Effects of Mergers and Acquisitions on Corporation Valuation

A thesis submitted by

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Abstract

The purpose of this paper is to examine the instantaneous wealth effect of mergers and acquisitions announcements on acquiring firm stockholders and bondholders. Based on a panel of 1,744 global M&A deals of 918 firms from 2016 to 2017 in the communication, technology, energy, and utility sectors, this paper finds a significant and positive hike in abnormal stock returns at the announcement month and no significant impact on bond returns. This jump in stock return is larger in the technology and communication sectors. Furthermore, there is no evidence showing that cross-border deals in the U.S can generate higher wealth. Third, this paper concludes that financial ratios have different impacts on abnormal stock returns in different industries. Finally, I find that M&A announcement increases individual bond Sharpe ratio at the announcement month.

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1. Introduction

Mergers and acquisitions (M&A) are a frequently used managerial approach to expanding and consolidating firms, as well as exploring new industries. By employing this strategy, firms tend to achieve greater efficiencies of scale and production. However, is this strategy really as effective as we imagine? This paper measures the effectiveness of M&A by using the wealth effect. The purpose of this paper is to discover the instantaneous effect of M&A announcement on the wealth of acquiring-firm stockholders and bondholders. Based on previous findings, I anticipate that there is a positive wealth effect for stockholders and bondholders.

Researchers have explored and given different opinions on the wealth effect since the early 1980s. In the financial market, the wealth effect is a situation in which stockholders are comfortable about their wealth and willing to consume more because of an increase in value of their stock portfolios. Lettau and Ludvigson (2002) find fluctuations in consumption-wealth ratios are strong predictors of both real stock returns and excess bond returns. In this paper, wealth effect stands for the change in shareholder's wealth due to adjustments in stock or bond prices led by M&A. Usually, we need to look at this effect on both targets and acquirers to understand who really benefits from M&A. However, a lot of target companies are private and their information is not available. This paper only examines the wealth effect of public acquirers from two perspectives, equity and debt, since their information is relatively available.

Previous literature disagrees on whether there is no or positive wealth effects of acquiring-firm shareholders. For equity, most literature finds a positive effect on stockholder's wealth at the announcement month and this effect is larger on targets compared to acquirers (Jensen and Ruback 1983, Asquith 1983). In the long-term, target-firm stockholders benefit from M&A after the announcement but acquirer-firm stockholders suffer a wealth loss both before and after announcement (Malatesta 1983). Moreover, cross-border deals generate higher wealth in Europe (Goergen and Renneboog 2004). The wealth effect is not limited to stocks. Billet, King and Mauer (2004) used M&A deals in the U.S. from 1979 to 1997 and found low-grade target bonds earned significant positive announcement period returns.

For equity regressions, this paper employs the Fama and French (1992) 5-facotr model as a benchmark for testing M&A wealth effects. Fama and French introduce an expansion of CAPM, the five-factor model, that includes company financial fundamental ratios as independent variables to explain most of the variations in stock returns. Then, I augment the model with time dummies, fixed effects, merging dummies, and merger-financial interactions to get the final model.

For bond regressions, I start with the Fama and French (1993) 2-factor model. Fama and French model explains deviations in bond returns. The two factors are interest rate premium and default risk premium. Then, I add a third factor into the regression, the finance premium (Bernanke, Gertler, & Gilchrist, 1999). Besides the 3 premiums, the final bond model includes time dummies, company fixed effects, merging dummies, and merger-premium interactions.

The data used in this paper is a panel of 1,744 global deals of 918 firms in the communication, technology, utility, and energy sectors from January 2016 to March 2017. Monthly stock returns and bond returns are included and used as dependent variables. This paper examines M&A wealth effect by adopting panel data analysis instead of the 2-step cross sectional approach (Fama & MacBeth, 1973). With running the stock and bond models individual sector data and the combined data from the 4 sectors, I find that M&A increases stock abnormal return by 0.41 percentage points at the announcement month. M&A decreases bond returns by 0.01 percentage points but this finding is not economically significant. Furthermore, stock return hikes are more drastic in the technology and communication sectors. Third, M&A announcement significantly increases individual bond Sharpe ratio. Last, financial ratios have different impacts on abnormal stock returns depending on the characteristics of the industry.

The structure of this paper is listed as follows. In the next section I review previous literature that discusses M&A wealth effects and models that track changes in equity and debt returns. Section 3 describes the data used for this research. In section 4, I introduce the approach and models to estimate the effect of M&A on stock and bond returns. In Section 5 and 6 I summarize and interpret the regression results and discuss limitations and applications of the findings. Section 7 outlines the major findings and recommendations for future research.

2. Literature Review

2.1 Merger & Acquisition

Researchers have investigated the M&A wealth effects since the1980s. Most of the research examines the stockholder's wealth effect because stocks represent a large component of corporate valuations and they are sensitive to market changes. Jensen and Ruback (1983) found that for completed deals, M&A announcement increased 20% of target-firm shareholders benefit. There was no lose for bidding-firm shareholders but also no significant gains. However, Asquith (1983) found significant gains to the shareholder of both acquiring and target firms on the announcement month, though the benefit for acquiring firms was small.

How does the wealth effect look in long term? Malatesta (1983) used 336 completed mergers in the U.S. from 1969 to 1974 to examine long-run consequence of merger on shareholder wealth. Researcher found that merger had a positive impact on target-firm shareholder wealth but the they suffered a wealth loss before a merger. Acquiring-firm stockholders suffered wealth loss both before and after merger. Bianconi and Tan (2017) looked at short-term and long-term M&A effect on corporate valuation. They found a positive short-term impact and a negative long-term impact on company valuation.

M&A is a global phenomenon that happens all around the world, not only in the U.S. Since the dataset used in this research includes global M&A deals, it is important to look at the wealth effect in different countries. Li and Chen (2002) found that M&A significantly increased wealth to shareholders of acquiring firms and could not bring the wealth to shareholder of target firms with 349 events of M&A of listed companies in China 1999-2000. Furthermore, different types of M&A had different wealth effects.

Goergen and Renneboog (2004) analyzed the short-term wealth effects of large takeover deals in Europe. They found a 9% effect for the target firms and only 0.7% for the acquiring firms. Moreover, they found cross-border deals generate higher wealth. A cross-border deal is a type of M&A that involves acquirer and target coming from different countries. Goergen and Renneboog found that when a UK firm was involved in the deal, the abnormal returns were higher than those of deals involving only European acquirers and targets. Bianconi and Tan (2017) examined the effect of M&A completion on corporate valuation. Corporate valuation went up at the time when mergers and acquisitions took place, but it negatively affected long-term firm valuation.

The wealth effect is not only observed among stockholders, but also among bondholders. Billet, King and Mauer (2004) used M&A deals in the U.S. from 1979 to 1997 and found low-grade target bonds earned significant positive announcement period returns. However, acquiring firm bondholders suffered a wealth loss at the announcement month. Moreover, target bonds had significantly larger returns when the target's rating was lower than the bidder's, which was aligned with coinsurance theory. In this paper, since I examine the general effect of M&A

announcement on bond return instead of those with different ratings, I will get control over bond ratings by including bond fixed effects, as bond ratings can significantly affect bond returns.

2.2 Equity

Equity is a major and important part of company's asset. Public companies issue shares of stock to raise money for their business. Changes in stock price therefore can directly affect company operations by influencing the amount of funds raised. Therefore, it is important to learn factors that may affect stock prices in order to show the effect of M&A on equity.

Previous research has discussed how to track changes in stock price. The Capital Asset Pricing Model (CAPM), a theoretical asset pricing model, helps measure the appropriate rate of return that one can expect from a portfolio for taking that risk (Sharpe, 1964). Every portfolio carries two risks. One is systematic risk, which is the risk of being in the market that cannot be diversified away. This risk is also called "beta". The other risk is unsystematic risk, which is specific to every portfolio. Sharpe claimed that a portfolio's return was solely related to its beta.

However, researchers found that beta lost its power explaining realized return instead of expected return and started to identify factors that may influence stock returns other than beta. One of which was the size effect found by Banz (1981). He claimed that market equity, ME(a stock's price times shares outstanding), adds to explanations in the variability of portfolio returns provided by market betas. He concluded that the market value of a company had a significant negative effect on asset pricing. With controlling for beta and firm sizes, Bhandari (1988) documented the positive relationship between leverage which is the ratio of debt to equity, and portfolio return. Moreover, this relationship was not sensitive to variations in market proxy or estimation methods. Stattman (1980) and Rosenberg, Reid, and Lanstein (1985) discovered a positive relationship between the ratio of a company's book-value of outstanding stocks and its market-value, B/M. Basu (1983) , with controlling over size and beta, presented that the earnings per share ratio, E/P, could explain the variation in U.S. stock returns.

Fama and French (1992) also found that beta could not explain average stock returns by itself and they focused on other factors that may influence stock returns, such as company characteristics. They consolidated previously discovered factors into their model to expand the original CAPM. Factors include book-to-market ratio (B/M), ME, financial leverage, and E/P. They explored the effects by using Fama and Macbeth (1973) regressions. Fama-Macbeth regression is a two-step method to estimate coefficients of asset pricing models. The first step is to regress each asset return on risk factors. This is the cross-section part of the method that captures heterogeneity among assets. The second step is to regress all assets' return on each factor exposure at each time step. This is the time-series part of the method that gives risk premiums over time. The Fama-Macbeth estimator is the average of these coefficients which gives the premium expected for a unit exposure in each risk. Fama and French(1992) found a negative relationship between size and return and a positive relationship between B/M and return. In order to accurately examine the effect of M&A on stock prices, I will get control over company characteristics by using Fama and French (1992) five factors.

2.3 Debt

Issuing bonds is another way for firms to raise capital. Similar to equity section, I need to know how to tract fluctuations in bond returns with models. Also, I need to get control over factors that may affect bond yields in order to reveal the M&A wealth effect. In 1993, Fama and French used bond-market factors, interest-rate risk (TERM) and default risk (DEF), to explain the common variation in bond returns. Their proxy for TERM was the difference between the monthly long-term government bond return and the one-month Treasury bill rate. For DEF, they used the difference between the return on a portfolio of long-term corporate bonds and the long-term government bond return. They claimed that except for low-grade corporates, the two factors could successfully capture the common fluctuation in bond returns.

There exists a bond-factor other than TERM and DEF that can affect bond returns. Bernanke, Gertler, and Gilchrist (1999) developed a business-cycle model to help explained the role of credit market frictions in business fluctuations. In their paper, they introduced financial accelerator which affects the intrinsic costs of borrowing and lending associated with asymmetric information. In this paper, I proxy this credit risk by using the difference between AAA bond returns and BAA bond returns. Presumably, credit risk premiums can explain a different part of fluctuations in bond returns compared to interest rate premiums and default premiums.

Raw returns measure the profitability of a portfolio but ignore risks. Sharpe (1966) introduced a measurement of reward to variability, which is usually referred as Sharpe ratio. It is defined as the ratio of excess return to standard deviation of that risky asset.

Pilotte and Sterbenz (2006) examined Sharpe ratios on treasury bonds. They predicted Sharpe ratios by estimating "monthly conditional means and conditional vitalities of excess returns on bills and bonds of different maturities" from 1959 to 1997. They found that Sharpe ratio was inversely related with maturities and was incredibly high for short-term bills. I am going to employ their methods of predicting Sharpe ratio and examine M&A effects on bond Sharpe ratio.

3. Data

I collect 1,774 completed global M&A events of 918 firms from 2016 January to 2017 March in the utility, energy, technology, and communication industries from Bloomberg database. Each deal needs to have clear acquirer, target, acquirer industry sector, target industry sector, and deal announcement date to be included into the dataset. This dataset only includes acquiring firms because a lot of information of target firms is not public. Firm-level market capitalization, book to market ratio (B/M), financial leverage, and PE ratio (P/E) of acquirers, treasury bill yield, government bond yield, AAA corporate bond yield, and BAA corporate bond yield are collected on a monthly basis. Thus, both equity and debt sections yield balanced panel datasets. I use Vanguard Total international stock market index to track price changes in stock market, since this dataset includes global deals. Vanguard Total international stock index tracks stock markets all over the globe to provide an exposure to both developed and emerging economies. Monthly Vanguard Total data is downloaded from Yahoo! Finance. Bond indices are collected from Federal Reserve Economic Data (FRED). Sources and definitions of variables used in this paper are listed in table 1.

For equity section, I include 4 company-level financial ratios as controls in the model, inspired by Fama and French (1992): market capitalization, book to market, financial leverage, and price earnings ratio. Market capitalization is the total value of all of a company's outstanding shares of stock and it measures the size of a corporate. It is the product of price per share and the number of outstanding shares.

Market to book ratio is the ratio of stock price to the book value per share. It is used to find the value of a company by comparing the market value of a firm to its book value. If the market value is higher than the book value, the firm is considered to be overvalued. A low market to book indicates that the firm is undervalued. This paper uses book to market (B/M) ratio which is the inverse of the market to book.

The third ratio is financial leverage. It assesses the extent of a firm using debt financing. The more debt financing a firm uses, the higher the financial leverage. Financial leverage is calculated as average total asset divided by average total common equity. Average is the average of the beginning period balance and the same ending period balance.

Price earnings ratio (P/E) measures a firm's current share price compared to its per-share earnings. A high P/E indicates that investors expect higher earnings growth in the future. A low P/E either suggests that a company is doing exceptionally well or currently being undervalued. P/E is calculated as market price per share divided by earnings per share.

Descriptive statistics are summarized in table 2. Before taking logs, the average monthly stock return is 3.74%; the average B/M is 0.61; the average financial leverage is 3.2; the average P/E is 37.93. Then, I sort the 1,774 deals by transaction values and table 16 lists the top 5 deals in the dataset.

Then, I analyze the data by sectors. First, I look at the capital intensity for each sector. Capital intensive specifies an industry that requires large amount of money or other financial resources to produce a good. An industry that needs more asset to produce a dollar of sales has higher capital intensity than an industry that requires less asset to produce. Therefore, return on assets (ROA) can be used as a measurement of capital intensity. It measures incomes generated from each dollar of asset. ROA is calculated by dividing total assets by sales. A high ROA indicates that the firm is efficiently using its assets and it is relatively light in capital. Table 15 displays the average and standard deviation of ROA of deals included in the dataset by industries. We can tell that from 2016 to 2017, the technology sector has the highest ROA, whereas the energy sector has the lowest. This is aligned with our understanding of the industry structures. The energy sector is more capital intensive than the technology sector because most of energy firms require a large amount of asset to start producing. However, for some companies in the technology sector, such as software developers, do not need much physical capital to start with. Table 3 gives the number of deals included in the dataset by sectors. Communication and technology firms have more M&A than energy and utility firms. Furthermore, most M&A deals happen within an industry or between closely related industries. There are a few cross-sector deals during the period 2016-2017. Not all of the deals in the dataset are showed in this table because some target firms do not belong to any of these 4 sectors. Table 4 describes industry characteristics by comparing means of financial ratios of each industry. Average M/B in the utility sector is lower than other sectors which indicate that utility firms are relatively undervalued compared to firms in the technology, communication, and energy sectors from 2016 to 2017. Furthermore, financial leverage is the highest in the utility sector which implies that utility firms use a lot of debt financing.

I further decompose the 1,744 M&A deals by analyzing the acquirer country and the target country since the data includes global deals. Table 5 presents top 5 countries where targets and acquirers come from. Total number of deals becomes 1,567 after deleting deals with no county information. M&A deals in the U.S. is a large portion of the dataset. Most of the acquires and targets come from the U.S. Japan has the second-most number of acquirers and targets. From the table we know that the deals come from all over the world. Regression results are not likely to be driven by observations in one country since no country takes more than 50% of the total deals.

Table 14 helps us understand the data for analyzing cross-border M&A effects in the U.S. If we consider U.S. acquirer vs. U.S. target as a domestic deal; U.S. acquirer vs. foreign target and foreign acquirer vs. U.S. target as cross-border deals, we would have sufficient deals in each category. Therefore, cross-border regressions could reveal real differences due to the type of deals instead of the data.

4. Model

In this section, I am going to present the econometric models used to examine the M&A wealth effect on stockholders and bondholders.

4.1. Equity

Inspired by Fama and French (1992), I build my equity regression functions based on the five-factor model. First, I take log of all the independent variables. It is more straightforward to interpret the results with percentage compare to the raw ratios. Then, I estimate the original five-factor model with my dataset since both time periods and companies have changed compare to their dataset. I include time dummies in the model in order to control changes over time. Company fixed effects is also included to allow heterogeneity across firms. As mentioned in previous section, there are two steps in Fama and Macbeth (1973) method. The first stage is a cross-sectional regression that estimates heterogeneity across firms, which is represented by the company fixed effect. The second stage is a time series regression that finds risk premium for each risk factor over time. In a one-step panel regression, this is now substituted with time dummies. The panel fixed-effect model is:

$$\mathrm{ret_{it}} = \alpha_0 + \alpha_1 VT_t + \alpha_2 \ln\left(\frac{B}{M}\right)_{it} + \alpha_3 ln(leverage_{it}) + \alpha_4 \ln\left(\frac{P}{E_{it}}\right) + \alpha_5 \ln\left(MC_{it}\right)$$

$$+\tau_i + \gamma_t + \varepsilon_{it}\ , \qquad (1)$$

where $\mathrm{ret_{it}}$ is monthly stock return; τ_i is company fixed effect; γ_t is times fixed effect; ε_{it} is the error term.

I start my research with first generating monthly abnormal returns using the capital asset pricing model (CAPM). Using abnormal returns as dependent variables can avoid first-order autocorrelations, whereas monthly returns are subject to first-order autocorrelations.[1] I use the following fixed-effect model to predict abnormal returns:

$$\text{ret}_{\text{it}} = \beta_0 + \beta_1 VT_t + \rho_i + \pi_t + \vartheta_{it}$$
$$\text{ret}_{it}^{abnormal} = \widehat{\beta_0} + \widehat{\vartheta_{it}} \qquad , \tag{2}$$

where VT_t is the Vanguard Total world stock index and ϑ_{it} is an idiosyncratic return that randomly distributed. Abnormal return is the sum of the constant and idiosyncratic risk.

To identify the effect of M&A announcement, I add the announcement date, $merge_{it}$, to the five-factor model as a treatment and examine the treatment effects. Since announcement is not a structural change to the firms that has long-term effects, $merge_{it}$ is set to 0 before and after the announcement and 1 at the announcement month. Therefore, the regression estimates the instantaneous M&A effect on abnormal return. The new model including merging dummies is:

$$\text{ret}_{it}^{abnormal} = \theta_0 + \theta_1 merge_{it} + \theta_2 \ln\left(\frac{B}{M}\right)_{it} + \theta_3 \ln\left(leverage_{it}\right) + \theta_4 \ln\left(\frac{P}{E}_{it}\right) + \theta_5 \ln(MC_{it})$$
$$+ \varphi_i + \omega_t + \epsilon_{it}$$
$$merger_{it} = \begin{cases} 0, before\ and\ after\ announcement \\ 1, at\ announcement\ month \end{cases} \tag{3}$$

$\ln\left(\frac{B}{M}\right)$ = log of book to market ratio

$\ln(leverage)$ = log of financial leverage

$\ln\left(\frac{P}{E}\right)$ = log of price to earnings ratio

$\ln(MC)$ = log of market capitalization

[1] The Wooldridge test for autocorrelation in the panel cannot confirm a first order autocorrelation in abnormal stock return for overall data: Wooldridge test for autocorrelation in panel data; H0: no first order autocorrelation; F (1, 1743) = 1.438; Prob > F = 0.2307.

I will run equation 3 for all data and individual sectors to catch different M&A effects among industries.

Since merging effect may vary among different level of financial ratios, I augment equation 3 by adding interactions of $merge_{it}$ and financial ratios. The augmented model is:

$$\text{ret}_{it}^{abnormal} = \gamma_0 + \gamma_1 merge_{it} + \gamma_2 X_{it} + \gamma_3 X_{it} \cdot merger_{it} + \varphi_i + \omega_t + \epsilon_{it}$$

$$merger_{it} = \begin{cases} 0, before\ and\ after\ announcement \\ 1, at\ announcement\ month \end{cases} \quad (4)$$

where X_{it} is a vector of financial ratios, including *ln(B/M)*, *ln(leverage)*, *ln(P/E)*, and *ln(mktcap)*. $X_{it} \cdot merger_{it}$ is the set of interaction terms of merge and the above ratios. Equation 4 will be run with all data and across sector data to catch different M&A effect among industries.

4.2.Debt

I first test the baseline bond two-factor model with my dataset to see if the two premiums can explain variations in bond returns (Fama & French, 1993). This model includes time dummies to get control over changes across time and company fixed effects to allow heterogeneity among firms. Furthermore, since bond return is subject to serial correlations, I include sufficient lags of bond returns in the model to make sure that the model is dynamic complete. The regression function is:

$$return_{it}^{bond} = \alpha_0 + \alpha_1 TERM_t + \alpha_2 DEF_t + \textstyle\sum_{j=1}^{N} \rho_j return_{i,t-j}^{bond} + \delta_i + \vartheta_t + \varepsilon_{it}, \quad (5)$$

YTM_{it} = the idiosyncratic monthly yield to maturity

$TERM_t =$ the Fama-French term for interest rate premium

$DEF_t =$ the default risk premium

Bernanke, Gertler, and Gilchrist (1999) showed the existence and importance of financial premium. Since financial premium is the extra returned payed by low rating firms, this paper uses the difference between BAA bond yields and AAA bond yields as a proxy for financial premium. I then expand equation 2 with a financial premium term. The augmented model is:

$$return_{it}^{bond} = \gamma_0 + \gamma_1 TERM_t + \gamma_2 DEF_t + \gamma_3 FIN_t$$

$$+ \sum_{j=1}^{N} \rho_j return_{i,t-j}^{bond} + + \omega_i + \varphi_t + \epsilon_{it} \quad (6)$$

$FIN_t =$ the financial premium.

With including merger into the equation, the model becomes:

$$return_{it}^{bond} = \alpha_0 + \alpha_1 TERM_t + \alpha_2 DEF_t + \alpha_3 FIN_t + \alpha_4 merger_{it} + \tau_i + \varepsilon_t + \eta_{it}$$

$$merger_{it} = \begin{cases} 0, before\ and\ after\ announcement \\ 1, at\ announcement\ month \end{cases} \quad (7)$$

Since M&A effect may vary with different levels of premium, I add interaction terms of merger and premiums to control this effect. The augmented econometric model is:

$$return_{it}^{bond} = \beta_0 + \beta_1 merge_{it} + \beta_2 TERM_t + \beta_3 DEF_t + \beta_4 FIN_t + \beta_5 TERM_t \times merger_{it}$$

$$+ \beta_6 DEF_t \times merger_{it} + \beta_7 FIN_t \times merger_{it} + \sum_{j=1}^{N} \rho_j return_{i,t-j}^{bond} + \omega_i + \theta_t$$

$$+ \mu_{it}$$

$$merger_{it} = \begin{cases} 0, before\ and\ after\ announcement \\ 1, at\ announcement\ month \end{cases} \quad (8)$$

Then, I examine the effect of M&A announcement on the Sharpe ratio, which is the reward/risk ratios. Since bond returns are subjects to autocorrelations and correlations in variance, I use a autoregressive conditional heteroscedasticity(ARCH) model to predict Sharpe ratios (Pilotte & Sterbenz,2006):

$$return_{it}^{bond} = \theta_0 + \sum_{j=1}^{N} \theta_j YTM_{i,t-j} + u_{it}$$

$$u_{it} = v_{it}\sqrt{h_{it}}$$

$$h_{it} = \gamma_0 + \sum_{i=1}^{q} \gamma_i \, u_{t-i}^2 + \sum_{i=1}^{p} \alpha_i \, h_{t-i},$$

$$Sharpe_{it}^{bond} = \frac{\widehat{mean_{it}}}{\widehat{sd_{it}}} \quad (9)$$

h_{it} = the conditional variance of u_{it};

$\widehat{mean_{it}}$ = the predicted mean of bond return;

$\widehat{sd_{it}}$ = the predicted standard deviation of bond return.

I then test the effect of M&A on the Sharpe ratios with equation:

$$Sharpe_{it}^{bond} = \beta_0 + \beta_1 merge_{it} + \beta_2 TERM_t + \beta_3 DEF_t + \beta_4 FIN_t + \beta_5 TERM_t \times merger_{it}$$
$$+ \beta_6 DEF_t \times merger_{it} + \beta_7 FIN_t \times merger_{it} + \sum_{j=1}^{N} \rho_j Sharpe_{i,t-j}^{bond} + \omega_i + \mu_{it}$$

$$merger_{it} = \begin{cases} 0, before\ and\ after\ announcement \\ 1, at\ announcement\ month \end{cases} \quad (10)$$

5. Results

5.1 Equity

I first test the Fama and French (1992) five-factor model in this merging dataset. Table 6, column 1 presents regression results of model 1. Using stock returns as dependent variable, a 1% increase in market capital increases 0.083 monthly stock return on average, ceteris paribus. A 1% increase in B/M decreases monthly stock return by 0.144 on average, ceteris paribus. Holding all others equal, a 1% increase in financial leverage decreases monthly stock return by 0.094 on average. These results are different from previous research. A possible explanation to this phenomenon is that I am using a very different dataset compare to previous research. This dataset uses observations in 2016-2017, whereas previous research mostly covers 1990 – 2010. Moreover, companies included in this dataset all have M&A at a certain point of time, which is also different compare to previous datasets.

Table 6, column 2 shows the results of equation 2. Abnormal returns are estimated as the summation of the constant and error term. Coefficient of Vanguard index is not significant which means the CAPM beta cannot explain variations in stock return by itself. This finding is aligned with the Fama and French (1992). Using abnormal returns generated from equation 2 as dependent variable, column 3 presents the regression results of the five-factor model. Effects of market cap, B/M, leverage and P/E are not statistically different from effects of using normal stock returns as the dependent variable.

Table 7 presents the results of the fixed-effect model including merging as a treatment (equation 3). Regression in column 1 uses overall data, whereas column 2-5 uses sector data of communications, energy, technologies, and utilities, respectively. With time fixed effects and company fixed effects, M&A announcement has a positive but insignificant effect on abnormal return with overall data. This impact is insignificant in most industries but significant in technology sector. Abnormal return increase 1.367 for the current month if a company announces acquiring a target, on average and ceteris paribus. This is a very large impact since 1.367 is -146% times the mean of abnormal return. The result shows that stock price spikes at the announcement month for technology firms. Investors are more excited with M&A in the technology industry than M&A in communications, energy, and utilities. Last, financial ratios have similar effects on abnormal return as previous regression. B/M in energy sector has the least negative impacts on abnormal return compare to other industries. Having abundant physical assets is crucial to energy firms since they usually require a lot of plants, equipment, and materials to produce. The regression result indicates that for energy firms, accumulating assets helps increase stock return. Having a high B/M is a plus.

I then augment equation 3 with merger and financial ratio interactions (equation 4), and table 8 presents the regression results of the augmented model. Column 1 presents the results of using all data. Column 2-5 displays the results of the communication sector, the energy sector, the technology sector, and the utility sector, respectively, using sector data. I conduct F test to examine the significance of merger impacts over merger and its interactions. They are jointly significant in column (1), (2) and (4). For overall data, merger has a 0.412 impact on contemporaneous abnormal return on average and holding other variables constant. In the technology sector, acquiring announcement increase abnormal return by 0.766, on average and ceteris paribus. For communication firms, M&A increases abnormal return by 0.679. From these results, we know that global stock markets react positively to M&A deals in general. Investors have higher expectations in future profit of technology related M&A than profit of energy related deals.

To further prove this finding, I plot a graph of abnormal return against event date using overall data. Event date is the difference between current month and announcement month. Therefore, when the announcement is made by the last month in the dataset (March 2017), we have the minimum of event date which is -14. When the announcement is observed by the first month in the dataset (January 2016), we have the maximum of event date, 14. Event date is 0 at the announcement month. There are two parts in graph 1, before announcement and after announcement. The 95% confidence interval of each data point is showed by the lines above and under each point. Comparing the two best-fit lines, there is a jump in abnormal return at the announcement month. This increase is the M&A effect and should be similar to the impact estimator in my econometric models. From table 8, the impact estimator for overall data is 0.412

which is aligned with the finding from graph 1. Furthermore, according to the graph, this jump is significant at 95% confidence level.

Table 15 presents regression results of domestic deals and cross-border deals. Column (1) includes deals that have American acquirers and targets. Column (2) includes American acquirers and foreign targets, whereas column(3) includes deals with foreign acquirers and American targets. F-test results indicate that merger and interaction terms are not jointly significant in any column. I cannot conclude that cross-border deals generate higher returns compared to domestic deals.

5.2 Debt

In the debt section, I first test the Fama and French (1993) two-factor bond model with interest rate premium and default premium (equation 5). Table 9 column (1) shows the result of equation 5. Both interest rate premium and default premium are insignificant with bond fixed effects, time fixed effects, and two lags of bond returns. The two-factor cannot explain the variations in bond returns. I then add the finance premium to the model (equation 6), and column (2) shows the estimators of equation 6. Estimators of the 3 premiums are significant. Coefficients of interest rate premium and default premium are positive, which indicates that higher interest rate premium and default premium are related with higher bond returns. The coefficient of finance premium is negatively related to bond returns. There are 2 possible explanations. First, bonds with a high finance premium is popular. That makes the bond price increase, which leads to a low return. Another explanation could be that firms that pay high finance premiums usually have high default risks. This could ultimately hurt bond returns.

Table 10 displays results of including merging announcement to the model (equation 7). Since monthly bond return is subject to serial correlation, I add lags of bond return to make the model dynamic complete. The optimum number of bond return lags in this model is 2 and o lags for merger. Further lags of bond return and merger do not help in explaining $return_{it}^{bond}$. Column 1 includes all sector data, and column 2-5 represent the communication sector, the energy sector, the technology sector, and the utility sector, respectively. Merger does not have significant impact on bond returns in any industry. This could indicate that bond returns are insensitive to market changes compare to stock. Unlike stock, people who invest in bonds look for long-term profit with low risks. They are less likely to trade bonds frequently due to market news. Therefore, M&A deals are not likely to have impacts on bond returns. It is interesting that communications have the smallest finance premium coefficient among all industries. Holding all other variables constant, the smaller the coefficient becomes, the higher the bond price is. If finance premium was 1% for all sectors, communications bonds would have the lowest bond return and highest bond price. This implies that investors think communication companies are less likely to default compare to other industries. Therefore, investors are more willing to take credit risks for higher returns.

Then, I include merger-premium interactions to the model (equation 8). Column 1 includes data from all 4 sectors and column 2-5 include data in the communication sector, energy sector, technology sector, and utility sector, respectively. Results of F test suggest that announcement and its interactions are jointly significant in general and in technology sector. The impact is negative in general and positive in technology sector. With overall data, announcement decreases contemporaneous bond returns by 0.01 and decrease long-term bond returns by 0.045, on average and ceteris paribus. A decrease in bond return means an increase in bond price, which indicate that the bond is more favorable at the announcement month. For technology companies, acquiring announcement raises contemporaneous bond returns by 0.06 and increases long-term bond returns by 0.136, on average and ceteris paribus. An increase in bond returns means a decrease in bond price, which indicates that the bond is less favorable at the announcement month. This implies that investors think it is risky for technology companies to acquire during this time period. Increase in risk violates their intentions of buying bonds, which is to avoid risks. Therefore, we see an increase in bond returns for technology companies.

Graph 2 plots bond returns against event date for two periods: before announcement and after announcement. Event date = 0 is the announcement month. At the announcement month, there is a gap between two best fit lines, which is caused by the deal announcement. This implies that the impact estimator in the econometrics model with overall data should be negative. My impact estimator from table 11 is negative with overall data, which is aligned with the finding from graph 2. Furthermore, according to the graph, this change is not significant with 95% confidence interval.

After analyzing impact of acquiring on bond returns, I look at the impact of it on Sharpe ratio. Sharpe ratio is the reward/risk ratio that measures excess return with each unit of volatility (Sharpe, 1964). It is measured by a GARCH(2,2) because the size of the error term is dependent on the scale of error terms in previous periods. Estimations of GARCH(2,2) are presented in table 12. Sharpe ratio is predicted as the conditional mean of returns over the conditional standard deviation of returns. Since predicted Sharpe ratio is subject to autocorrelation, I include lags of Sharpe ratio. With 8 lags of predicted Sharpe and 0 lags of merger, the model is dynamic complete. Table 13 presents the results of investigating merging impacts. Column (1) includes only time dummies and company fixed effects. I find no significant impacts of merging on predicted Sharpe ratio. Then, I include premiums to the regression, and the results are listed in column (2). Merging neither has no significant impacts of merging on predicted Sharpe ratio.

Next, I include the premium interactions to the equation (now the model is equation 10), and results are listed in column (3). F test confirms that merging announcement and its interactions have a significant and positive influence on Sharpe ratio. Acquiring announcement can increase contemporaneous Sharpe ratio by 8.46 and increase long-term Sharpe ratio by 4.5. This effect fades with time.

6. Discussion

There are several important findings from the results. First, M&A announcements significantly increase acquiring-firm stockholder's wealth by 0.41 percentage point at the announcement month. This impact is economically significant since announcements will lead to a 36% change in contemporaneous abnormal return. Bond returns of acquiring companies decrease 0.01 percentage point at the announcement month and decrease 0.04 percentage point in long-term. Both short-term and long-term impacts are not economically significant with semi-elasticities of 0.25% and 1.3%, respectively. To sum up, this paper finds an increase in acquiring-firm stockholder's wealth and no changes in bondholder's wealth at the announcement month. Stocks are more sensitive to market changes than bonds because stockholders are more willing to trade stocks and take risks for high returns. Unlike stocks, bonds are debt securities that have low risks and needed to be held for a longer period of time. Therefore, bonds are relatively insensitive to market changes, such as M&A announcements. Previous research found drastically positive M&A wealth effect for target-firm stockholders and small wealth effects for bidding-firm stockholders (Jensen and Ruback 1983, Asquith 1983, Li and Chen 2002, Goergen and Renneboog 2004). My findings are aligned with previous literature.

Second, M&A effects are different in sectors. This paper includes 4 sectors: communications, technologies, energy, and utilities. M&A announcements increase only technologies and communications stock abnormal returns at the announcement month. For technology sector, announcement abnormal return is increased by 0.77 percent point. The announcement increases abnormal return by 67% for the announcement month which is economically significant. For communication firms, announcement increases abnormal return by 0.68 percent point. This impact is also economically significant with a 60% semi-elasticity. These results indicate that stock investors have high expectations in technology-related acquirers generating profit from the M&A deal. This expectation is especially high at the announcement month. Kallunki, Pyykkö, and Laamanen (2009) found that "technology acquirers were more successful in converting their S&D spending into positive future profitability than non-technology acquirers".

Third, financial ratios have different impacts on stock abnormal return among different industries. In table 7, effect of B/M in energy is significantly less negative than that of overall data. This indicates that high B/M helps energy firms to have high abnormal returns. Furthermore, effect of financial leverage in utilities sector is significantly more negative than that of overall data. This implies that utility firms are punished by having high financial leverage. Capital-intensive sectors, such as energy and utilities, are rewarded with high B/M and punished by high financial leverage ratio. Energy and utilities companies are valued on their ability of producing with using own assets instead of using debt financing.

7. Conclusion

This paper examines instantaneous effects of M&A announcements on acquirer's stock and bond returns. With 1,774 global M&A deals from 2016 January to 2017 March in the technology, communication, energy, and utility sectors, I found a 0.41 percentage-point instantaneous growth in stockholder's wealth and a -0.01 instantaneous impact with bondholder's wealth at the announcement month. Stock abnormal returns increase even more in the communication and technology industries with 0.68 percentage points and 0.77 percentage points, respectively. Furthermore, financial fundamental ratios affect abnormal return differently across different industries depending on the characteristics of that industry. Last, M&A announcement increases individual bond Sharpe ratio at the announcement month.

These findings help stock and bond investors to understand what to expect with a M&A announcement and therefore can better benefit or avoid losses from changes. On the other hand, by knowing the potential changes in stock and bond returns with an announcement, acquirers can more thoroughly analyze the benefits and loses from a M&A; hence make a better decision.

This paper only examined the instantaneous effect of M&A announcements on stock and bond returns with a short period of time. Future research could explore the long-term effect and expand the time period of dataset to make more general statements about M&A effects. Future researchers can also look at how types of M&A and bond ratings affect stock and bond returns.

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Table 1. Variable descriptions and sources

Name	Variable	Unit
Equity Data from Bloomberg		
Monthly stock return	stock_return	0% - 100%
Market capitalization	mktcap	1,000$
Book to market ratio	booktomkt	ratio
Leverage	leverage	ratio
P/E Ratio	peratio	ratio
Equity Data from Yahoo! Finance		
Vanguard Total World Stock	VT	0% - 100%
Debt Data from Bloomberg		
Monthly bond yield to maturity rate	bond_return	0% - 100%
Debt Data from FRED		
AAA corporate bond yield	AAA	0% - 100%
BAA corporate bond yield	BAA	0% - 100%
1-month treasury bill yield	tbill	0% - 100%
10-year government bond yield	govt	0% - 100%

Table 2. Summary statistics

Name	Number	Mean	SD	Min	Max
Equity Data					
Monthly stock return	26,160	3.74	127.49	-83.17	12,658.62
Market capitalization (1,000s)	26,160	1,500	17,000	0.00031	430,000
B/M	26,160	0.61	0.72	0.00	38.91
leverage	26,160	3.20	4.13	1.01	79.70
P/E	26,160	37.93	225.23	0.40	12,044.42
ret_abnormal	26,160	-1.14	127.43	-92.47	12645.46
ln(mktcap)	26,160	9.15	2.95	-1.17	19.89
ln(B/M)	26,160	-0.87	0.88	-5.53	3.66
ln(leverage)	26,160	0.90	0.61	0.01	4.38
ln(P/E)	26,160	3.15	0.76	-0.91	9.40
Vanguard Total world stock	26,160	1.37	2.26	-1.97	7.55
Debt Data					
Monthly bond yield to maturity(YTM)	14,670	3.45	2.41	-56.61	19.60
AAA corporate bond yield	14,670	3.72	0.26	3.28	4.06
BAA corporate bond yield	14,670	4.71	0.36	4.22	5.45
1-month treasury bill yield	14,670	0.31	0.13	0.19	0.66
10-year governemtn bond yield	14,670	1.96	0.34	1.50	2.49
i_premium	14,670	1.65	0.24	1.24	2.07
d_premium	14,670	1.76	0.18	1.49	2.18
financial_premium	14,670	0.98	0.24	0.67	1.45
predicted_sharpe	14,670	10.09	7.97	-30.75	83.12

Table 3. Number of deals by industry

Acquirer company sector \ Target company sector	Communication	Technology	Energy	Utility	Total
Communication	312	154	2	2	470
Technology	93	293	8	1	395
Energy	2	2	273	15	292
Utility	2	2	50	57	111

Table 4. Industry mean comparisons

Name	All	Communication	Energy	Technology	Utility
Number of observations	1,744	631	374	562	165
Monthly stock return	3.74	1.83	8.59	2.37	4.84
Market Capitalization (1,000s)	$1,500	$1,500	$1,500	$1,500	$1,500
Market to book (M/B)	3.80	3.79	3.05	4.85	1.98
Leverage (FL)	3.20	3.49	3.07	2.68	4.13
P/E Ratio	37.93	32.57	74.92	34.71	18.52

Table 5. Most frequent acquirer country and target country

	Acquirers			Targets		
Rank	Country	Number of deals	Percentage to total deals	Country	Number of deals	Percentage to total deals
1	U.S.	635	39.86%	U.S.	398	35.44%
2	Japan	228	14.31%	Japan	123	10.95%
3	Canada	155	9.73%	Britain	60	5.34%
4	China	80	5.02%	Canada	59	5.25%
5	South Korea	57	3.58%	China	58	5.16%

Table 6. Five-factor model replication

	(1) stockreturn	(2) stockreturn	(3) ret abnormal
VTreturn	0.192	0.018	
	(3.07)**	(0.17)	
ln(mktcap)	8.327		8.128
	(2.79)**		(2.77)**
ln(booktomkt)	-14.425		-14.430
	(7.10)**		(7.12)**
ln(leverage)	-9.402		-9.444
	(5.15)**		(5.19)**
ln(peratio)	0.526		0.529
	(0.54)		(0.54)
_cons	-91.294	-1.142	-89.159
	(3.17)**	(1.13)	(3.14)**
R^2	0.05	0.00	0.07
N	17,205	26,160	17,205
Company FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes

Notes: Coefficients of *mktcap*, *booktomkt*, *leverage* in column 1 and 3 are not significantly different at 5% significance level, with p-values of 0.9459, 0.9979, and 0.9815, respectively.
* p<0.05; ** p<0.01

Table 7. Stock Regressions

	(1)	(2)	(3)	(4)	(5)
	abnormal return	abnormal return	abnormal return	abnormal return	abnormal return
merger	0.304	-0.085	-0.202	0.980	0.592
	(0.98)	(0.16)	(0.30)	(1.84)*	(1.07)
ln(mktcap)	8.128	6.608	3.083	10.485	-0.406
	(2.77)***	(0.89)	(1.21)	(2.81)***	(0.09)
ln(booktomkt)	-14.429	-19.212	-2.952	-18.402	-24.157
	(7.12)***	(3.70)***	(2.02)**	(6.32)***	(4.66)***
ln(leverage)	-9.445	-9.955	-2.335	-4.689	-19.369
	(5.19)***	(1.93)*	(1.23)	(1.43)	(3.56)***
ln(peratio)	0.532	0.228	2.050	-1.848	-1.129
	(0.55)	(0.23)	(1.61)	(0.63)	(1.03)
_cons	-89.188	-81.390	-36.487	-114.259	19.377
	(3.15)***	(1.01)	(1.73)*	(3.78)***	(0.44)
R^2	0.07	0.20	0.03	0.09	0.29
N	17,205	6,480	2,460	6,435	1,830
Company FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Sector		communication	energy	technology	utility

Note: 1. energy ln(booktomkt) estimator is significant different than general ln(booktomkt) estimator with F(1, 163) = 61.98, Prob > F = 0.0000.

2. technology ln(mktcap) estimator is not significantly different than general ln(mktcap) estimator with F(1, 428) = 0.4, Prob > F = 0.5276.

3. utilities ln(leverage) estimator is significantly different than general ln(leverage) estimator with F(1, 121) = 3.33, Prob > F = 0.0705.

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 8. Stock regressions with interaction terms

	(1) abnormal return	(2) abnormal return	(3) abnormal return	(4) abnormal return	(5) abnormal return
merger	0.779	-0.493	-6.594	-0.877	7.403
	(0.36)	(0.13)	(1.46)	(0.19)	(1.33)
ln(mktcap)	8.078	6.571	3.051	10.426	-0.348
	(2.75)***	(0.88)	(1.20)	(2.79)***	(0.07)
ln(booktomkt)	-14.394	-19.190	-2.820	-18.389	-23.694
	(7.10)***	(3.68)***	(1.92)*	(6.38)***	(4.49)***
ln(leverage)	-9.460	-10.073	-2.227	-4.634	-18.817
	(5.20)***	(1.95)*	(1.17)	(1.41)	(3.55)***
ln(peratio)	0.528	0.168	2.026	-1.881	-0.936
	(0.54)	(0.17)	(1.56)	(0.65)	(0.83)
ln(mktcap) × merger	-0.168	-0.530	0.674	-0.018	0.266
	(1.69)*	(3.33)***	(2.42)**	(0.09)	(1.39)
ln(booktomkt) × merger	-1.196	-0.893	-2.114	-1.031	-4.112
	(2.49)**	(1.26)	(1.38)	(0.79)	(2.35)**
ln(leverage) × merger	-0.466	-0.305	-0.885	-0.446	-1.663
	(0.68)	(0.31)	(0.45)	(0.25)	(1.01)
ln(peratio) × merger	0.153	1.701	-0.089	0.354	-3.430
	(0.27)	(1.69)*	(0.11)	(0.29)	(2.05)**
_cons	-88.640	-80.690	-36.110	-113.620	17.899
	(3.12)***	(1.00)	(1.72)*	(3.74)***	(0.40)
R^2	0.07	0.20	0.03	0.09	0.30
N	17,205	6,480	2,460	6,435	1,830
Company FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Interactions	Yes	Yes	Yes	Yes	Yes
Sector		communication	energy	technology	utility

Note: 1. The F test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for overall data: H0: coefficient are jointly 0; F (4, 1146) = 3.85; Prob > F = 0.0041.
2. The F test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for communications: H0: coefficient are jointly 0; F (4, 431) = 4.01; Prob > F = 0.0014.
3. The F test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for energy: H0: coefficient are jointly 0; F (5, 163) = 1.55; Prob > F = 0.1925.
4. The F test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for technology: H0: coefficient are jointly 0; F (5, 428) = 2.10; Prob > F = 0.0645.
5.The F test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for utilities: H0: coefficient are jointly 0; F (5, 121) = 1.61; Prob > F = 0.1636.

* p<0.1; ** p<0.05; *** p<0.01

Graph 1. Stock abnormal return against event date

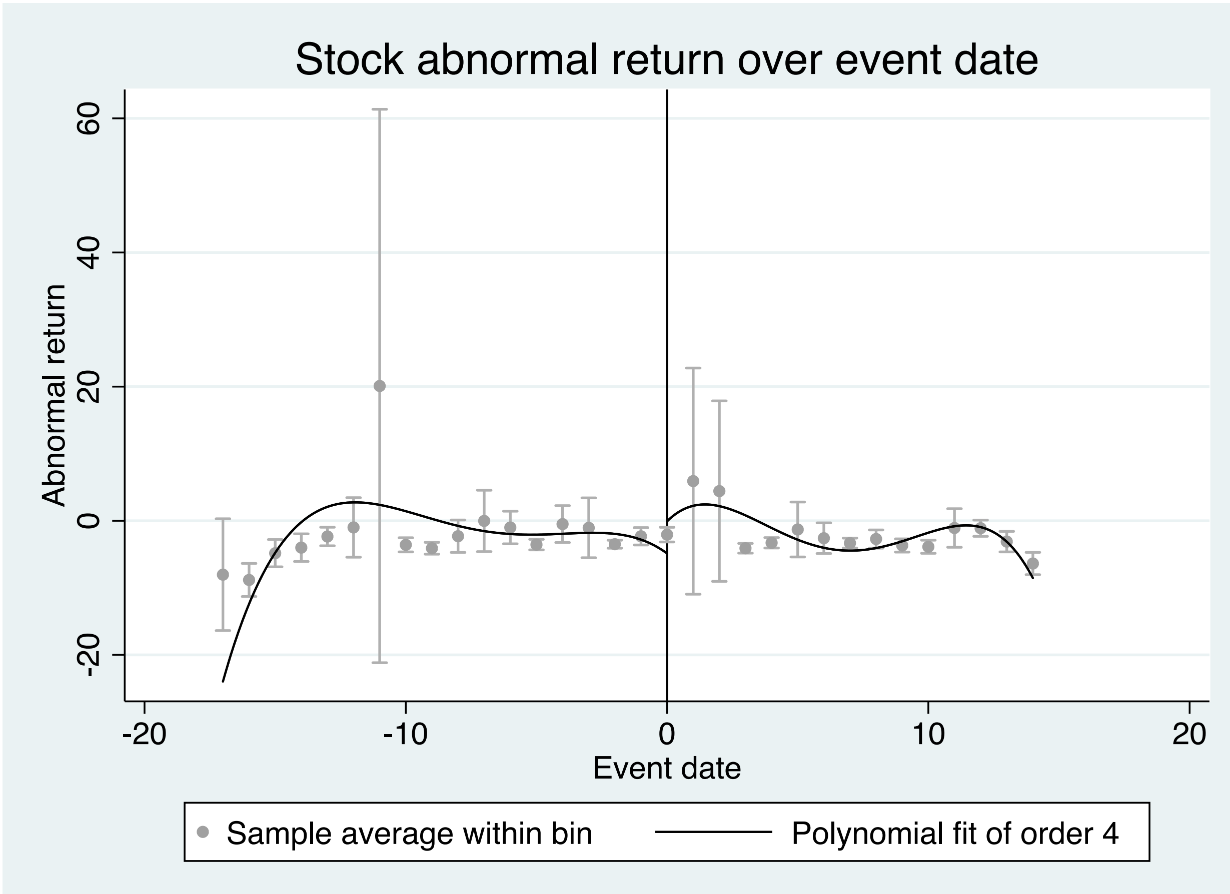

Table 9. Bond regression replication

	(1)	(2)
	return	return
L.return	0.613	0.604
	(5.33)**	(5.62)**
L2.return	0.164	0.205
	(4.90)**	(6.64)**
i_premium	0.198	0.470
	(1.75)	(7.45)**
d_premium	-0.619	1.376
	(1.75)	(8.29)**
finance_premium		-1.239
		(5.00)**
_cons	1.460	-1.418
	(3.28)**	(5.20)**
R^2	0.66	0.67
N	12,714	12,714
Time dummies	Yes	Yes
Bond FE	Yes	Yes

* $p<0.05$; ** $p<0.01$

Table 10. Bond regression

	(1)	(2)	(3)	(4)	(5)
	return	return	return	return	return
return t-1	0.604	0.961	0.413	0.454	0.660
	(5.63)***	(6.57)***	(9.49)***	(7.60)***	(8.66)***
return t-2	0.204	0.098	0.173	0.131	0.041
	(6.63)***	(1.28)	(6.68)***	(3.24)***	(0.78)
merger	-0.031	-0.072	-0.017	0.027	-0.015
	(0.97)	(1.22)	(0.37)	(1.00)	(0.55)
i_premium	0.469	0.330	0.464	0.499	0.487
	(7.39)***	(3.31)***	(6.77)***	(8.24)***	(4.83)***
d_premium	1.377	1.198	1.538	0.864	0.820
	(8.32)***	(4.34)***	(4.38)***	(6.47)***	(3.66)***
finance_premium	-1.239	-1.393	-0.674	-0.739	-0.544
	(5.00)***	(8.63)***	(3.29)***	(7.31)***	(3.24)***
_cons	-1.415	-1.507	-1.308	-0.643	-0.623
	(5.21)***	(3.26)***	(2.45)**	(2.84)***	(1.82)*
R^2	0.67	0.88	0.54	0.54	0.67
N	12,714	4,433	4,420	1,794	2,067
Bond FE	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
Sector dummies		communication	energy	technology	utility

Note: T test

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 11. Bond regression with interactions

	(1) return	(2) return	(3) return	(4) return	(5) return
return t-1	0.603	1.015	0.413	0.453	0.741
	(5.63)***	(12.97)***	(9.49)***	(7.61)***	(15.72)***
return t-2	0.205		0.173	0.133	
	(6.62)***		(6.64)***	(3.41)***	
merger	-1.536	0.301	-0.820	-0.329	-0.024
	(1.01)	(0.37)	(0.40)	(0.21)	(0.04)
i_premium	0.460	0.247	0.454	0.497	0.450
	(7.30)***	(4.27)***	(6.80)***	(7.96)***	(7.57)***
d_premium	1.343	0.793	1.516	0.852	0.822
	(8.28)***	(6.46)***	(4.47)***	(6.22)***	(5.20)***
finance_premium	-1.238	-1.125	-0.684	-0.741	-0.570
	(4.96)***	(11.55)***	(3.34)***	(7.48)***	(5.16)***
i_premium × merger	0.150	-0.118	0.137	0.002	-0.107
	(0.55)	(0.54)	(0.32)	(0.01)	(0.80)
finance_premium × merger	-0.032	0.680	0.036	0.101	0.092
	(0.06)	(1.07)	(0.05)	(0.16)	(0.40)
d_premium × merger	0.745	-0.482	0.312	0.160	0.052
	(0.81)	(0.73)	(0.27)	(0.15)	(0.17)
_cons	-1.341	-0.781	-1.248	-0.621	-0.686
	(4.88)***	(4.73)***	(2.40)**	(2.64)**	(3.00)***
R^2	0.67	0.88	0.54	0.54	0.70
N	12,714	4,774	4,420	1,794	2,226
Bond FE	Yes	Yes	Yes	Yes	Yes
Interactions	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
Sectors		communication	energy	technology	utility

Note: The t-test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for overall data: H0: coefficient are jointly 0; F (4, 136) = 2.16; Prob > F = 0.0768.
The t-test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for communications: H0: coefficient are jointly 0; F (4, 40) = 1.22; Prob > F = 0.3184.
The t-test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for energy: H0: coefficient are jointly 0; F (4, 38) = 0.57; Prob > F = 0.6844.
The t-test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for technology: H0: coefficient are jointly 0; F (4, 26) = 9.94; Prob > F = 0.0001.
The t-test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for utilities: H0: coefficient are jointly 0; F (4, 29) = 1.32; Prob > F = 0.2864.
* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Graph 2. Bond return over event date

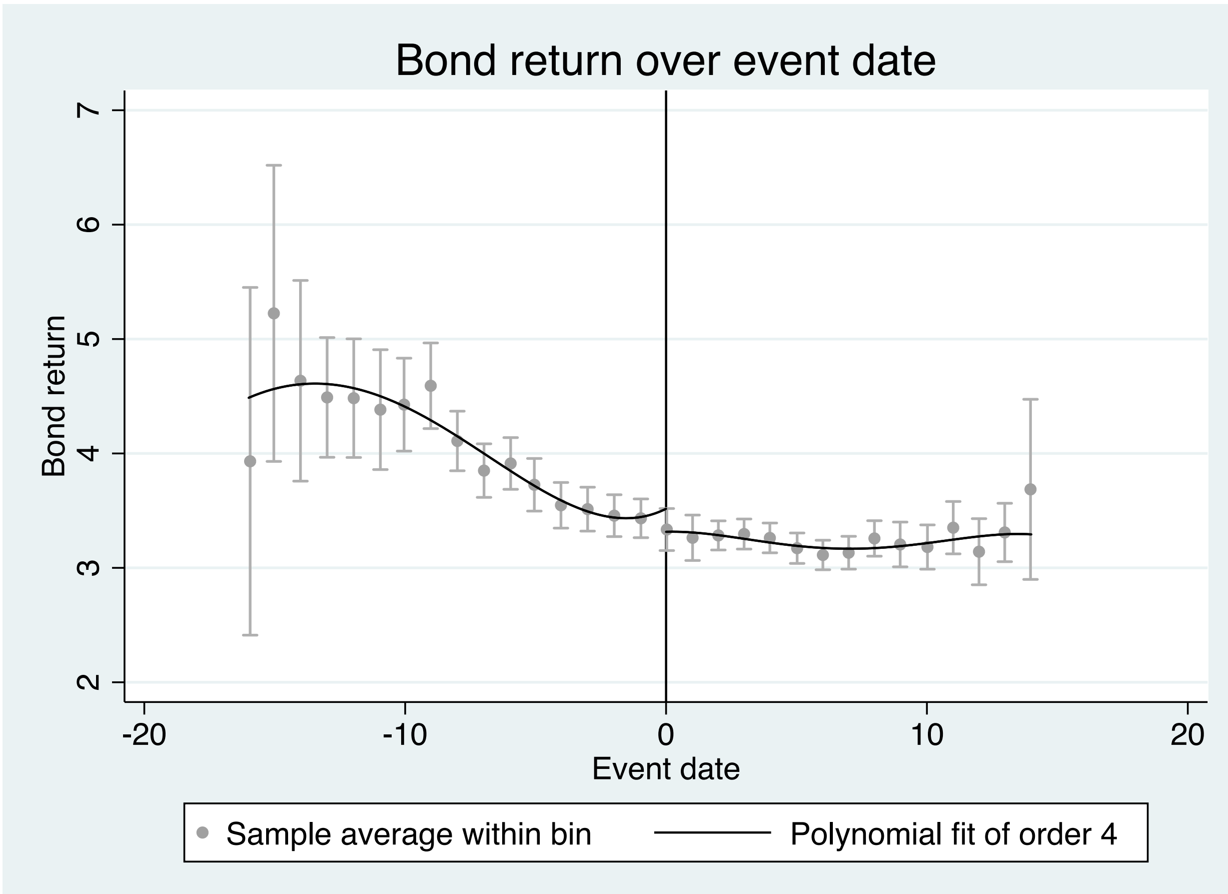

Table 12. ARCH model results

return	_cons	3.753
		(24.87)**
ARMA	L.ar	1.143
		(41.59)**
	L2.ar	-0.158
		(6.13)**
ARCH	L.arch	1.876
		(14.22)**
	L2.arch	0.106
		(4.28)**
	Larch	-0.040
		(3.69)**
	L2.garch	0.043
		(4.82)**
	_cons	0.026
		(7.86)**
N		14,670

* $p<0.05$; ** $p<0.01$

Table 13. Bond Sharpe ratio

	predicted_sharpe	predicted_sharpe	predicted_sharpe
L.predicted_sharpe	-0.130	-0.138	-0.137
	(6.96)***	(5.99)***	(5.87)***
L2.predicted_sharpe	-0.158	-0.119	-0.121
	(5.75)***	(4.82)***	(4.90)***
L3.predicted_sharpe	-0.275	-0.237	-0.235
	(8.51)***	(8.63)***	(8.65)***
L4.predicted_sharpe	-0.080	-0.060	-0.056
	(3.01)***	(2.38)**	(2.17)**
L5.predicted_sharpe	0.080	0.055	0.054
	(3.98)***	(2.84)***	(2.72)***
L6.predicted_sharpe	-0.137	-0.144	-0.139
	(4.64)***	(5.32)***	(5.17)***
L7.predicted_sharpe	-0.195	-0.129	-0.129
	(6.50)***	(3.13)***	(3.15)***
L8.predicted_sharpe	-0.126	-0.112	-0.117
	(3.04)***	(2.52)**	(2.63)***
merger	0.413	0.361	-75.897
	(0.52)	(0.47)	(3.14)***
i_premium		2.249	1.406
		(1.15)	(0.75)
d_premium		21.571	19.531
		(3.11)***	(3.05)***
finance_premium		-8.273	-7.675
		(1.49)	(1.39)
d_premium × merger			27.017
			(1.56)
i_premium × merger			16.842
			(3.59)***
finance_premium × merger			2.862
			(0.13)
_cons	21.728	-13.145	-8.824
	(21.26)***	(1.00)	(0.72)
R^2	0.25	0.26	0.27
N	6,846	6,846	6,846
Time dummies	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes
Premiums		Yes	Yes
Interactions			Yes

Note: The t-test linear hypotheses after estimation confirms that merger and merger interactions are not jointly 0 for overall data: H0: coefficient are jointly 0; F (4, 136) = 3.67; Prob > F = 0.0071.

* p<0.1; ** p<0.05; *** p<0.01

Table14. M&A deals related to the U.S.

Acquirer Country	Target country: U.S.	Target country: Other countries
U.S.	296	102
Others countries	339	383

Table 15. M&A effect on cross-border deals

	(1) abnormal return	(2) abnormal return	(3) abnormal return
merger	1.108	-20.277	-8.353
	(0.17)	(1.07)	(1.12)
mktcap	9.210	-24.482	7.431
	(2.69)**	(1.78)	(2.57)*
booktomkt	-11.486	-48.328	-16.114
	(2.87)**	(3.07)**	(4.57)**
leverage	-6.543	-29.690	-1.426
	(1.53)	(2.74)**	(0.49)
peratio	0.471	-2.123	1.434
	(0.46)	(0.97)	(1.33)
int_mktcap_merger	-0.222	0.451	0.428
	(0.60)	(0.43)	(1.65)
int_booktomkt_merger	0.093	-1.444	-0.955
	(0.07)	(1.08)	(0.79)
int_leverage_premium_merger	-0.239	2.664	-2.654
	(0.16)	(1.01)	(1.43)
int_peratio_premium_merger	0.634	3.598	1.867
	(0.53)	(1.32)	(0.77)
_cons	-94.975	217.679	-98.886
	(3.22)**	(1.66)	(3.53)**
R^2	0.21	0.26	0.29
N	3,030	1,500	1,275
Time dummies	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes
Type of deals	domestic	Foreign targets	Foreign acquires

Notes: 1. The F test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for column 1: H0: coefficient are jointly 0; F (4, 201) = 0.44; Prob > F = 0.7769.

2. The F test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for column 2: H0: coefficient are jointly 0; F (4, 99) = 1.28; Prob > F = 0.2850.

3. The F test linear hypotheses after estimation confirms that merger and merger interactions are jointly 0 for column 3: H0: coefficient are jointly 0; F (4, 84) = 1.45; Prob > F = 0.2241.

* p<0.05; ** p<0.01

Table 16. Top-value M&A global deals in the data

Rank	Announce Date	Target Name	Acquirer Name	Announced Total Value (mil.)	Target Country	Acquirer Country
1	11/21/16	Energy Transfer LP	Energy Transfer Partners LP	50745.62	UNITED STATES	UNITED STATES
2	9/6/16	Spectra Energy Corp	Enbridge Inc	42223.61	UNITED STATES	CANADA
3	10/31/16	Level 3 Communications Inc	CenturyLink Inc	33500.2	UNITED STATES	UNITED STATES
4	7/18/16	ARM Holdings PLC	SoftBank Group Corp	30124.56	BRITAIN	JAPAN
5	2/1/17	ONEOK Partners LP	ONEOK Inc	17377.65	UNITED STATES	UNITED STATES

Table 17. ROA mean and standard deviation by industry

industry	**ROA mean**	**ROA sd**
Communications	1.62	12.93
Energies	-5.44	17.66
Technologies	3.25	28.32
Utilities	2.57	3.71

Appendix

Merger impact calculations

(If the economic significance if larger than 20%, the impact is economically significant)

Table 7:

- Technologies

$$\text{Impact} = e^{0.98} - 1 = 1.66 \text{ percentage point}$$

Table 8:

- For overall data

$$\text{merging impact} = e^{0.779+(-0.168)*\overline{mktcap}+(-1.196)*\overline{booktomkt}+(-0.466)*\overline{leverage}+(0.153)*\overline{peratio}} - 1$$
$$= 0.412 \text{ percentage point}$$

- Communications

$$\text{merging impact} = e^{-0.493+(-0.53)*\overline{mktcap}+(-0.893)*\overline{booktomkt}+(-0.305)*\overline{leverage}+(1.701)*\overline{peratio}} - 1$$
$$= 0.679$$

- Technologies

$$\text{merging impact} = e^{-0.877+(-0.018)*\overline{mktcap}+(-1.031)*\overline{booktomkt}+(-0.446)*\overline{leverage}+(0.354)*\overline{peratio}} - 1$$
$$= 0.766$$

$$\text{Semi} - \text{elasticity} = 0.766 \times \frac{\bar{x}}{\bar{y}} = 0.766 \frac{1}{-1.14} = -67\%$$

Table 11:

- For overall data

$$\text{merging impact} = e^{0.603+(0.15)*\overline{i\_premium}+(-0.745)*\overline{d\_premium}+(-0.032)*\overline{finance\_premium}} - 1$$
$$= -0.01$$

$$\text{LRP} = \frac{merging\ impact}{1 - \sum_{j=1}^{2} \rho_j} = \frac{-0.01}{1 - 0.603 - 0.205} = -0.045$$

- Technologies

$$\text{merging impact} = e^{0.453+(0.002)*\overline{i_{premium}}+(0.16)*\overline{d\_premium}+(0.101)*\overline{finance\_premium}} - 1 = 0.06$$

$$\text{LRP} = \frac{merging\ impact}{1 - \sum_{j=1}^{2} \rho_j} = \frac{0.06}{1 - 0.453 - 0.133} = 0.136$$

Table 13:

$$\text{merging impact} = e^{-75.897+(16.842)*\overline{\iota_{premium}}+(27.017)*\overline{d\_premium}+(2.862)*\overline{finance\_premium}} - 1 = 8.46$$

$$\text{Semi} - \text{elasticity} = 8.46 \times \frac{\overline{merge}}{\overline{predicted\ sharpe}} = 8.46\frac{1}{10.09} = 84\%$$

$$\text{LRP} = \frac{merging\ impact}{1 - \sum_{j=1}^{8} \rho_j}$$

$$= \frac{8.46}{1 - (-0.137) - (-0.121) - (-0.235) - (-0.056) - (0.54) - (-0.139) - (-0.129) - (-0.117)}$$

$$= 4.50$$

$$\text{Semi} - \text{elasticity} = 4.5 \times \frac{\overline{merge}}{\overline{predicted\ sharpe}} = 4.5\frac{1}{10.09} = 45\%$$