers take advantage of market inefficiencies by using overvalued stock to fund acquisitions. In other words, acquirers use their overvalued stock as a means of payment, acquiring undervalued target companies at a lower price (Dong et al., 2006; Rhodes–Kropf et al., 2005). Fu et al. (2013) also suggest that using overvalued stock as payment for acquisitions can enhance the acquiror firm's performance and shareholder wealth. On the other hand, some recent studies have challenged these

earlier views. Eckbo et al. (2018) proposed the rational payment design hypothesis, suggesting that target companies are unlikely to naively accept overpriced shares from acquirers. Klizka et al. (2022), after studying 1,155 M&A transactions completed by publicly traded U.S. acquirers from 2009 to 2016, provided evidence supporting the rational hypothesis. They found that the overvaluation of acquirers do not have a significant effect, while misvaluation metrics are positively correlated with the proportion of cash in M&A financing.

In previous research, equity overvaluation has also been linked to another corporate activity: financing. Despite differences in sensitivity, Dong et al (2012) provided evidence that equity overvaluation leads to both equity and debt financing. Huang and Ritter (2009) suggested that firms utilize equity financing to cover their financing deficits when the cost of equity financing is low. This financing method not only affects the corporate capital structure but also has a significant impact on corporate M&A decisions. Equity overvaluation allows firms to obtain financing at lower costs, thereby acquiring more funds for M&A activities. For companies with access to financing sources, they are more likely to use cash for acquisition transactions (Faccio & Masulis, 2005; Martin, 1996). Cash is generally considered easy to use, provided that companies have sufficient debt capacity or liquid assets. Furthermore, cash payment allows bidders to avoid the substantial costs associated with obtaining shareholder approval for pre-emptive rights waivers and stock authorizations, as well as the higher regulatory costs of stock offers. Thus, diverging from previous research, we aim to explain the influence of equity overvaluation on the choice of payment methods in corporate acquisitions through the financing aspect. Given that equity overvaluation enhances a firm's external financing capabilities, we propose that it makes firms more inclined to use cash payments. The hypothesis 1 is as follows:

H_1: When aquiror firms are overvalued, they are more likely to choose cash as the payment method.

Based on the pecking order theory, we further discuss the impact of equity overvaluation in the presence of varying sources and availability of financing. Originally proposed by Myers(1984) , the pecking order theory categorizes a company's financing sources into internal retained earnings, external debt, and

external equity, suggesting that firms prioritize the use of internal resources, debt, and equity issuance in that order to meet their financing needs. In the presence of information asymmetry, where managers are aware of the firm's true value but shareholders or external investors are not, the issuance of new shares might lead investors to believe that their stock is overvalued. Consequently, to avoid the signal that could depress stock prices, managers might eschew issuing new shares. Instead, they prefer to finance new projects using retained earnings, as these funds do not face adverse selection problems. If internal funds are inadequate for project financing, managers will resort to external debt before issuing new shares, due to the lesser signaling effect of debt. According to the debt capacity theory (Myers, 1977) , a firm's ability to incur and repay debt determines its debt capacity. During periods of high investor sentiment, when the value of new assets is high, a firm's debt capacity increases, thereby enhancing its ability to raise debt capital and adopt an aggressive leverage strategy (S. Li et al., 2023) . Therefore, we suggest that firms, when their equity is overvalued, will prioritize using this overvaluation period for debt financing, thus influencing their decision-making process regarding the method of payment in acquisitions. The hypothesis 2 is as follows:

H_2: Debt financing is a significant factor in acquirers choosing cash payments due to equity overvaluation.

3. Methodology

3.1 Sample

We sourced Japanese M&A data from the SDC database and financial as well as stock-related data on Japanese companies from Nikkei Financial Quest. To filter the M&A data, we applied the following criteria:

1. The acquisition is announced and completed between 2006 and 2023.

2. All acquisitions occurred in Japan, and both acquiror and target firms are Japanese firms. Specifically, the acquiror firms are listed firms.

3. The deal value is at least 100 million JPY.

4. The percentage of shares acquired after the transaction is not less than 50%.

After the screening and removing financial acquiror firms and observations with missing data, we end up with a sample of 3052 transactions from 2006 to 2023. Table 1 provides the overview of M&A distributions by industry and year.

Insert Table 1 about here

In Panel A, the distribution reveals that 2007 was the peak year for M&A activities, accounting for 9.37% of total transactions (286 transactions), followed by 2006 and 2008, which accounted for 6.88% (210 transactions) and 7.11% (217 transactions) respectively. In these M&A deals, cash is the predominant payment method, comprising 72.15% of all transactions (2202 transactions), with stock payments representing 26.51% (809 transactions), and other methods only 1.34% (41 transactions). In terms of the proportion of cash payments, 2023 recorded the highest at 83.70%, indicating a preference for cash payment in that year. In 2006, the proportion of cash payments was 58.10%, suggesting a gradual increase in the use of cash payments over the period.

In Panel B, manufacturing is the most concentrated sector for M&A transactions, comprising 1026 transactions or 33.62% of the total. This was followed by the trade industry (701 transactions, 22.97%) and transportation, information, and communication industry (648 transactions, 21.23%). In these industries, cash remained the primary payment method. For instance, in the manufacturing sector, 698 transactions used cash, accounting for 68.03%; in the trade industry, 505 transactions used cash, representing 72.04%; and in the transportation, information, and communication sectors, 478 transactions used cash, comprising 73.77%. The service sector has the higher proportion of cash payments, which is 83.65%.

3.2 Variables

This study primarily adopts the method proposed by Rhodes-Kropf et al. (2005) to measure equity overvaluation. They suggest that the market-to-book value ratio of a stock can be decomposed into two parts: the ratio of market value to intrisic value (M/V), representing the level of mispricing, and the ratio of fundamental value to book value (V/B), representing the company's growth opportunities. The equation is as follows:

$$\frac{M}{B} = \frac{M}{V} \times \frac{V}{B}$$

After taking the logarithm of both sides of the above equation, it becomes:

$$m - b = (m - v) + (v - b)$$

Where m represents the market value of the stock, b represents the book value of the stock, and v represents the intrinsic value of the stock. Our primary goal here is to estimate the intrinsic value of the stock. In previous research, certain financial information, denoted as θ, can reflect the intrinsic value of the company, represented as v(θ;α). In this context, Equation 2 can be expressed as:

$$m_{it} - b_{it} = \left[m_{it} - v_{it}(\emptyset_{it}, \alpha_{jt})\right] + \left[v_{it}(\emptyset_{it}, \alpha_{jt}) - v_{it}(\emptyset_{it}, \alpha_{j})\right] + \left[v_{it}(\emptyset_{it}, \alpha_{j}) - b_{it}\right]$$

The first term, $\left[m_{it} - v_{it}(\emptyset_{it}, \alpha_{jt})\right]$, represents the difference between the market value and the fundamental value under the valuation effects conditions of time t and industry j, and is referred to as firm-specific mispricing. The second component, $\left[v_{it}(\emptyset_{it}, \alpha_{jt}) - v_{it}(\emptyset_{it}, \alpha_{j})\right]$, is the ratio of the fundamental value at time t to the long−term value, and is called the time−series sector error. The third one, $\left[v_{it}(\emptyset_{it}, \alpha_{j}) - b_{it}\right]$, is primarily used to mearsure a company's growth opportunities. These three components vary on an annual company level, involve valuation multiples that differ across industries and time periods.

A linear regression model is being established to correlate the company's market value, book value, net income, and leverage ratio:

$$Ln(M_{it}) = \alpha_0 + \alpha_1 \ln(B_{it}) + \alpha_2 \ln(|NI_{it}|) + \alpha_3 \mathrm{I} * \ln(|NI_{it}|) + \alpha_4 \mathrm{I} * lev_{it} + \varepsilon_{it}$$

Where M_{it} represents the market value of the firm, B_{it} is book value, NI_{it} is net income, I is a dummy variable that takes the value 1 when net income is zero or negative, and 0 otherwise. lev_{it} represents financial leverage. It is regressed by year and industry to obtain its coefficient. After that, the annual average value of each regression coefficient is introduced into the following equation to obtain the internal value of the company:

$$Ln(V_{it}) = \alpha_0 + \alpha_1 \ln(B_{it}) + \alpha_2 \ln(|NI_{it}|) + \alpha_3 \mathrm{I} * \ln(|NI_{it}|) + \alpha_4 \mathrm{I} * lev_{it} + \varepsilon_{it}$$

In this study, the ratio of $Ln\left(\frac{M_{it}}{V_{it}}\right)$ from the year prior to M&A represents the level of equity overvaluation required.

Moreover, this study considers using the P/B ratio as a proxy for overvaluation. Some psychological models suggest that P/B is a proxy for misvaluation, which in turn predicts subsequent abnormal returns (Daniel et al., 2001). Following Dong et al. (2006), We calculate P/B as a ratio of equity instead of total assets , as it is more likely to influence M&A decisions due to its focus on equity misvaluation.

The dependent variable is a dummy variable for cash payments, where the payment method is coded as 1 for “Cash Only” and 0 otherwise. Furthermore, to enhance the accuracy of the model, we incorporate several other factors that may influence the choice of payment method in Japanese M&A transactions. In this study, we include percentage of shares acquired, imputed fees ratio, a dummy variable for financial advisor involvement, the status of the target company, the acquirer’s leverage ratio from the prior year, the acquirer’s retention rate from the prior year, the growth rate of the acquirer’s sales from the prior year, the number of employees in acquirer firm from the prior year, and the market return at the time of acquisition. Definitions for all variables are provided in Appendix 1.

3.3 Descriptive statistics

Table 2 shows the summary statistics for the main variables used in our study, including distinct statistics for cash and non-cash payments. The data indicate that in cases using cash payments, the mean value of the proxy variable for equity overvaluation L_Ln_MV (L_PB) is 0.418 (2.826) with a standard

deviation of 1.165 (4.761), while for non-cash payment cases, the mean is 0.400 (2.044) with a standard deviation of 1.045 (2.527). This suggests that companies with higher valuations tend to choose cash payments. Additionally, the mean acquisition percentage (MAper) in cash payment cases is 74.681%, significantly higher than the 60.134% in non-cash payment cases, indicating that companies acquiring a larger proportion of the target company's shares are more likely to choose cash payments. In terms of debt issuance (Debt_issue), the mean for cash payment cases is 0.070, significantly higher than 0.031 for non-cash payment cases, indicating that companies making cash payments are more likely to support acquisitions through debt financing. This is consistent with the observation of a higher proportion of cash payments. Furthermore, the involvement of financial advisors (FA) also shows significant differences between cash and non-cash payments. In cash payment cases, only 29.1% of transactions involved financial advisors, compared to 51.9% in non-cash payment cases, suggesting that transactions with financial advisor involvement are more inclined towards non-cash payment methods. Finally, differences in leverage (L_Lev) and retained earnings (L_Retention) between cash and non-cash payment cases are also noteworthy. The average leverage in cash payment cases is 1.702, lower than 1.977 in non-cash payment cases, while retained earnings average 7.123 in cash payment cases, higher than 6.395 in non-cash payment cases. These data suggest that companies with lower leverage and higher retained earnings are more inclined to use cash payments, consistent with some prior literature. Overall, these descriptive statistics reveal key factors and differences in firms' choice of payment methods during acquisitions, providing foundational information for further empirical analysis.

Insert Table 2 about here

4. Results

4.1 Acquiror overvaluation and Payment methods

In this section, we examine the relationship between acquirer overvaluation and the use of cash payments in mergers and acquisitions. Table 3 presents the Probit regression results for the dependent variable, a dummy for cash payments, against two proxy variables for equity overvaluation.

Insert Table 3 about here

The results indicate that the coefficients for the acquirer overvaluation indicators are significantly positive at the 5% and 1% levels, suggesting that acquirer overvaluation leads to the use of cash payments in acquisitions. This finding holds after the introduction of firm-level control variables. Unlike previous literature, our sample from the Japanese M&A market provides new evidence for the relationship between equity overvaluation and payment methods. In all models we include industry and year dummies to control for industry- and year-level influences that do not vary with the individual. Not only the overvaluation variables, but some other variables also show a significant effect on cash payment. The financial leverage of the acquirer in the year prior to the acquisition shows a negative correlation with cash payments, implying that companies facing greater financial stress or with lower debt capacities are more inclined to use stock payments. Retention rate from the previous year show a significantly positive effect in model 4, suggesting that companies with higher retained earnings, or internal funds, are more likely to choose cash payments. These two variables underscore the significance of financial capability in the decision-making process for payment methods in M&A.

4.2 Path analysis of the effect of overvaluation on M&A payment

We further explored the mechanism through which equity overvaluation affects cash payment by conducting a path analysis. This analysis allows us to examine whether the positive correlation between

equity overvaluation and cash payments can be directly attributed to equity overvaluation facilitating a firm's debt issuance, which in turn increases the likelihood of choosing cash due to the financing obtained from the debt issuance. Hence, the mediating variable in our indirect pathway is debt issuance. Following previous literature (X. Li et al., 2019; Pevzner et al., 2015), we establish the mediation effect model as follows:

$$Cash\ Payment_i = \delta_0 + \delta_1 Overvaluation_i + \delta_2 Debt\ Issuance_i + \Sigma\delta_j Control_j + \varepsilon_i$$

$$Debt\ Issuance_i = \lambda_0 + \lambda_1 Overvaluation_i + \Sigma\lambda_j Control_j + \epsilon_i$$

We use annual accounting data from Nikkei Financial Quest to measure the company's debt issuance. To mitigate the impact of M&A on the financial data, we employ unconsolidated accounting figures. Debt issuance is the change in assets minus the change in book equity (Δ total assets − Δ book equity − Δ deferred taxes) scaled by lagged assets (Baker & Wurgler, 2002; Dong et al., 2012). Table 4 presents the results of the path analysis.

Insert Table 4 about here

In Panel A of Table 4, we use the debt issuance of the acquiror firms as the dependent variable. The coefficients for the key overvaluation variables are significantly positive at the 1% level, indicating that equity overvaluation in the year prior to M&A significantly increases the company's debt issuance. In Panel B of Table 4, where the dummy variable for cash payment serves as the dependent variable, by incorporating the debt issuance variable into the model, we can identify the mechanism through which equity overvaluation affects cash payments.

The results show that equity overvaluation has an indirect effect on the payment method through the mediating variable of debt issuance, significant at the 5% level. The indirect effects of the two overvaluation variables on cash payments are 0.0053 and 0.0029, respectively, with their economic magnitude approximately 10% of the direct effects. This suggests that equity overvaluation facilitates the

likelihood of acquirors choosing cash payments by promoting debt issuance. Therefore, Hypothesis H2 is validated, indicating that debt issuance is an important channel through which equity overvaluation leads to cash payments in M&A.

4.3 Endogeneity and Robustness test

Our results indicate that acquiror overvaluation in the year prior to an acquisition impacts the payment method used in the transaction. However, these findings may be subject to potential endogeneity issues, which could affect the validity and interpretability of the results. First, reverse causality presents a significant endogeneity concern. For instance, while we suggest that equity overvaluation influences debt financing, which in turn affects the payment method, debt financing not only impacts the choice of payment method but may also be influenced by the payment choice itself. This bidirectional causality could lead to biased estimation results. Secondly, there may be an omitted variable bias if the model excludes certain critical variables, such as the company's governance structure or management's risk preferences. These unaccounted factors could simultaneously affect both the independent and dependent variables, leading to biased estimates.

4.3.1 Propensity score matching

To ensure robustness in our findings and alleviate endogeneity issues, this study employs the Propensity Score Matching (PSM) technique. We create a dummy variable based on the degree of equity overvaluation, where firms with overvaluation greater than the median in their industry are coded as 1, otherwise 0. We calculate propensity scores using variables such as the proportion of shares acquired (MAper), Imputed fee ratio (Imput_Ratio), financial advisor involvement (FA), target firm status (T_Public), growth rate of sales (L_SalesG), and market return rate (TOPIX_Re). Subsequently, we perform a 1:3 nearest neighbor matching. Panels A and B of Table 5 report the differences in various variables before and after matching based on a 1:3 nearest neighbor matching approach. As shown in the table, after

propensity score matching, the p-values for the variables in the matched sample are not significant, indicating effective matching and passing the balance test. In the results, the coefficients for the two measures of equity overvaluation on cash payments are 0.0873 and 0.0281, respectively, and are statistically significant at the 1% level. This indicates that the higher the degree of equity overvaluation, the greater the likelihood of a firm opting for cash acquisitions. The empirical outcomes from the PSM test further reinforce our initial hypothesis.

Insert Table 5 about here

4.3.2 Instrumental Variable

This study employs the industry-level equity overvaluation as the instrumental variable, which significantly affects firm-level equity overvaluation and possesses exogeneity. The study reduces potential estimation biases due to non-linear model specifications by employing a two-stage probit instrumental variable regression model. In the first stage, there is a significant positive correlation between industry-level overvaluation and equity overvaluation, with an F-statistic value greater than 10, indicating that it passes the weak instrument variable test. In the second stage, the coefficient linking equity overvaluation to cash payments is significant. After conducting the Instrumental Variable test, our empirical results still support the hypothesis.

Insert Table 6 about here

Conclusion

We conducted probit regression analysis to examine the impact of equity overvaluation on the choice of payment method in M&A in the Japanese market. Our sample consisted of 3052 M&A deals from 2006 to 2023, and the results indicated a significant positive effect of equity overvaluation on the likelihood

of cash payments. This relationship remained robust after controlling for deal-level characteristics, firm-level characteristics, and fixed effects for industry and year. Our findings further clarified the relationship between equity overvaluation and cash payments through a path analysis, demonstrating that debt issuance is an important mechanism through which overvaluation influences cash payments. When acquirers are overvalued, they engage in debt financing, thereby increasing the likelihood of opting for cash payments. The robustness of our results persisted even when other measures of equity overvaluation were used and after considering endogeneity issues using Propensity Score Matching (PSM) and instrumental variable techniques.

Our research findings can be summarized as follows: Although equity overvaluation is typically associated with stock payments in the existing literature, our data from the Japanese market provides different evidence. Unlike Eckbo et al. (2018) and Klizka et al. (2022), we explain the relationship between equity overvaluation and cash payments from a financing perspective. If the equity of the acquiring company is overvalued in the year prior to an acquisition, they are more likely to choose cash payments during the acquisition. This tendency may be influenced by Japan's unique banking system and interest rate environment. Equity overvaluation enhances a firm's financing capacity, making it easier to secure funds through debt issuance for cash payments in acquisitions.

Our study on the Japanese market contributes to the discussion on equity overvaluation and M&A, offering both theoretical and empirical evidence on how equity overvaluation can lead to cash payments from a financing perspective. The research also provides empirical proof that equity overvaluation is one of the reasons for the high proportion of cash payments in Japanese M&A market, offering theoretical insights for other countries with similar institutional and market characteristics. For policymakers and regulators, understanding the relationship between equity overvaluation and M&A payment methods can help them better assess the health of the market. A high proportion of cash payments might reflect the market's confidence in firm valuations or the firms' expectations of future cash flow stability. Therefore, monitoring changes in M&A payment methods can serve as an indicator of market sentiment and economic health.

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Table 1

Sample distribution by year and industry

Panel A. Distribution of M&A deals in Japan by year.

Year	N	Cash	Percentage	Stock	Percentage	Other
2006	210	122	58.10%	88	41.90%	0
2007	286	202	70.63%	81	28.32%	3
2008	217	163	75.12%	52	23.96%	2
2009	209	146	69.86%	62	29.67%	1
2010	172	111	64.53%	61	35.47%	0
2011	145	99	68.28%	45	31.03%	1
2012	161	122	75.78%	35	21.74%	4
2013	155	106	68.39%	46	29.68%	3
2014	161	112	69.57%	47	29.19%	2
2015	157	103	65.61%	48	30.57%	6
2016	164	135	82.32%	29	17.68%	0
2017	174	124	71.26%	38	21.84%	12
2018	165	128	77.58%	36	21.82%	1
2019	149	121	81.21%	27	18.12%	1
2020	105	86	81.90%	18	17.14%	1
2021	133	87	65.41%	44	33.08%	2
2022	154	122	79.22%	32	20.78%	0
2023	135	113	83.70%	20	14.81%	2
Total	3052	2202	72.15%	809	26.51%	41

Panel A. Distribution of M&A deals in Japan by Industry.

Acquiror Industry	N	Cash	Percentage	Stock	Percentage	Other
Construction	100	48	48.00%	50	50.00%	2

Electric Power & Gas	25	20	80.00%	5	20.00%	0
Fishery, Agriculture & Forestry	8	7	87.50%	1	12.50%	0
Manufacturing	1026	698	68.03%	319	31.09%	9
Real Estate	122	93	76.23%	28	22.95%	1
Services	422	353	83.65%	64	15.17%	5
Trade	701	505	72.04%	190	27.10%	6
Transportation, Information & Communication	648	478	73.77%	152	23.46%	18
Total	3052	2202	72.15%	809	26.51%	41

Table 2 presents the distribution of M&A deals in Japan by year and industry. It shows the number of deals in each year and industry of our sample, the percentage, and the distribution of payment methods.

Table 2

Descriptive statistics

		Total		Cash Payment		Non-Cash Payment	
	N	Mean	SD	Mean	SD	Mean	SD
L_Ln_MV	3052	0.413	1.133	0.418	1.165	0.400	1.045
L_PB	3052	2.608	4.272	2.826	4.761	2.044	2.527
Debt_issue	3052	0.059	0.213	0.070	0.218	0.031	0.197
MAper	3052	70.629	32.066	74.681	30.725	60.134	33.087
Imput_Ratio	3052	0.038	0.027	0.041	0.028	0.032	0.025
FA	3052	0.354	0.478	0.291	0.454	0.519	0.500
T_Public	3052	0.258	0.437	0.211	0.408	0.378	0.485
L_Lev	3052	1.779	1.784	1.702	1.698	1.977	1.978
L_Retention	3052	6.921	14.013	7.123	13.792	6.395	14.567
L_SalesG	3052	11.962	27.756	12.370	26.438	10.906	30.901
L_Employee	3052	14.069	38.778	13.114	37.361	16.544	42.151

Table 1 presents the descriptive statistics of the major variables. All variables are defined in Appendix A.

Table 3

Acquiror overvaluation and Payment methods

	(1)	(2)	(3)	(4)
L_Ln_MV	0.0649***	0.0617**		
	(2.58)	(2.40)		
L_PB			0.0171**	0.0257***
			(2.04)	(2.76)
MAper	0.0076***	0.0077***	0.0073***	0.0075***
	(8.54)	(8.58)	(8.30)	(8.34)
Imput_Ratio	3.9429***	4.4067***	3.4931***	4.0137***
	(3.70)	(4.07)	(3.29)	(3.72)
FA	-0.5357***	-0.5482***	-0.5185***	-0.5332***
	(-8.11)	(-8.25)	(-7.86)	(-8.03)
T_Public	0.1128	0.0896	0.1193	0.0932
	(1.49)	(1.18)	(1.58)	(1.23)
L_Lev		-0.0300**		-0.0290*
		(-1.99)		(-1.94)
L_Retention		0.0035*		0.0042**
		(1.85)		(2.20)
L_SalesG		-0.0011		-0.0017*
		(-1.12)		(-1.78)
L_Employee		0.0019***		0.0022***
		(2.71)		(3.10)
TOPIX_Re		0.0005		-0.0001
		(0.10)		(-0.02)
Constant	-1.0525***	-1.0345***	-1.0796***	-1.0835***
	(-5.85)	(-5.54)	(-5.96)	(-5.78)

Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	3,052	3,052	3,052	3,052
Pseudo R-squared	0.0987	0.104	0.0981	0.105

Table 3 presents the Probit model results for the impact of equity overvaluation on Cash Payment. Column (1) and Column (3) contain explanatory variable and deal-level control variables. Column (2) and Column (4) include the explanatory variable and all control variables. All variables are defined in the Appendix A. Industry and year dummies are included in all regressions. ∗∗∗, ∗∗, and ∗ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4

Result of path analysis

Panel A: Results of debt issuance on equity overvaluation

	(1)	(2)
VARIABLES	Debt Issuance	Debt Issuance
λ_1: L_Ln_MV	0.0100***	
	(2.85)	
λ_1: L_PB		0.0055***
		(5.71)
Controls	YES	YES
Industry	YES	YES
Year	YES	YES
N	3,052	3,052
Adjusted R-squared	0.0763	0.0837

Panel B: Results of cash payment on debt issuance and equity overvaluation

	(1)	(2)
VARIABLES	Cash Payment	Cash Payment
δ_1: L_Ln_MV	0.0586**	
	(2.26)	
δ_1: L_PB		0.0243***
		(2.60)
δ_2: Debt_issue	0.5278***	0.5233***
	(3.66)	(3.59)
Controls	YES	YES
Industry	YES	YES
Year	YES	YES

N	3,052	3,052
Pseudo R-squared	0.108	0.108
$\lambda_1\delta_2$ (L_Ln_MV)	0.0053**	
$\lambda_1\delta_2$ (L_PB)		0.0029**

Table 4 reports path analysis estimates of the relation between overvaluation and cash payment. The mediating variables is debt issuance (Debt_issue). We include the same control variables used in Table 3. All variables are defined in the Appendix A. Industry and year fixed effects are included in all regressions. ∗∗∗, ∗∗, and ∗ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5

Propensity score matching

Panel A: Balance check (L_Ln_MV)

Variables	Treatment group	Control group	Difference	p-value
MAper	65.515	66.442	-0.927	0.433
Imput_Ratio	0.036	0.036	-0.001	0.389
FA	0.420	0.410	0.010	0.581
T_Public	0.324	0.316	0.008	0.641
L_SalesG	12.387	13.547	-1.160	0.295
TOPIX_Re	0.359	0.316	0.043	0.813

Panel B: Balance check (L_PB)

Variables	Treatment group	Control group	Difference	p-value
MAper	70.407	69.936	0.471	0.688
Imput_Ratio	0.040	0.040	0.000	0.849
FA	0.324	0.301	0.023	0.175
T_Public	0.246	0.239	0.006	0.683
L_SalesG	17.992	16.874	1.118	0.353
TOPIX_Re	0.202	0.043	0.159	0.390

Panel C: Regression results of equity overvaluation on M&A payment (PSM).

	(1)	(2)
	Cash Payment	Cash Payment
L_Ln_MV	0.0873***	
	(2.90)	
L_PB		0.0281***
		(2.74)

MAper	0.0083***	0.0081***
	(7.64)	(7.45)
Imput_Ratio	5.2374***	4.8169***
	(3.97)	(3.67)
FA	-0.5486***	-0.5350***
	(-7.50)	(-7.31)
T_Public	0.0971	0.0944
	(1.09)	(1.06)
L_Lev	-0.0193	-0.0157
	(-1.12)	(-0.92)
L_Retention	0.0017	0.0024
	(0.81)	(1.24)
L_SalesG	-0.0023*	-0.0031**
	(-1.65)	(-2.14)
L_Employee	0.0022***	0.0026***
	(2.89)	(3.38)
Constant	-1.2433***	-0.0050
	(-5.61)	(-0.78)
Industry	YES	YES
Year	YES	YES
N	2,800	2,800
Pseudo R-squared	0.114	0.114

Table 5 shows the results of Propensity score matching (PSM) method for both two overvaluation variables. Panel A and B of table 5 presents the balance test results using the PSM sample 1:3 nearest neighbor matching method on selected variable. Panel C of table 5 presents the results using a PSM sample. We include the same control variables used in Table 3. All variables are defined in the Appendix A. Industry and year fixed effects are included in all regressions. ∗∗∗, ∗∗, and ∗ denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6

Instrumental Variable

	First Stage		Second Stage	
	(1)	(2)	(3)	(4)
VARIABLES	L_Ln_MV	L_PB	Payment_C	Payment_C
IV_MV	1.5432***			
	(2.98)			
IV_PB		0.7988***		
		(2.68)		
L_Ln_MV			2.0914***	
			(2.62)	
L_PB				0.6302**
				(2.43)
MAper	-0.0026***	0.0129***	0.0029	0.0057***
	(-3.68)	(4.67)	(1.15)	(3.03)
Imput_Ratio	-2.4305***	9.3399***	7.8441***	-0.7283
	(-3.11)	(3.48)	(2.74)	(-0.25)
FA	0.1035**	-0.7583***	-0.3531*	-0.3198**
	(2.02)	(-5.15)	(-1.88)	(-1.98)
T_Public	0.0617	-0.0356	0.0320	0.0738
	(1.02)	(-0.24)	(0.14)	(0.48)
L_Lev	0.1104***	-0.2542***	0.2604***	-0.1865**
	(9.56)	(-2.78)	(6.17)	(-2.57)
L_Retention	0.0056***	-0.0078	-0.0240***	0.0187**
	(3.98)	(-1.41)	(-4.70)	(2.56)

L_SalesG	0.0004	-0.0019	0.0344***	-0.0225**
	(0.60)	(-1.08)	(12.89)	(-2.46)
L_Employee	0.0036***	-0.0055*	-0.0014	0.0030**
	(6.62)	(-1.72)	(-0.68)	(2.07)
TOPIX_Re	-0.0044	0.0095	0.0229	-0.0140
	(-1.08)	(0.90)	(1.53)	(-1.16)
Constant	-0.5531**	-0.5292**	-0.2041	-2.1739***
	(-2.38)	(-2.05)	(-0.17)	(-2.78)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	3,052	3,052	3,052	3,052
F	14.47	21.25		
AR			26.16***	25.78***
Wald			4.12**	8.65***

Table 6 represents the results of regression analysis based on the instrumental variable (IV) approach using industry-level overvaluation as the instruments. We include the same control variables used in Table 3. All variables are defined in the Appendix A. Industry and year fixed effects are included in all regressions. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix 1.

Variable definitions

Variable	Definition
Payment_C	Dummy variable equal to 1 if the payment method is "Cash Only", and 0 otherwise.
L_Ln_MV	Based on Rhodes-Kropf's research, it is the ratio of the company's intrinsic value to its market value in the year prior to the acquisition.
L_PB	Price-to-book ratios in the year prior to the acquisition, the proxy for overvaluation
Debt_issue	Debt issuance: the change in assets minus the change in book equity (Δ total assets − Δ book equity − Δ deferred taxes) scaled by lagged assets
MAper	Percentage of shares acquired in the transaction
Imput_Ratio	The imputed fee ratio to the total acquisition value.
FA	dummy variable equal to 1 if either the acquirer or the target company has a financial advisor, and 0 otherwise.
T_Public	dummy variable equal to 1 if the target company is publicly listed, and 0 otherwise.
L_Lev	The leverage ratio of the acquiror company in the year prior to the acquisition.
L_Retention	The retention ratio of the acquiror company in the year prior to the acquisition.
L_SalesG	The growth rate of sales for the acquiror company in the year prior to the acquisition.
L_Employee	The number of employees (in thousands) at the acquiror company in the year prior to the acquisition.

This table contains definitions for the variables employed in this study.