Merger Arbitrage Returns in the U.S. Market

Evidence on Deal Duration and Failure Risk

by

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ABSTRACT

This paper examines the determinants of realized merger arbitrage returns in U.S. public M&A deals announced between 2016 and 2024, with a focus on deal duration and deal failure risk. Since SPAC mergers differ structurally from ordinary M&A transactions, the main clean specifications exclude SPAC transactions, while full-sample results are retained mainly for descriptive comparison. Using transaction data, market prices, and regulatory filings, I construct realized arbitrage returns and estimate OLS, heteroskedasticity robust, and rank based specifications. The results show that deal duration is associated with substantial cross industry variation, while deal failure risk is negatively related to realized arbitrage returns after trimming and outlier controls. This negative relation is especially strong in Healthcare and Life Sciences. Overall, the findings suggest that realized merger arbitrage performance is shaped by both time to completion and downside deal risk.

Keywords: merger arbitrage, M&A, deal duration, deal-failure risk, SPAC transactions

Preface

This thesis is motivated by an interest in how financial markets price uncertainty in settings with discrete and outcome-dependent risks. Merger arbitrage provides a natural context, where returns depend not only on pricing at announcement but also on the evolution of deal outcomes over time.

While theory suggests that higher risk should command higher returns, realized outcomes in merger arbitrage often reflect more complex dynamics due to asymmetric payoffs and the possibility of deal failure. This project focuses on bridging this gap by examining realized returns through the joint lens of deal duration and failure risk.

By analyzing U.S. M&A transactions from 2016 to 2024, this study aims to better understand how time, regulatory uncertainty, and downside risk interact to shape arbitrage performance, particularly across industries with differing institutional environments.

1 Introduction

This paper examines whether deal duration and deal failure risk help explain variation in realized merger arbitrage returns. Using a sample of U.S. public M&A transactions announced between 2016 and 2024, the analysis focuses on realized returns rather than announcement spreads, and evaluates how time to completion and downside risk jointly shape arbitrage outcomes across industries and deal structures.

Merger arbitrage remains a central event-driven investment strategy, yet realized returns vary substantially across transactions due to differences in timing, structure, and completion risk. Existing research has largely concentrated on announcement-date spreads and observable deal characteristics, with less attention to the independent role of deal duration. This omission is notable, as the time required for a deal to resolve may capture underlying uncertainty related to regulatory review, contractual complexity, and financing conditions.

Prior literature establishes that merger arbitrage generates abnormal returns, often attributed to limits to arbitrage and incomplete risk pricing. Baker and Savasoglu document positive abnormal returns in both cash and stock deals, linking these returns to capital constraints and completion risk. This interpretation is consistent with the limits-to-arbitrage framework developed by Shleifer and Vishny, which argues that capital constraints, risk exposure, and institutional frictions prevent arbitrageurs from fully eliminating mispricing, allowing spreads to persist in equilibrium. Mitchell and Pulvino further show that arbitrage returns exhibit nonlinear payoff structures, resembling short put options that are particularly sensitive to market downturns.

Completion risk has been identified as a central determinant of arbitrage returns. Higher ex-ante failure risk is generally associated with wider spreads, reflecting compensation for uncertainty. However, recent evidence suggests that the dynamics of merger outcomes are more complex. Heath and Mitchell show that interim risks such as renegotiation, regulatory intervention, and deal termination play a critical role in shaping realized outcomes, particularly during adverse market conditions. These findings highlight that arbitrage returns depend not only on initial pricing but also on the evolution of deal-specific risks over time.

Behavioral explanations further complement this perspective. Wang demonstrates that investors overweight tail risks in merger settings, leading to persistent mispricing in target stocks. This mechanism is consistent with broader behavioral finance theories of probability weighting and limits to arbitrage, especially the frameworks developed by Barberis and Huang and by Shleifer and Vishny. These effects are likely to intensify in transactions with longer durations, where uncertainty accumulates and arbitrage capital becomes more constrained.

In addition, deal characteristics such as target size and transaction structure shape arbitrage outcomes through their interaction with market frictions. Larger transactions may require more capital and face greater regulatory scrutiny, leading to slower price convergence. Payment structure also plays a role, as stock-based transactions introduce hedging complexity and information asymmetry absent in cash deals, as shown by Branch and Yang. These factors suggest that duration does not operate in isolation, but instead interacts with multiple sources of uncertainty embedded in the deal.

Despite these insights, the role of deal duration remains insufficiently isolated in empirical tests. Duration may reflect not only delay but also deeper sources of uncertainty, including regulatory scrutiny, renegotiation risk, and financing constraints. This paper addresses this gap by testing whether deal duration and failure risk jointly explain realized merger arbitrage returns, and whether these relationships vary systematically across industries.

2 Methodology

2.1 Data Sources

The sample is constructed from multiple financial and regulatory data sources. Capital IQ is used to obtain target company names, announcement dates, closing dates, and company identification codes such as ISINs. LSEG provides daily stock returns, market capitalization, and historical pricing data for both target and acquiring firms. SEC filings are used to verify merger announcements and extract key transaction characteristics, including deal structure, offer terms, exchange ratios,

and the legal identity of the acquiring firm. Federal Reserve Economic Data, or FRED, provides monthly Treasury bill rates, which are used as proxies for the risk free rate in return calculations.

The analysis focuses on U.S. public company stock based M&A transactions announced and completed between January 1, 2016 and December 31, 2024. The initial Capital IQ screen yields 1,113 observations. Matching these transactions to acquiring firm information reduces the sample to 754 observations. Of these, 619 contain usable deal terms, defined by the availability of an offer price per share, an exchange ratio, or both. A total of 428 observations then provide the pricing information required to compute proposal based excess returns.

The final sample includes both successful and failed transactions and is limited to deals involving publicly listed target and acquiring firms. This restriction ensures consistent pricing, comparable return measurement, and sufficient disclosure of transaction terms. Overall, the sample construction balances broad deal coverage with data completeness in order to support consistent estimation of merger arbitrage returns and related deal characteristics.

2.2 Variable Definitions

Source note: The construction of realized arbitrage returns follows Ben Branch and Taewon Yang, "A Test of Risk Arbitrage Profitability," and the deal-failure-risk score follows Mitchell and Pulvino.

Deal duration. For deal i, deal duration D_i is measured in calendar days as

$$D_i = \textit{Resolution Date}_i - \textit{Announcement Date}_i$$

where $\textit{Resolution Date}_i$ is the closing date for successful deals and the abandonment announcement date for failed deals.

Target size. M_i denotes the target firm's market capitalization.

Arbitrage return. For deal i, realized arbitrage return R_i is computed using the formula that matches the deal type and outcome.

- **Successful cash deal:**

$$R_i = \frac{\log\left(\frac{C+CD-T_1}{T_1}\right)}{N} - R_f$$

- **Failed cash tender offer:**

$$R_i = \frac{\log\left(\frac{T_f-T_1+CD}{T_1}\right)}{N} - R_f$$

- **Successful stock swap offer:**

$$R_i = \frac{\frac{XA_1-T_1+IS}{T_1} - \sum_{t=1}^{N}\log(1+R_{m,t})}{N}$$

- **Failed stock swap offer:**

$$R_i = \frac{\frac{XA_1-T_1}{T_1} - \frac{XA_f-T_f}{T_1} + \frac{IS}{T_1} - \sum_{t=1}^{N}\log(1+R_{m,t})}{N}$$

where C is the offered cash amount per target share, CD is accumulated cash dividends per target share during the holding period, T_1 is the target stock price one day after announcement, T_f is the target stock price on the abandonment announcement date, X is the announced exchange ratio, A_1 is the acquirer's stock price one day after announcement, A_f is the acquirer's stock price on the abandonment announcement date, IS is interest earned on the short position during the holding period, N is the holding period length in days, R_f is the average daily Treasury bill rate, and $R_{m,t}$ is the market return on day t during the holding period.

Deal-failure-risk score. For deal i, the deal-failure-risk score F_i is defined as

$$F_i = \frac{P_{\text{offer}} - P}{P_{\text{offer}} - P_{\text{alone}}}$$

where P_{offer} is the offer value per target share, P is the target stock price at $t+2$ after announcement, and P_{alone} is the target stock price 22 trading days before announcement. For stock offers, P_{offer} equals the announced exchange ratio multiplied by the acquirer's stock price at $t+2$.

2.3 Regression Specifications

The empirical analysis uses linear regressions to examine associations among deal duration, target size, the deal-failure-risk score, and realized arbitrage return. Here, i indexes deals, g indexes industry groups, and s indexes the estimation subsamples reported later.

2.3.1 Deal Duration and Target Size

To examine the association between deal duration and target size, I estimate

$$\ln(D_i) = \alpha + \beta \ln(M_i) + \epsilon_i$$

where D_i is deal duration, M_i is target market capitalization, α is the intercept, β is the slope coefficient, and ϵ_i is the error term.

2.3.2 Deal Duration and Arbitrage Return

To examine the association between deal duration and realized arbitrage return, I estimate pooled and industry-specific specifications:

$$R_i = \alpha + \beta D_i + \epsilon_i$$

$$R_{ig} = \alpha_g + \beta_g D_{ig} + \epsilon_{ig}$$

where R_i is realized arbitrage return, D_i is deal duration, and the subscript g denotes industry group.

2.3.3 Deal-Failure-Risk Score and Arbitrage Return

To examine the association between the deal-failure-risk score and realized arbitrage return, I estimate pooled and subsample-specific specifications:

$$R_i = \alpha + \beta F_i + \epsilon_i$$

$$R_{is} = \alpha_s + \beta_s F_{is} + \epsilon_{is}$$

where F_i is the deal-failure-risk score and the subscript s denotes the estimation subsamples.

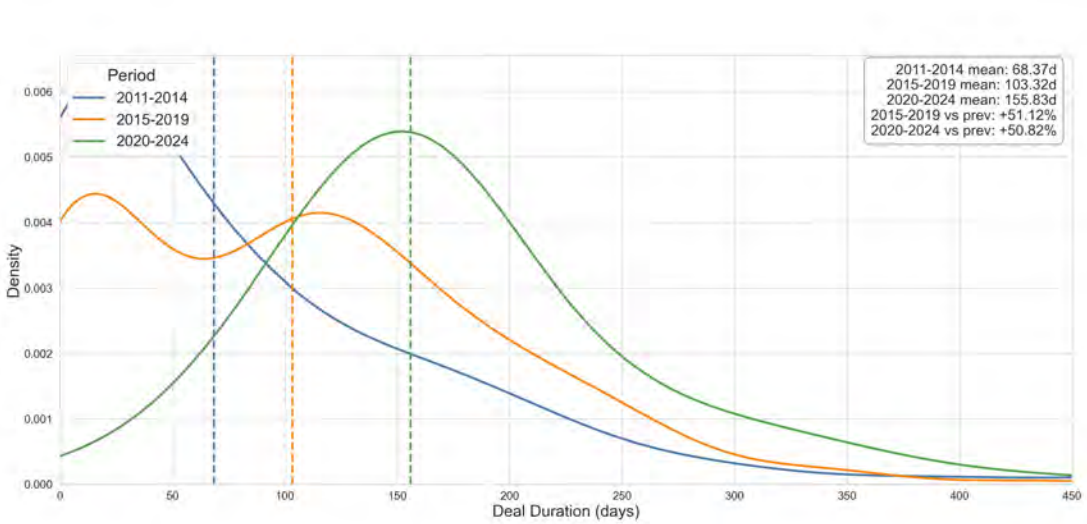
3 Empirical Results

3.1 Descriptive Analysis of Deal Duration

This subsection summarizes the distribution of deal duration by reporting key moments and quantiles, thereby distinguishing short-cycle from long-cycle transactions in the sample. Based on the 1,113 observations identified in the initial Capital IQ screen, the study first analyzes the overall distribution of deal duration before applying the stricter filters used in the regression sample.

A comparison across three subperiods reveals a clear rightward shift in the distribution of deal duration over time, as depicted in Figure 1. The mean duration increased from 68.37 days in 2011–2014 to 103.23 days in 2015–2019, and further to 155.83 days in 2020–2024, representing growth of 51.12% and 50.82%, respectively. The density curves flatten and widen across periods, indicating longer and more variable completion timelines. The increasingly pronounced right skew suggests a rising share of transactions with extended closing periods in recent years.

Figure 1: Deal Duration Distribution by Period with Mean Markers



The annual evolution of deal duration shows a sustained upward trend in both mean and median values, with a notable acceleration after 2020. The mean peaks at approximately 280 days in 2022, while the median reaches around 220 days, reflecting heightened regulatory scrutiny and market uncertainty. Although durations moderate slightly in 2023, they remain elevated and converge at roughly 210 days in 2024. The persistent gap between the mean and median indicates the presence of outliers, confirming a structural lengthening of M&A completion timelines.

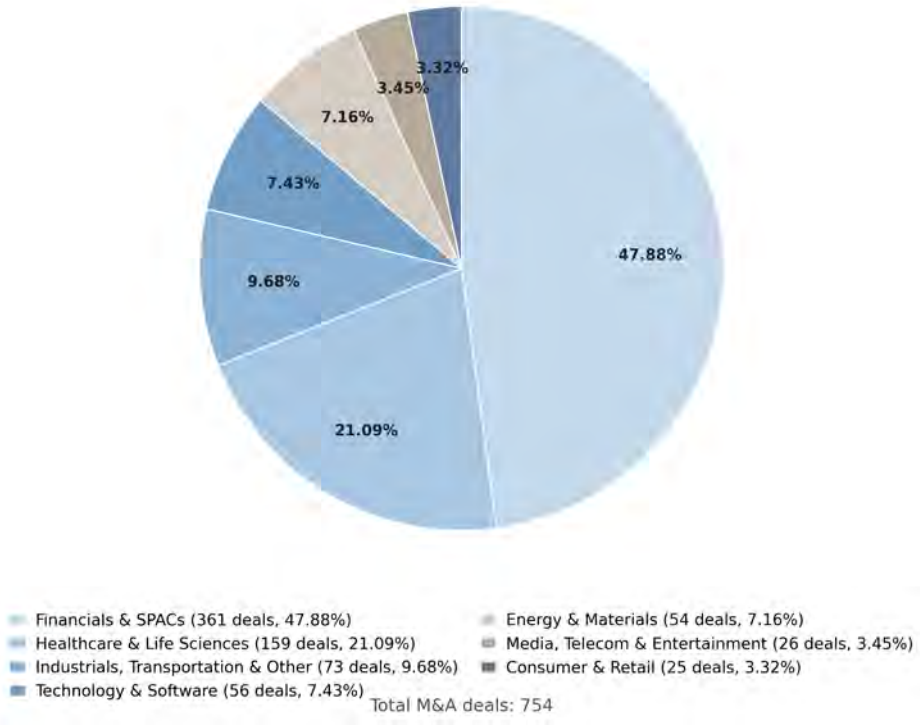
Figure 2: Yearly Trend of Deal Duration with Period-over-Period Growth

3.2 Industry Distribution of M&A Transactions

This subsection presents the industry composition of the screened M&A sample and compares deal concentration across sectors. Since Financials and SPACs account for a large share of the sample, the later empirical analysis excludes SPAC deals and reports non-SPAC specifications as the preferred estimates.

The sample is concentrated in Financials and SPACs, which account for 47.88% of transactions. Healthcare and Life Sciences form the second-largest group at 21.09%, followed by Industrials, Transportation, and Other sectors at 9.68%. Technology and Software represent 7.43%, Energy and Materials account for 7.16%, and Media, Telecom, and Entertainment account for 3.45%. Consumer and Retail has the smallest share, at 3.32%. Overall, the distribution shows substantial sectoral concentration, which motivates the use of non-SPAC analysis in the later regression section.

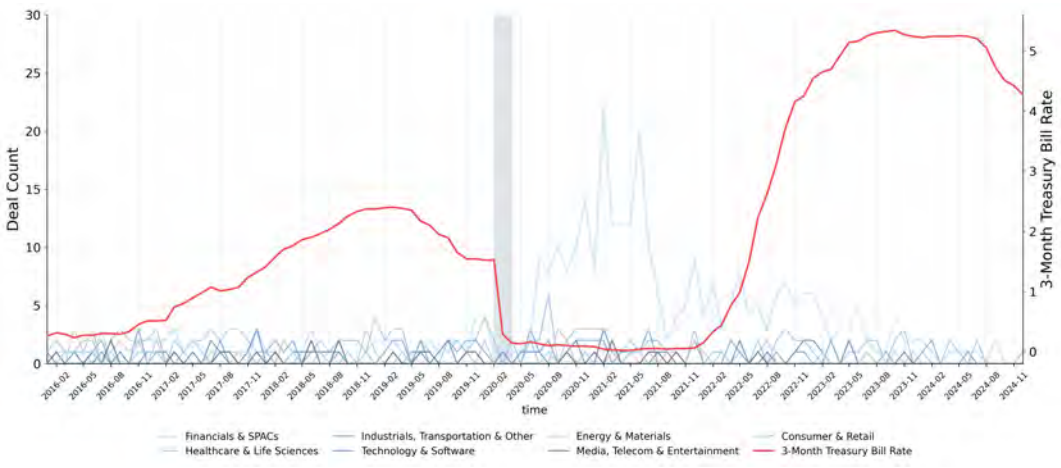
Figure 3: Industry distribution of M&A transactions.



Shifting from a cross-sectional to a time-series perspective, the post-2020 M&A surge in the

U.S. market can be understood through the lens of interest rate dynamics during the COVID-19 pandemic. As the 3-Month Treasury Bill Rate from FRED dropped sharply to near-zero levels, the Federal Reserve's accommodative policy lowered financing costs and injected substantial liquidity into the U.S. financial system. This environment increased firms' borrowing capacity, elevated equity valuations, and enabled widespread use of both cheap debt and stock as acquisition currency, particularly fueling SPAC-driven activity. As low rates persisted, these effects accumulated, resulting in a concentrated M&A boom before moderating with the subsequent tightening cycle.

Figure 4: Monthly M&A Deals by Industry vs. 3-Month Treasury Bill Rate.



3.3 Regression Analysis of Arbitrage Returns

This subsection estimates baseline return specifications using linear and quantile frameworks, with emphasis on the marginal effect of deal duration after controlling for standard deal characteristics.

3.3.1 Deal Duration and Market Cap

This subsection examines the relationship between deal duration and target market capitalization to assess whether larger transactions are associated with longer completion timelines.

Table 1: Stats Outcome: Deal Duration and Market Cap

Metric	Overall	No SPAC	No SPAC + Successful Only
Slope	0.0366	0.0590	0.0510
Intercept	4.1338	3.5027	3.7410
R-Squared	0.0221	0.0528	0.0431
P-Value	0.0124	0.0009	0.0157
Sample Size	379.0000	234.0000	202.0000

Table 1 reports regressions of log(deal duration) on log(target market capitalization) across three samples. The Overall column uses the full valid sample, the No SPAC column excludes SPAC transactions, and the No SPAC + Successful Only column further restricts the sample to non-SPAC deals that were completed successfully. Because both variables are in logs, the slope can be interpreted as an elasticity. A 1% increase in target market capitalization is associated with a 0.0366% longer deal duration in the full sample, a 0.0590% longer duration after excluding SPACs, and a 0.0510% longer duration in the non-SPAC successful subsample. The coefficients are statistically significant at the 95% confidence level in all three specifications, although the R^2 values remain modest, ranging from 0.0221 to 0.0528. Overall, the estimates suggest that larger transactions tend to take longer to resolve.

3.3.2 Deal Duration and Arbitrage Returns

This part focuses on the sign, magnitude, and significance of the duration coefficient to test whether longer time-to-close is associated with higher arbitrage compensation.

Table 2: Duration and Arbitrage Return Summary Statistics by Industry Group

	Overall	Financials & SPACs	Healthcare & Life Sci.	Energy & Materials	Technology & Software	Industrials, Transportation & Other
Mean Deal Duration (days)	214.4600	241.5000	172.1900	222.3500	223.5900	207.5600
Median Deal Duration (days)	176.0000	186.5000	158.5000	197.0000	206.0000	190.5000
Mean Arbitrage Return	0.0504	-0.0192	-0.0065	0.5182	0.0943	0.2109
Median Arbitrage Return	-0.0020	-0.0016	-0.0761	-0.0008	0.0036	0.0010

Table 2 summarizes mean and median deal duration and arbitrage return by industry group. Financials and SPACs exhibit the longest average duration at 241.5 days, while Healthcare and Life Sciences has the shortest mean duration at 172.19 days. In every industry group, the mean deal duration exceeds the median, indicating right-skewed completion times and a nontrivial share of especially long deals. Arbitrage returns are more uneven across sectors. The overall mean return is 0.0504, but the overall median is slightly negative at -0.0020, suggesting that a limited number of high-return deals raise the sample average. This pattern is especially pronounced in Energy and Materials, where the mean return of 0.5182 is far above the median of -0.0008, pointing to the influence of outliers.

Table 3: Duration–Arbitrage Regression Statistics by Industry Group

	Overall	Financials & SPACs	Healthcare & Life Sci.	Energy & Materials	Technology & Software	Industrials, Transportation & Other
Slope (Duration)	0.0006	0.0002	0.0105**	-0.0017	-0.0014	-0.0035
Intercept	-0.0700	-0.0795	-1.8115	0.9067	0.4072	0.9321
R^2	0.0029	0.0140	0.0930	0.0104	0.0154	0.0498
Sample Size	223	94	62	20	17	16

Table 3 then regresses arbitrage return on deal duration within each industry group. Sample size varies substantially across columns, from 94 observations in Financials and SPACs to only 16 in Industrials, Transportation, and Other, so the smaller-sector estimates should be interpreted cautiously. Only Healthcare and Life Sciences shows a positive and statistically significant duration coefficient at the 95% confidence level, with a slope of 0.0105 and an R^2 of 0.0930. The overall coefficient is close to zero at 0.0006, with an R^2 of just 0.0029, indicating that deal duration alone has little pooled explanatory power for realized arbitrage returns. The remaining industry coefficients are negative and small in magnitude, with low R^2 values throughout, suggesting that duration by itself does not explain much cross-sectional variation in realized returns outside Healthcare and Life Sciences. Since the Financials and SPACs group combines structurally different SPAC transactions with ordinary financial-sector deals, these estimates are interpreted descriptively. The preferred interpretation of the return regressions places greater weight on the non-SPAC and sector-specific results reported in the following analysis.

3.3.3 Failure Probability and Arbitrage Returns

This subsection examines how deal-failure risk relates to merger arbitrage returns and whether accounting for this risk changes the estimated effect of deal duration.

After excluding observations with missing deal-failure-risk or arbitrage-return values, the sample contains 220 usable deals. Removing SPAC transactions leaves 162 non-SPAC deals, which form the preferred clean sample for the main failure-risk analysis. Because 22 observations have failure-probability values above 1, this variable is more appropriately interpreted as a deal-failure-risk score than as a literal probability bounded between 0 and 1. I evaluate the relationship using OLS, heteroskedasticity-robust HC3 inference, and rank-based Spearman and Kendall tests under four specifications. Overall (trim_z3) uses all available deals with winsorized returns and removes observations with $|z| > 3$ in either failure score or return. Non-SPAC Baseline excludes SPAC deals without additional trimming. Non-SPAC trim_z3 applies the same $|z| > 3$ filter in the non-SPAC sample. Healthcare & Life Sci. focuses on the non-SPAC Healthcare and Life Sciences

subsample using a 1.5×IQR filter on both variables.

Table 4: Failure-Probability–Arbitrage Statistics by Key Specification

	Overall (trim_z3)	Non-SPAC Baseline	Non-SPAC trim_z3	Healthcare & Life Sci.
Slope (Failure Score)	-0.4242***	0.1290	-0.4015***	-0.5259***
Intercept	0.0031	0.0410	-0.0080	-0.0939
R^2	0.2036	0.0049	0.1797	0.3426
OLS p-value	1.27e-11	0.3781	8.80e-08	5.17e-06
HC3 p-value	1.21e-05	0.4172	6.56e-06	2.16e-04
Spearman ρ	-0.3581	-0.2047	-0.4154	-0.6401
Spearman p-value	1.45e-07	0.0090	1.68e-07	3.24e-07
Kendall τ	-0.2445	-0.1418	-0.2859	-0.4787
Kendall p-value	2.16e-07	0.0077	2.96e-07	6.85e-07
Sample Size	204	162	147	52
Removed by Trim	16	0	15	9

Table 4 documents a robust negative relationship between deal-failure risk and realized merger arbitrage returns. This pattern is consistent across trimmed specifications and becomes more pronounced in the Healthcare and Life Sciences subsample. Rank-based tests further confirm this result, indicating that transactions with higher failure risk tend to be associated with lower ex post returns.

At first glance, this finding may appear to contradict the standard intuition that higher risk should command higher returns. However, this apparent tension can be resolved by distinguishing between expected and realized returns. While higher-risk deals typically offer wider spreads ex ante, reflecting compensation for bearing completion risk, expected returns are determined by implied completion probabilities embedded in prices. In contrast, realized returns depend on the actual outcome of the transaction. Given the asymmetric payoff structure of merger arbitrage, where upside is capped at the deal spread while downside losses in failed deals can be substantial, an increase in failure probability can lead to lower realized returns even when initial spreads appear

attractive.

From a market perspective, practitioner evidence similarly highlights that regulatory intervention is a primary driver of deal failure, and failed transactions often result in sharp price declines for targets, generating significant losses for arbitrageurs. Moreover, regulatory risk frequently manifests not only through outright deal termination but also through prolonged review processes and evolving conditions, which increase uncertainty over the holding period and reduce realized returns.

The stronger negative relationship observed in Healthcare and Life Sciences is economically intuitive given the institutional features of the sector. Regulatory authorities have increasingly expanded the scope of merger review in this industry beyond traditional product overlaps to include pipeline competition, innovation incentives, and future market structure. At the same time, more stringent enforcement standards have raised the likelihood that transactions are challenged, delayed, or restructured. These features introduce multiple layers of uncertainty that extend beyond standard antitrust considerations.

In addition, healthcare valuations are particularly sensitive to evolving information during the merger process, including clinical trial outcomes, regulatory approvals, reimbursement policies, and commercialization prospects. As new information arrives, market expectations can shift materially, making deal valuations more fragile over time. Even when initial spreads reflect perceived risk, adverse developments during the holding period can erode expected gains and lead to weaker realized performance.

Taken together, the evidence suggests that deal-failure risk is a meaningful predictor of realized merger arbitrage performance, but not in the direction implied by a simple risk–return tradeoff. Instead, in settings characterized by asymmetric payoffs and substantial downside risk, higher failure probability can lead to lower ex post returns. This effect is most pronounced in Healthcare and Life Sciences, where regulatory scrutiny and information uncertainty jointly increase the fragility of transactions and magnify the downside risk faced by arbitrageurs.

While the analysis does not establish a causal relationship, the consistency between the

institutional characteristics of healthcare transactions and the observed return patterns supports a plausible economic mechanism linking regulatory intensity, failure risk, and realized arbitrage performance.

3.4 Discussion

Taken together, the results suggest that deal duration is best interpreted as a heterogeneous proxy rather than a uniformly priced source of arbitrage premium. The positive and statistically significant relation between duration and arbitrage return appears only in the Healthcare and Life Sciences subsample, while the overall slope is close to zero. This pattern implies that time to completion matters primarily when longer duration reflects economically meaningful frictions such as antitrust review, regulatory complexity, or financing uncertainty, rather than delay alone.

The market-cap regressions help clarify this mechanism. Larger targets tend to take longer to resolve, consistent with the view that more complex or more visible transactions require lengthier negotiations, financing arrangements, and regulatory approvals. However, because duration is only weakly related to realized returns in the pooled sample, the evidence does not support the idea that arbitrageurs are systematically compensated for waiting by itself. Instead, compensation appears to depend on the type of uncertainty embedded in the delay.

The failure-risk results reinforce this interpretation. Once realized returns are examined rather than announcement-date spreads, higher deal-failure risk is associated with lower, not higher, arbitrage performance, and this negative relation remains under robust and rank-based specifications. In other words, deals that appear attractive ex ante because they offer wider spreads may still produce worse realized outcomes if the downside from delay, renegotiation, or termination dominates the upside from successful completion.

These findings should be interpreted with some caution. First, the sample is limited to U.S. public deals from 2016 to 2024, a period that includes unusual market conditions such as the pandemic M&A boom, the SPAC wave, and the subsequent rise in interest rates. Second, the failure-probability measure functions more like a risk score than a literal probability, which limits

direct probabilistic interpretation. Third, several industry subsamples are small, so coefficient estimates outside the larger groups should be viewed as suggestive rather than definitive. Even so, the evidence points to a clear practical implication: merger arbitrage performance depends less on the mere passage of time than on the specific form of completion risk embedded in a deal.

3.5 Conclusion

This paper investigates whether deal duration and deal failure risk help explain realized merger arbitrage returns in U.S. public M&A transactions announced between 2016 and 2024. Using transaction characteristics, market data, and regulatory filings, the analysis constructs realized arbitrage returns and evaluates them across overall and industry-level samples.

Three conclusions emerge. First, deal duration varies meaningfully across industries and is positively associated with target size, indicating that larger transactions tend to require more time to resolve. Second, longer duration does not generate a strong positive return premium in the full sample, although a significant positive relation appears in Healthcare and Life Sciences. Third, deal-failure risk is robustly negatively related to realized arbitrage returns after trimming and outlier controls, with the strongest effect again concentrated in Healthcare and Life Sciences.

Overall, the results suggest that realized merger arbitrage returns are shaped by both time to completion and downside deal risk, but that failure risk is the more powerful and consistent determinant. For practitioners, this implies that wider spreads in high-risk deals should not automatically be interpreted as superior opportunities. For future research, a useful extension would be to combine richer regulatory and financing variables with dynamic models of deal resolution to better separate compensation for waiting from compensation for bearing completion risk.

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