Bid-Ask Spreads Around M&A Announcements

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Draft 04/18/2021

Abstract

Merger and Acquisition (M&A) announcements are catalysts for large shifts in market activity. In particular, Corporate Finance literature has extensively documented the existence of abnormal returns around M&A announcements. Using theory from Market Microstructure, I investigate the impact of announcements on bid ask spreads for stocks involved in a proposed M&A transaction. I also investigate shifts in Volume and Volatility to further explain changes in the bid ask spread. The empircs are done at both a daily level and a intraday minute level using TAQ data. I propose conditions that will cause the bid ask spread to shift following an M&A announcement. These results are consistent with previous results in Market Microstructure regarding the impact of new information on trading activity.

1 Introduction

It is well documented that stocks involved in an M&A announcement have abnormal returns in the short run. Furthermore, these announcements given professional investors the opportunity to engage in merger arbitrage. It is also documented in Brennan et al. that there is an increased probability of informed trading around M&A announcements [1]. All this being considered, I expect that there is a change in the bid ask spread around the announcement period for stocks involved in an M&A deal. This paper tests whether this shift has anything to do with the announcement or more so with the volume, volatility, and price shifts.

To test this hypothesis I run a HAC robust regression of the following type:

$$ln(\%spread) = \beta_0 + \beta_1 ln(volume) + \beta_2 ln(price) + \beta_3 ln(volatility) + \beta_4 ln(Announcement) \quad (1)$$

I gather data on M&A deals from 2016 - 2020 using the SDC platinum database. This study focuses on large deals for public companies in the United States as I use TAQ data for information about trades. For the regressions, I aggregate the TAQ data into minute intervals and daily intervals. For the minute level regression, I use daily volatility in favor of minute volatility as there is not enough change within a minute. Volatility is calculated using the standard deviation of returns.

Ultimately I find that the announcement effect depends on the deal type. There is a noticeable difference in the impact of an announcement between M&A deals that involve all cash, all stock, or both. Furthermore, the announcement effect is quite low for acquirers and consistently high for acquirers. This is expected as target stocks are typically less liquid and hence would be more sensitive to any new information. I also document that there are noticeable shifts in volume, volatility, and price following an announcement. Similar to the announcement effect, these shifts also depend on the type of deal.

2   Literature Review

Previous work studying market activity around M&A announcements has been focused on understanding returns and price movement following the announcement. Andrade et al. find that Target firms have a 24% abnormal return in the window from 20 days prior to the announcement to the close[2]. They also conclude that acquirer firms, while not losers, have much lower returns than targets. Furthermore the paper goes on to observe returns for acquirers and targets are contingent on deal type. They show that both targets and acquirers perform better when there is no equity involved in the transaction. Mitchell et al. further explore the issue of equity financed M&A transactions and find downward price pressure caused by professional investors [3]. They find increased short interest for acquiring firms financing the deal with equity, consistent with a merger arbitrage strategy.

Much of the other relevant work for this study comes from market microstructure. Particularly relevant for this work are models that show changes in trading behavior and activity in the presence of new information. By modeling a trading environment as a series sequential auctions, Kyle finds that an insider will maximize profits by masking their trades amongst other noise traders[4]. Hence the more liquid acquirer stocks will be less sensitive to price shifts caused by any insider trades. Easley et al. also explore asymmetric information by analyzing the probability of informed trading[5]. They find that new information has a greater impact for less liquid stocks. This work is also consistent with the empirical work done by Hasbrouck using a VAR model[6]. As targets tend to have significantly lower volumes than their respective acquirers, this explains why an information effect is more pronounced for these stocks.

Bagehot concludes that spread and liquidity are inversely related and poses the idea that market makers face an adverse selection cost [7]. This provides one possible explanation for why spreads may change for stocks involved in an M&A transaction since we know there is typically increased volume around announcement periods. Glosten and Harris break down the spread into two components, the transaction cost and and an adverse selection cost [8]. Upon empirically analyzing the adverse selection component they are unable to reject that the adverse selection component has an impact on the spread. This is consistent with the theoretical result shown by Glosten and Milgrom as they also concluded adverse selection has an impact on the spread[9]. From a market makers perspective, new information about a M&A deal should change this adverse selection cost, depending on deal sentiment and type.

3   Description of Data

I use SDC platinum to gather information about large M&A deals in the United States between 2016 - 2020. Specifically, I look at deals with values between and 10 and 50 billion. I also only focus on deals in which both the acquirer and target are public as I will need to gather trade information from TAQ. Furthermore, I gather information about the announcement date, rumor information, and deal type from SDC platinum. I randomly sample 15 deals from this query to include in this study. Of these 15 deals, 6 are stock deals, 5 are cash, and 4 are hybrid. Only 4 deals in the sample had documented rumors prior to the announcement.

For the trade data I use TAQ data for information about each individual trade for these stocks. I look at each stock over a time period of 3 months: the month before the announcement, the month of the announcement, and the month following the announcement. To facilitate less noisy regressions I aggregate the TAQ data by minute and by day. I also exclude the first 5 and last 5 minutes of trading as these periods typically have significant outliers in trading activity. This leads to an average of 23932 minutes of data per stock or 63 trading days. The announcement variable is a binary variable that takes on the value 1 on all days following the announcement and 0 all days before.

I calculate ln(% spread) using the following formula where NBO and NBB are the national best offer and national best bid, respectively.

$$ln(\%spread) = ln[\frac{NBO - NBB}{(NBO - NBB)/2}] \tag{2}$$

To calculate volatility I first calculate minute returns using the last price from each minute. I then take the standard deviation of the minute returns and multiply this by $\sqrt{390}$ for the daily volatility.

$$returns_t = ln(price_t) - ln(price_{t-1}) \tag{3}$$

$$dayvolatility = \sigma_{minutereturns} * \sqrt{390} \tag{4}$$

When aggregating the data into minute periods and daily periods I typically use median values. The only exception to this rule was with the volume variable. Rather than taking the median value of the trade, I summed across all volumes with the minute. I then took logs of these values for the regression.

$$minuteVolume = \sum_{trade \in minute} tradeSize \tag{5}$$

$$dailyVolume = \sum_{trade \in day} tradeSize \tag{6}$$

4   Results

I separate regressions for both the Target and Acquirer to better study their changes individually. I further separate the results by deal type for the same reason. All regressions use Newey-West standard errors robust to both heteroscedasticity and auto correlation of lag 2.

4.1 Target Announcement Effect

The following regressions focus on Target stocks. I present results using both data at the minute level and the daily level.

Table 1: Target % Spread Minute Regression

	Dependent variable: log percentage spread			
	All Targets	Cash Deals	Cash/Stock Deals	Stock Deals
	(1)	(2)	(3)	(4)
Announced	0.001	-0.495***	-0.409***	0.019***
	(0.004)	(0.010)	(0.006)	(0.005)
Intercept	-2.867***	-5.546***	-8.126***	-2.834***
	(0.015)	(0.031)	(0.036)	(0.032)
logDayVolatility	0.522***	0.293***	0.141***	0.521***
	(0.004)	(0.006)	(0.004)	(0.008)
logPrice	-0.364***	-0.110***	0.263***	-0.338***
	(0.003)	(0.004)	(0.006)	(0.003)
logVolume	-0.168***	-0.070***	-0.084***	-0.160***
	(0.001)	(0.002)	(0.002)	(0.001)
Observations	346,470	117,977	95,202	133,291
R^2	0.514	0.520	0.283	0.333
Adjusted R^2	0.514	0.520	0.283	0.333
Residual Std. Error	0.576(df = 346465)	0.487(df = 117972)	0.415(df = 95197)	0.551(df = 133286)
F Statistic	43436.281*** (df = 4.0; 346465.0)	11852.362*** (df = 4.0; 117972.0)	3893.931*** (df = 4.0; 95197.0)	8333.573*** (df = 4.0; 133286.0)

Note: *p<0.1; **p<0.05; ***p<0.01

As shown in Table 1, the announcement is neither statistically nor numerically significant on the log percent spread when looking at all targets. Upon separating the data by deal type, the announcement effect on the percent spread is now evident. This consistent with Figure 1 presented below which details shifts in the log spread following an announcement. Both the figure and regression results show that the announcement has a negative impact on the spread for hybrid and cash deals. For targets in an equity financed deal, the announcement has a near zero effect. This coefficient is near zero due to the variable behavior in the % spread for these targets. We also see that coefficients on Volume and Volatility have the appropriate sign. The coefficient on price is as expected for all the regression except hybrid deals. The relatively low R^2 values are from the noise in the data.
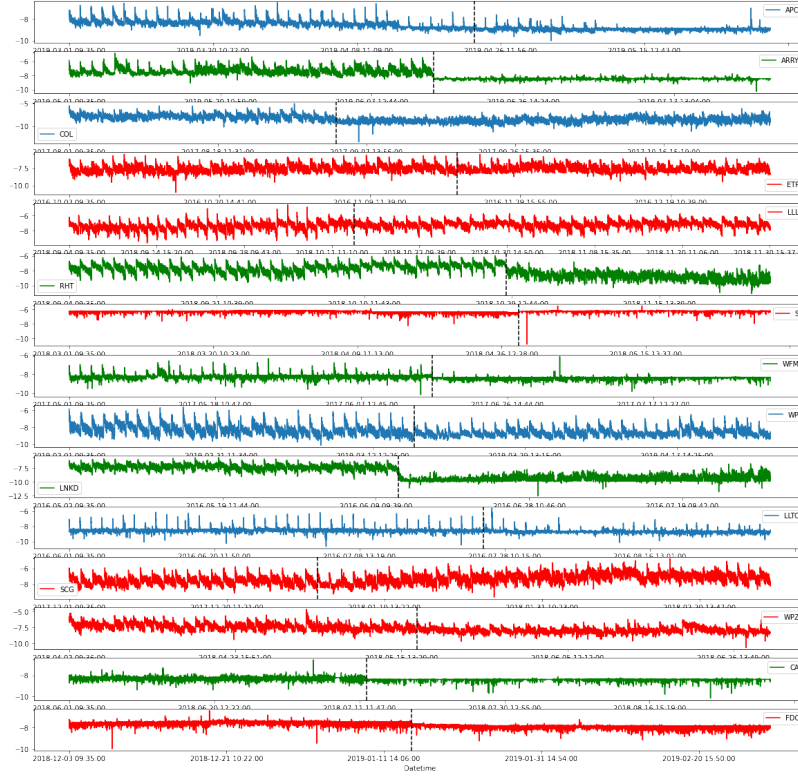
Figure 1: Plot of the log Spread for 15 target companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Targets involved with Rumors include CA, COL, S, and APC

I also run the same regressions for Targets using daily data rather than minute data to eliminate noise. The results for this regression can be found in Table 2. As expected, this regression leads to a higher R^2. The coefficients on all variables retain the same signs. Unlike the previous regression where the announcement was not significant for all Targets, it is marginally significant here. I also find that the announcement is not statistically significant for stock deals here. The change in statistical significance is likely due to the disparity in the sample size. Despite this, the announcement effect for stock deals is still numerically close to 0 for the same reason mentioned earlier.

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Table 2: Target % Spread Daily Regression

	Dependent variable: log percentage spread			
	All Targets	Cash Deals	Cash/Stock Deals	Stock Deals
	(1)	(2)	(3)	(4)
Announced	0.106*	-0.389***	-0.310***	0.061
	(0.059)	(0.124)	(0.052)	(0.080)
Intercept	1.174**	-3.791***	-5.790***	1.066
	(0.496)	(1.022)	(0.498)	(0.731)
logDayVolatility	0.535***	0.319***	0.205***	0.615***
	(0.038)	(0.070)	(0.032)	(0.081)
logPrice	-0.474***	-0.156***	0.221***	-0.462***
	(0.041)	(0.055)	(0.062)	(0.061)
logShareVolume	-0.336***	-0.139**	-0.177***	-0.300***
	(0.028)	(0.056)	(0.020)	(0.039)
Observations	945	317	255	373
R^2	0.642	0.630	0.620	0.427
Adjusted R^2	0.641	0.626	0.614	0.420
Residual Std. Error	0.453(df = 940)	0.389(df = 312)	0.205(df = 250)	0.438(df = 368)
F Statistic	225.423*** (df = 4.0; 940.0)	51.149*** (df = 4.0; 312.0)	54.180*** (df = 4.0; 250.0)	47.426*** (df = 4.0; 368.0)

Note: *p<0.1; **p<0.05; ***p<0.01

4.2 Acquirer Announcement Effect

The following regressions focus on Acquirer stocks. I present results using both data at the minute level and the daily level.

Table 3: Acquirer % Spread Minute Regression

	Dependent variable: log percentage spread			
	All Acquirers	Cash Deals	Cash/Stock Deals	Stock Deals
	(1)	(2)	(3)	(4)
Announced	-0.002	0.079***	-0.067***	0.017***
	(0.003)	(0.004)	(0.004)	(0.004)
Intercept	-4.996***	-7.853***	-7.050***	-2.568***
	(0.020)	(0.036)	(0.036)	(0.029)
logDayVolatility	0.513***	0.232***	0.157***	0.743***
	(0.004)	(0.005)	(0.006)	(0.006)
logPrice	0.011***	0.145***	-0.073***	-0.174***
	(0.002)	(0.002)	(0.008)	(0.003)
logVolume	-0.134***	-0.031***	-0.061***	-0.205***
	(0.001)	(0.002)	(0.002)	(0.002)
Observations	355,029	120,880	96,705	137,444
R^2	0.242	0.240	0.059	0.389
Adjusted R^2	0.242	0.240	0.058	0.389
Residual Std. Error	0.479(df = 355024)	0.390(df = 120875)	0.400(df = 96700)	0.469(df = 137439)
F Statistic	9419.214*** (df = 4.0; 355024.0)	4888.151*** (df = 4.0; 120875.0)	633.006*** (df = 4.0; 96700.0)	9997.888*** (df = 4.0; 137439.0)

Note: *p<0.1; **p<0.05; ***p<0.01

Similar to the results from the Target minute regression, the announcement effect is not significant

at the minute level across all Acquirers but becomes statistically significant when separating by deal type. Interestingly, the announcement effect for all situations is not numerically different to zero. I propose that this is because if there are traders who change their behavior based on an announcement, they can more easily mask their trades for Acquirers as shown in [4]. Furthermore Easley et al. and Hasbrouck show that more liquid stocks are less sensitive to new information [6] [5].These regressions have much lower R^2 values and less indicative of any changes following announcements. Furthermore Figure 2 below showing the percentage spread over time for the targets does not have as clear a change after the announcement.
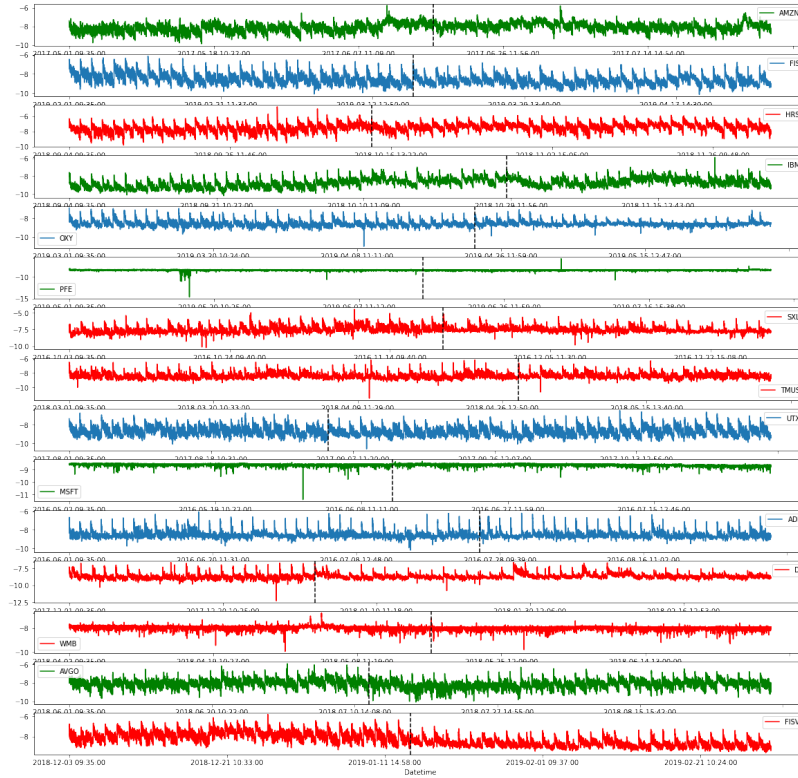
Figure 2: Plot of the log Spread for 15 Acquirer companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Acquirers involved with Rumors include AVGO, UTX, TMUS, and OXY.

Using the daily data for the regression we see that there is little change in the coefficients. Again we find changes in statistical significance due to the sample size being much smaller. We also see slightly higher R^2 after eliminating noise from the data. The most noticeable change when going from minute level data to daily data is the coefficient on the announcement for Acquirers involved in stock deals. It is now clearly positive and marginally significant in the daily regression.

Table 4: Acquirer % Spreads Daily Regression

	Dependent variable:			
	All Acquirers	Cash Deals	Cash/Stock Deals	Stock Deals
	(1)	(2)	(3)	(4)
Announced	0.021	0.078	-0.054**	0.138**
	(0.040)	(0.049)	(0.024)	(0.056)
Intercept	-3.217***	-7.712***	-6.239***	1.932***
	(0.397)	(0.951)	(0.469)	(0.572)
logDayVolatility	0.529***	0.229***	0.195***	0.755***
	(0.044)	(0.054)	(0.046)	(0.058)
logPrice	0.003	0.146***	-0.032	-0.285***
	(0.025)	(0.033)	(0.053)	(0.043)
logShareVolume	-0.190***	-0.028	-0.094***	-0.393***
	(0.018)	(0.046)	(0.026)	(0.031)
Observations	947	319	255	373
R^2	0.364	0.351	0.218	0.619
Adjusted R^2	0.361	0.343	0.206	0.615
Residual Std. Error	0.370(df = 942)	0.294(df = 314)	0.169(df = 250)	0.320(df = 368)
F Statistic	52.625*** (df = 4.0; 942.0)	33.192*** (df = 4.0; 314.0)	13.132*** (df = 4.0; 250.0)	88.246*** (df = 4.0; 368.0)

Note: *p<0.1; **p<0.05; ***p<0.01

4.3 Shifts in Volume and Volatility

Along with new information, the change in the spread can be explained by shifts in volume and volatility. As mentioned in [7], an increase in volume is expected to lower the spread. Bagehot also mentions that more volatile stocks will also have higher spreads as market makers have have risk when dealing with these stocks. In this study I find that while volume only has a short term increase following an announcement while volatility has a permanent change. In particular I find that for targets involved in hybrid or cash deals, the volatility peaks on the announcement day and stays consistently low. Following the announcement, these targets have little to no price movement, resembling bond like behavior. The only time would be significant price movement is if the deal terms are updated. Figure 3 shows the daily volatility movement for target stocks.
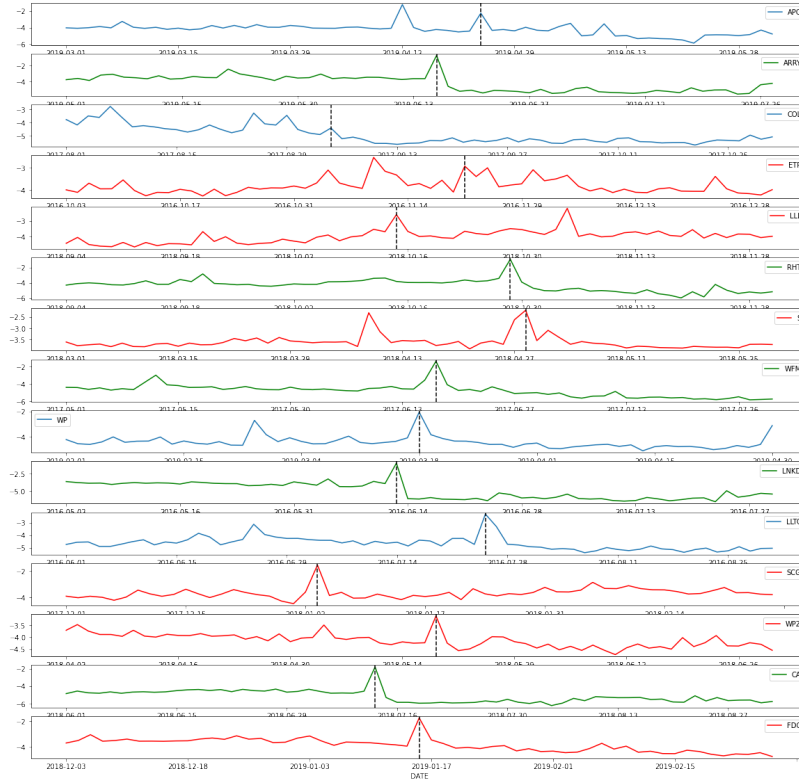
Figure 3: Plot of the daily volatility for 15 target companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Targets involved with Rumors include CA, COL, S, and APC. Spikes happen on announcement days and drop to relative lows for targets involved in cash and hybrid deals.

5 Further Study

To expand on this work using a larger sample size of deals would be more indicative of any changes across the cross section of deal type. Also, using a larger time frame would allow one to better see any permanent shifts across the time series. Another area to explore is the cross market activity of M&A stocks around the announcement day. An increased relationship in cross market activity at the microsecond level may indicate the use of a pairs trading strategy. For stock financed deals, as shown in Mitchell et al., it is common for merger arbitrageurs to short the acquirer and long the target [3]. Thus one could see if the cross market trades for stock financed deals resemble a merger arbitrage strategy by signing trades using a lee reedy type algorithm [10].

6 Conclusion

I find that the bid ask spread shifts significantly following an M&A announcement for certain stocks. I propose that the bid ask spread falls for targets involved in cash or hybrid transactions not only due

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to an announcement effect, but also due to drops in volatility and short term increases in volume. Targets involved in stock deals face an increase in spread as they are percieved to be more risky to hold. Acquirers do not have a large shift in bid ask spreads as they are less sensitive to new information and bear most of the risk in an M&A deal. Since acquirers also do not have large volatility changes, market makers do not shift their beliefs on the acquirer stocks.

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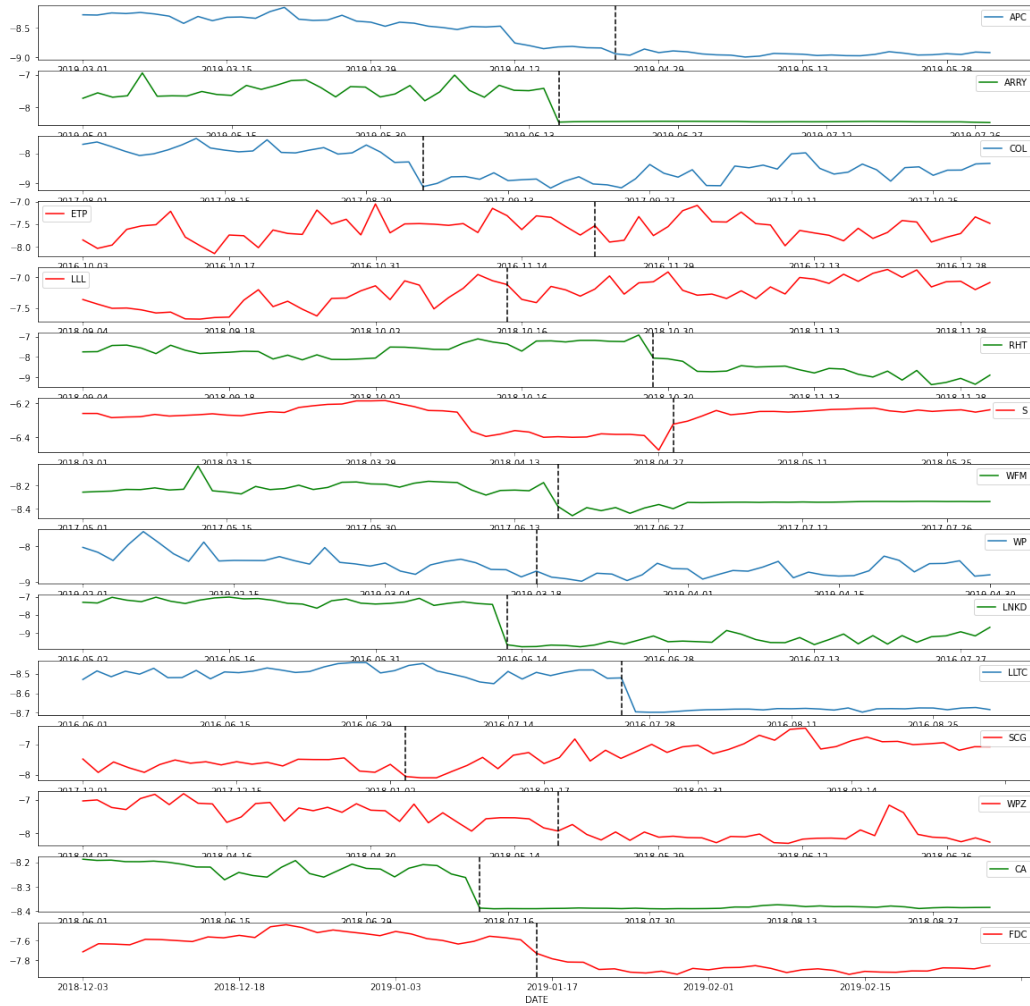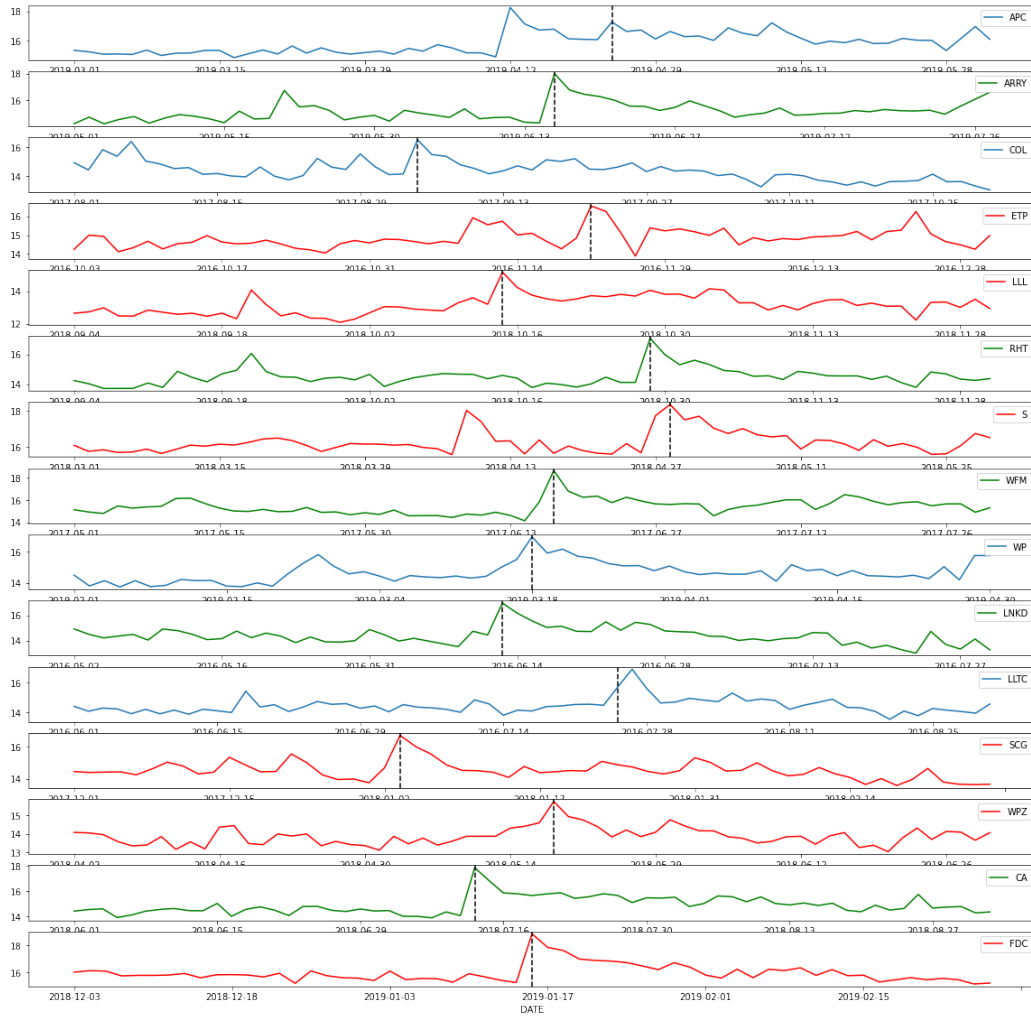# 7 Appendix

7.1 Target daily Graphs

Figure 4: Plot of the daily median percent spread for 15 target companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Targets involved with Rumors include CA, COL, S, and APC. Targets involved in cash and hybrid deals see consistently lower spreads after the announcement date.
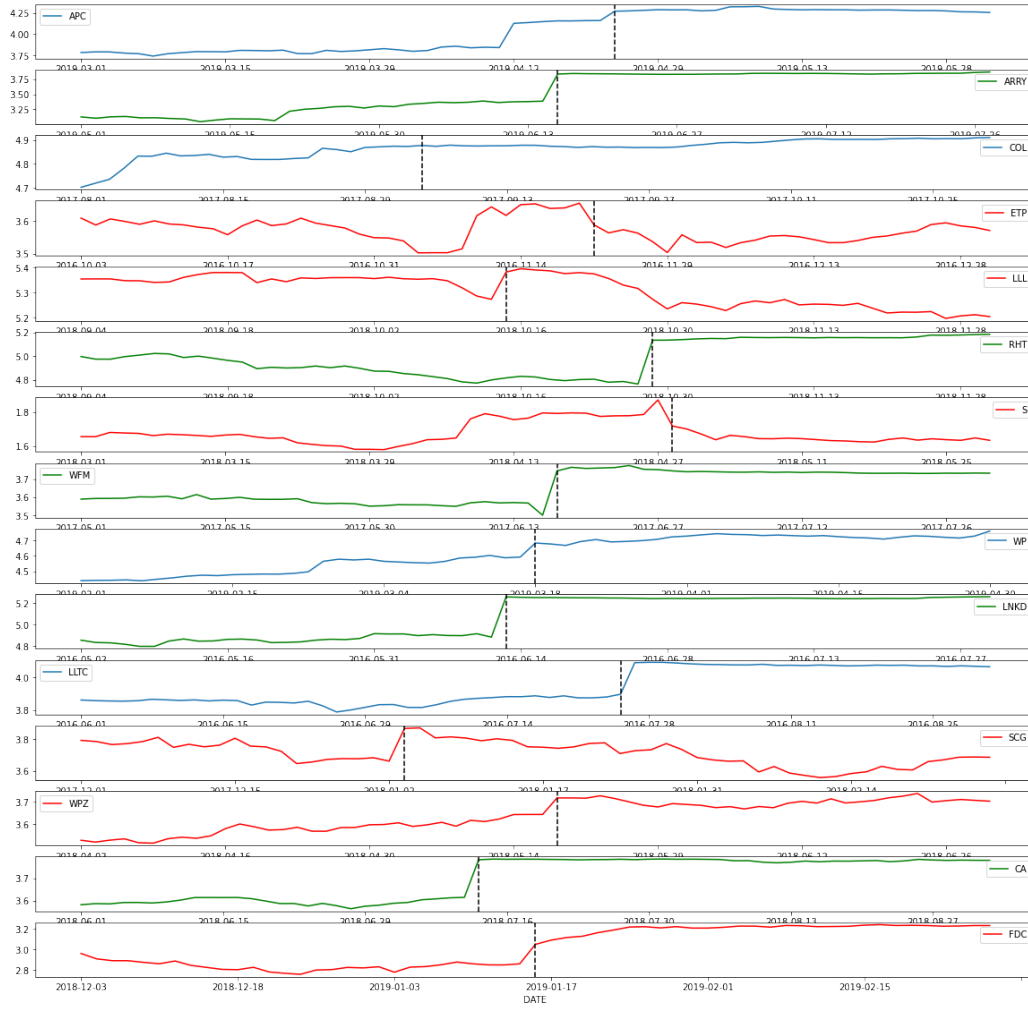
Figure 5: Plot of the daily share volume for 15 target companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Targets involved with Rumors include CA, COL, S, and APC. There are clear spike on the announcement day. Volume remains consistently high for a few days but returns to normal values over time.
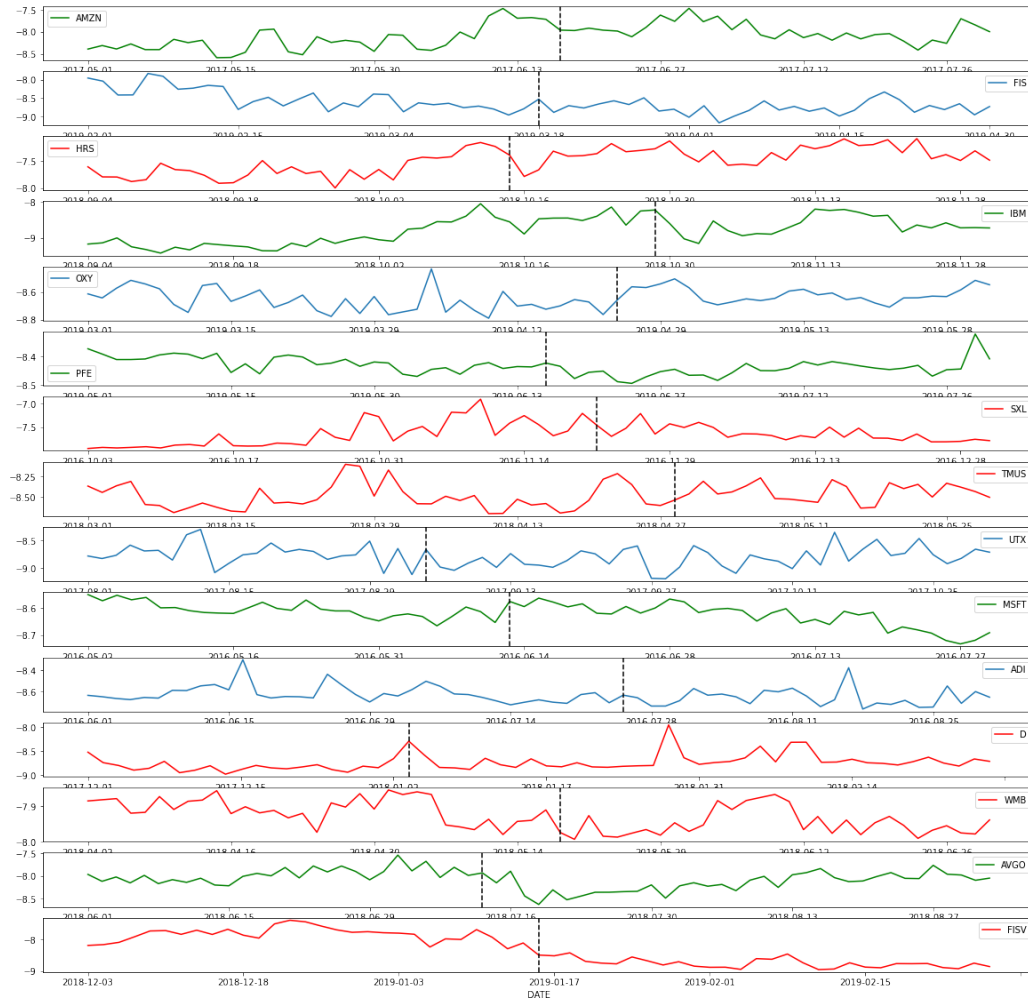
Figure 6: Plot of the daily log Price for 15 target companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Targets involved with Rumors include CA, COL, S, and APC. There are clear spike on the announcement day for targets involved in cash or hybrid deals. Following the initial spike, the prices stabilize for the remaining time period.

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7.2 Acquirer daily Graphs

Figure 7: Plot of the daily percent spread for 15 acquirer companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Acquirers involved with Rumors include AVGO, UTX, TMUS, and OXY. There is no clear change in the spread following the announcement.
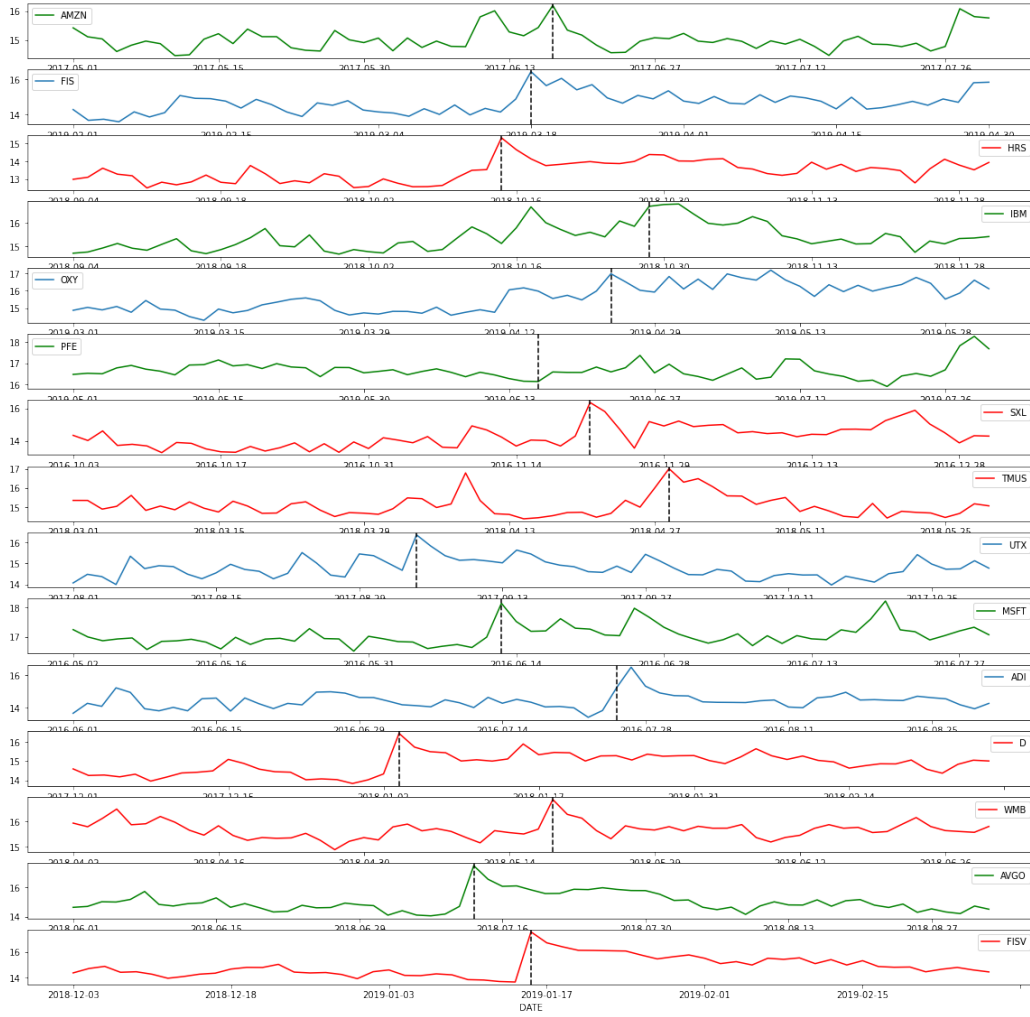
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Figure 8: Plot of the daily volume for 15 acquirer companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Acquirers involved with Rumors include AVGO, UTX, TMUS, and OXY. Volume spikes on the announcement day and returns to standard levels over time.
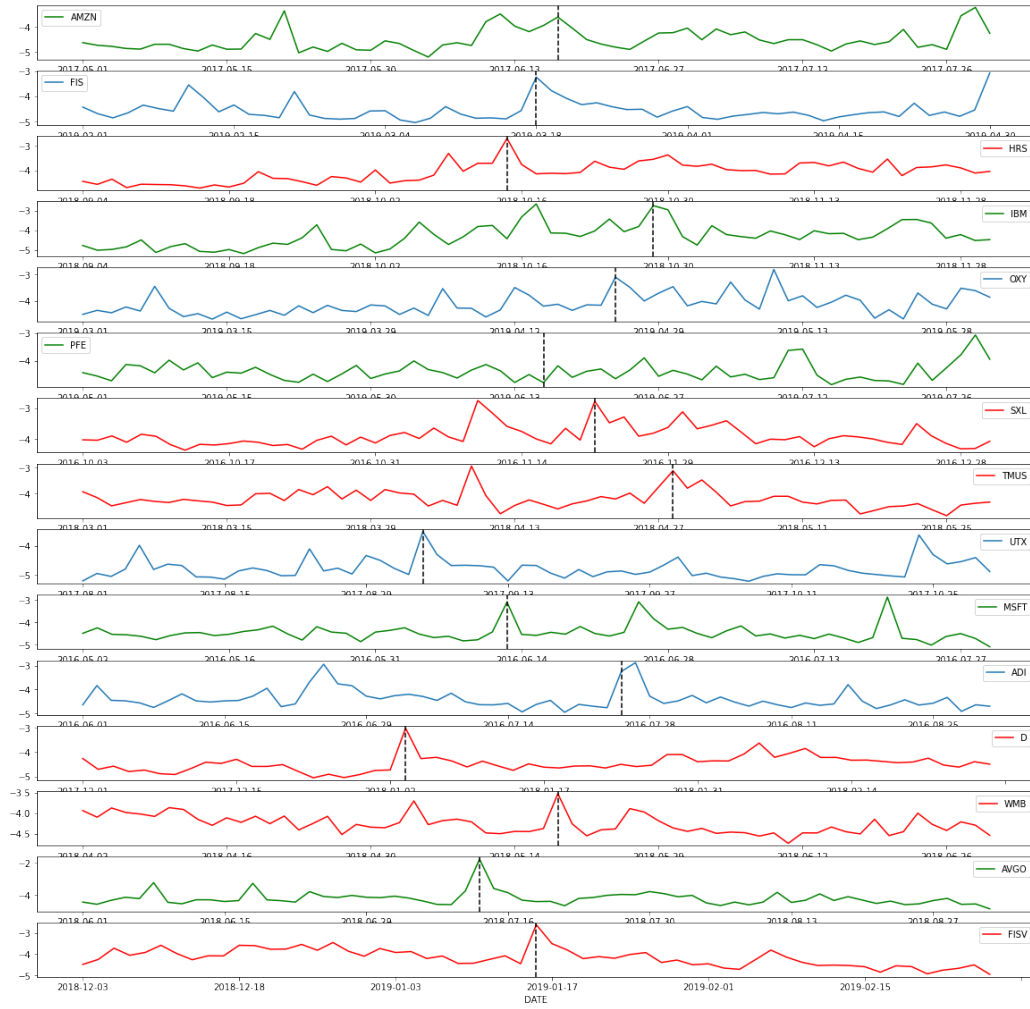
Figure 9: Plot of the daily volatility for 15 acquirer companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Acquirers involved with Rumors include AVGO, UTX, TMUS, and OXY. Volatility spikes on the announcement day and returns to daily levels immediately.
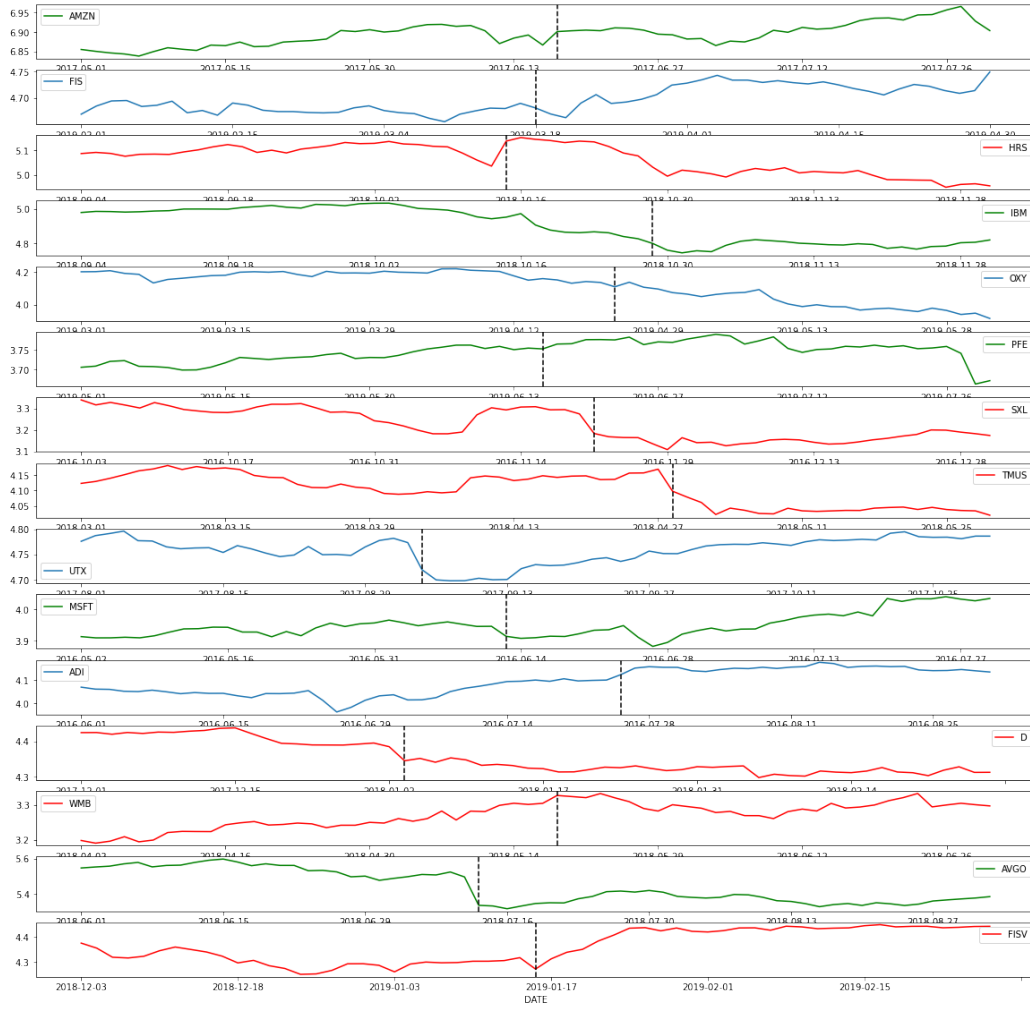
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Figure 10: Plot of the daily log price for 15 acquirer companies. The black line indicates the first trading day after the announcement. Green lines are targets involved in cash deals. Blue lines are targets involved in deals that involve both cash and stock. Red lines are targets involved in stock only deals. Acquirers involved with Rumors include AVGO, UTX, TMUS, and OXY. There is no consistent price movement following the announcement for targets.