POST FINANCIAL CRISIS M&A PERFORMANCE IN THE US: A DEEPER DIVE INTO THE PHARMACEUTICAL AND OIL & GAS INDUSTRY

by

Alam, Md Ashraful
Bachelor of Business Administration in Finance & Accounting, 2016

and

Bhatia, Saksham
B.S in Business Administration: Finance and Real Estate, 2016

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN FINANCE

In the Master of Science in Finance Program
of the
Faculty
of
Business Administration

SIMON FRASER UNIVERSITY

Fall 2019

Approval

Name:	**Alam, Md Ashraful & Bhatia, Saksham**
Degree:	**Master of Science in Finance**
Title of Project:	**Post Financial Crisis M&A performance in the US: A Deeper Dive into the Pharmaceutical and Oil & Gas Industry**

Supervisory Committee:

_____

Dr Victor Song
Senior Supervisor
Lecturer, Finance

_____

Carlos da Costa
Second Reader
Lecturer, Finance

Date Approved: _____

Abstract

The goal of this paper was to assess the performance of the M&A activities in the pharmaceutical and oil & gas sector in the US public market after the financial crisis of 2008. As historically long-term post-M&A return has been negative, we delved into ascertaining this result in these two sectors.

For analysing the performance, we have taken a sample of public companies domiciled in the US who has executed M&A activities within 2010-2017 with a deal size greater than 10 million USD. The excess return has been calculated for these stocks using monthly calendar time portfolio and Fama-French Four Factor model (using both equal-weighted and value-weighted method for the constructed portfolio) and our results re-affirms in almost every case that there is no significant positive performance for M&A activities in both pharmaceutical and oil & gas sector.

This study illustrates that historical underperformance of M&A activities persists in oil & gas and pharmaceutical sector; these sectors have been able to generate a positive return through M&A activities.

Keywords: M&A; Event Study; Calendar-time Portfolio, Fama-French three Factor Model, Oil & Gas, Pharmaceutical.

Acknowledgements

We want to express our heartfelt gratitude to Dr Viktor Song, who has driven us towards the right direction during our research and has provided impactful guidance for our work.

We would also like to convey our deepest appreciation and gratitude to Mr Carlos da Costa whose contributions have been pivotal for this research and whose insightful suggestions and thoughtful guidance, as well as continued support, have translated into us completing this research.

Table of Contents

List of Figures

List of Tables

Glossary

M&A	Mergers and Acquisition.
C-T Portfolio	Calendar time portfolio approach. This approach calculates the excess return of a portfolio based on a specific event of interest (in this case, the merger or acquisition). Monthly calendar time portfolio has been used for this paper.
FFC Model	Fama, French and Carhart factor return model calculates the excess return of a stock based on three factors: value, growth and momentum.
SIC	Standard Industrial Classification, it is a standardised classification system which is widely used and introduced by NAICS Association.
Event Study	An event study is an approach to ascertain the effect of an event on a stock's price performance.

1: Introduction

M&A implies the financial transaction between two companies through mergers, acquisition, consolidation, buying the majority of assets, buying a significant portion of assets, etc. M&A has been one of the most common corporate activities where there are different motivations for different companies. The primary motivations for the companies for M&A are to scale up the business process through strategic allocation and/or gain more significant market share for potential growth opportunities.

Companies who initiate the merger by making a bid for the company are called acquirer, whereas the company they are bidding for are generally known as target companies. The primary goal of this research is to assess the post-M&A performance of the acquirer, in this case, especially in the oil & gas industry and pharmaceutical industry in the US after the financial crisis (2010-217).

The research and findings around assessing the post-merger long-term performance has been divisive. For example, Franks, Harris and Titman (1991) have discovered underperformance in post-merger share price studying the US market from 1975-1984 with 399 transactions. However, they attributed the performance, not to the M&A activity but the error in the benchmark. On the contrary, Malatesta (1983) found that the post-acquisition stock price performance was negative, but not statistically significant. Some of the findings of relative underperformance or statistically insignificant performance does not conform with the findings of Fama, Fisher, Jensen and

Roll (1969) who posited that stock price usually depicts the information by the end of the event month.

Our goal was to ascertain the post-merger performance of the US oil & gas sector and pharmaceuticals sector. Firstly, our motivation to choose the oil & gas sector was the rationale that the oil & gas sector usually has one of the largest numbers of M&A transactions in the North American market. Secondly, the reason to choose the pharmaceutical sector was the dependency of pharmaceutical markets on patents and newer technological advancements. We thought that these innovations might have an impact on the merger valuations, which will be finally reflected on the price after acquiring.

To analyse, we have taken the transactions from 2010-2017 in oil & gas and pharmaceutical sector and calculated the abnormal return of the acquirers based on these two models. The main reason for M&A activities in oil & gas sector is Economies of scale through horizontal and vertical integration. We wanted to ascertain of the impact of economies of scale in oil & gas sector in the long run returns of the acquirers' stock. The primary motivation of M&A activities in pharmaceutical sector is to gain access to patents and innovations.

Another focus of our study was to discover any long-run impact of these innovations within the M&A activities of this sector and how it can impact the long-run returns of acquirers' stock

First one is the calendar time-monthly abnormal return (CAR) market model, and the second approach is using Fama-French, 4-factor model (1993) we calculated the abnormal return for those two sectors. Also, we analysed the returns for two types of

index construction: equal-weighted and value-weighted. The primary motivation was to account for the size effect of the firms that we are analysing.

In this paper, we have broken down the dataset and explained the methodology of our analysis in Section 1. In Section 2, we have illustrated our findings from our analysis and finally we have drawn our conclusion in Section 4.

2: Data & Method

2.1 Data

Our dataset comprises two sectors from the US public market: (1) Oil & gas and (2) Pharmaceuticals. We have taken the transactions in these two sectors from 2010-2017 (mainly to abate the direct effects of the financial crisis, we have truncated 2008 and 2009 from our analysis).

We have used some specific set of criteria to choose our sample universe. There were four criteria: (1) The acquirers need to be public US companies, (2) The deal size should be larger than 10M USD, (3) Only Merger and Acquisition of majority assets have been considered for control effect, (4) only completed deals have been considered. We have also considered cross-border deals. Finally, we got a sample of 219 transactions with a total of 160 companies within these two sectors.

2.1.1 Oil & Gas sector:

There has been a total of 157 transactions in the oil & gas sector in the US, and there has been

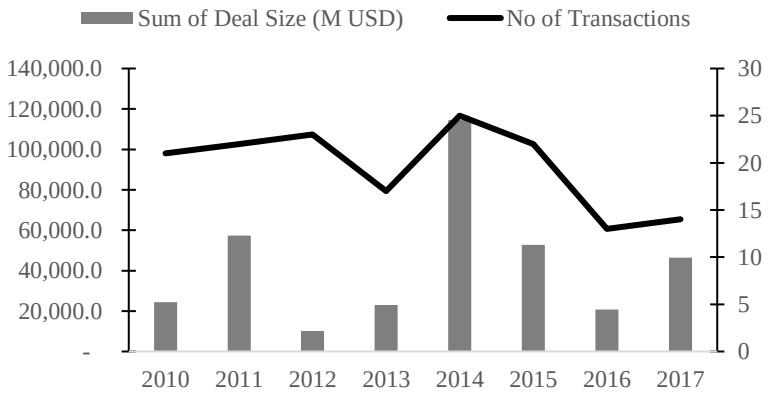

Figure 1: The number of transactions and dollar value of transactions in the oil & gas sector, in millions of USD

total number of 126 unique companies. As it can be seen from figure 1, the M&A deals have been dispersed over the 8-year period for the sector with the highest number of transactions in 2014 (25 deals) and the highest sum of the deal size was 114,526.7 M USD.

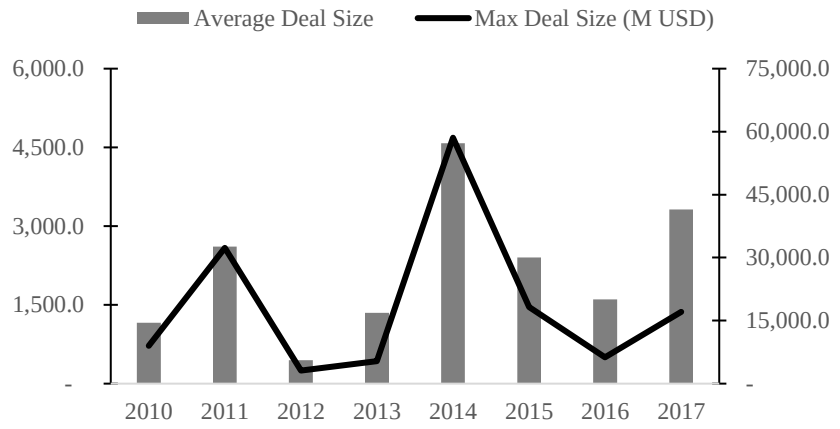

Figure 2: Maximum and Average Deal Size in oil & gas sector, in millions USD

From figure 2, we can see that the average deal size also picked up in 2014, with a maximum deal size of 58,551.1 M USD.

Table 1: Distribution of Transactions by Year (Oil & gas)

Year	Sum of Deal Size (M USD)	No of Transactions	Average Deal Size	Max Deal Size (M USD)
2010	24,380.8	21	1,161.0	9,000.5
2011	57,400.3	22	2,609.1	32,338.1
2012	10,206.1	23	443.7	3,109.8
2013	22,920.3	17	1,348.3	5,330.9
2014	114,526.7	25	4,581.1	58,551.1
2015	52,801.1	22	2,400.1	18,222.9
2016	20,826.7	13	1,602.1	6,291.1
2017	46,462.8	14	3,318.8	17,118.1
Total	349,524.8	157	17,464.0	149,962.6

Table 2 summarises the top 5 transactions from 2010 to 2017 in the oil & gas sector, and it shows that Kindler Morgan Inc has been one of the most prominent names with the two largest acquisitions.

Table 2: Top 5 Transactions by dollar value in oil & gas (2010-2017)

Announcement Date	Deal Size (M USD)	Target Name	Acquirer Name
8/10/2014	58,551.10	Kinder Morgan Energy Partners LP	Kinder Morgan Inc
10/16/2011	32,338.09	El Paso Corp	Kinder Morgan Inc
1/26/2015	18,222.90	Regency Energy Partners LP	Energy Transfer Partners LP
2/1/2017	17,118.06	ONEOK Partners LP	ONEOK Inc
11/3/2015	11,369.03	Targa Resources Partners LP	Targa Resources Corp

2.1.2 Pharmaceutical Industry

There has been a total of 62 transactions in the pharmaceutical sector in the US with 33

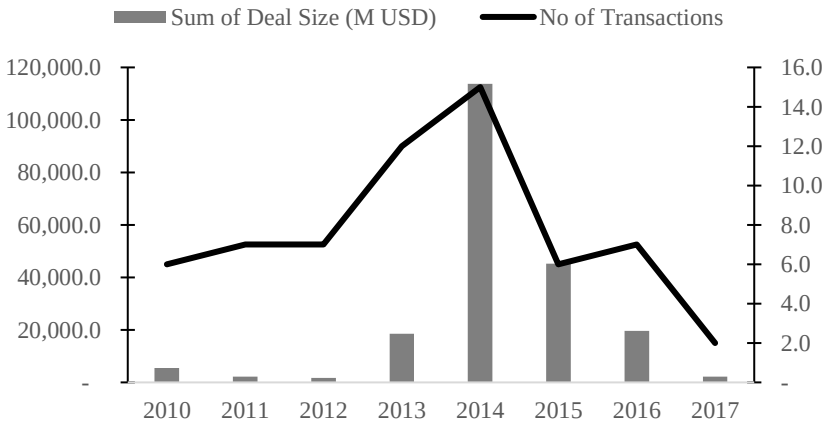

Figure 3: The number of transactions and dollar value of transactions pharmaceutical sector, in millions of USD

unique acquirers. From figure 1, the M&A deals have been dispersed over the 8-year period for the sector with the highest number of transactions in 2014 as well (25 deals) and the highest sum of the deal size was 114,526.7 M USD.

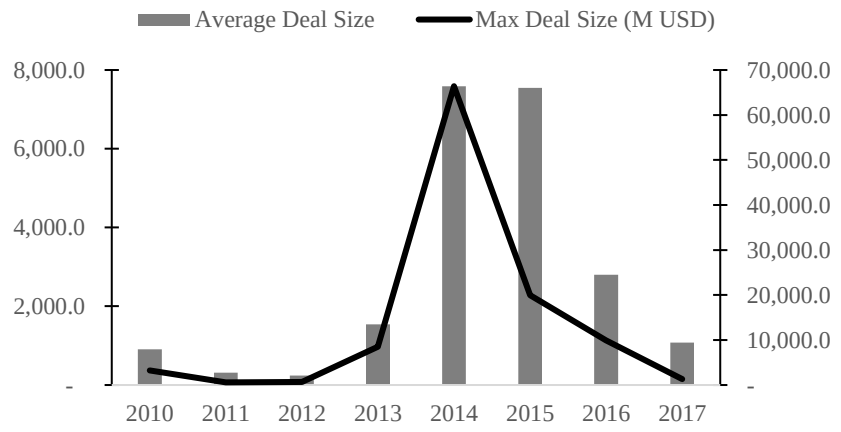

Figure 4: Maximum and Average Deal Size in the pharmaceutical sector, in millions of USD

From Table 4, we can see the overall distribution of the transactions from 2010-2017 and again, similar to the oil & gas sector, and the pharmaceutical sector had rising M&A deals in 2014.

Table 3: Distribution of Transactions by Year (Pharmaceutical)

Year	Sum of Deal Size (M USD)	No of Transactions	Average Deal Size	Max Deal Size (M USD)
2010	5,433.6	6	905.6	3,217.9
2011	2,188.7	7	312.7	585.3
2012	1,663.2	7	237.6	700.0
2013	18,470.4	12	1,539.2	8,488.1
2014	113,768.9	15	7,584.6	66,404.4

2015	45,282.3	6	7,547.0	19,917.0
2016	19,622.8	7	2,803.3	9,917.0
2017	2,158.7	2	1,079.4	1,310.0
Total	**208,588.7**	**62**	**2,751.2**	

Table 4 illustrates the top 5 transactions within the period, and Actavis PLC has executed the two largest M&A deals during that period. Another interesting fact is that both deals were in 2014.

Table 4: Top 5 Transactions in the Pharmaceutical Industry (2010-2017)

Announcement Date	**Deal Size (M USD)**	**Target Name**	**Acquirer Name**
11/17/2014	66,404.40	Allergan Inc	Actavis PLC
2/18/2014	23,615.63	Forest Laboratories Inc	Actavis PLC
3/4/2015	19,916.98	Pharmacyclics Inc	AbbVie Inc
2/5/2015	16,770.84	Hospira Inc	Pfizer Inc
2/10/2016	9,917.05	Meda AB	Mylan NV

2.2 Method

For our analysis, we have used the CRSP (Centre for Research in Security Prices) database, and we have tried to assess the impact of the M&A deals from 2010-2017 using event study from Eventus. We have had 36 months of estimation time with a 12-months of event horizon where $T_1 = -6$ (before six months of the event date) and $T_2 = +6$ (after six months of the event date) as well as $T_0 = 0$ (the event month). We have observed the return performance based on the event and assess if there was significant over or

underperformance. For the return calculation, two methods were used: (1) Fama-French four Factor model (1996) and (2) Calendar time monthly abnormal return market model. For the regression, we have used the OLS (Ordinary Least Square) method.

We have also incorporated the size effect of the firms for our calculation and endeavoured to find any anomaly in the return performance for the firm size. Andre, Kohli and L'Her (2004) has introduced this approach in their paper while assessing the long-run performance of M&A and discovered statistically significant anomalies in terms of the index weight. For that, returns have been calculated based on both equally weighted index and value-weighted index.

2.2.1 Fama-French four Factor Model

For our analysis, we have calculated the return of each calendar month using the Fama-French Four Factor Model, which incorporates the seminal study of Fama-French four-factor return calculation (1993) and augmented by Carhart (1997). The return has been calculated as followed:

$$R_{jt} = \alpha + \beta_j R_{mt} + \beta_{sj} SMB_t + \beta_{hj} HML_t + \beta_{uj} UMD_t + \epsilon_{jt} \quad (1)$$

where,

R_{jt} = Return of the common stock from the jth firm on month t,

R_{mt} = Return of the market index on month t

α = Abnormal return for month t

SMB_t = Average monthly return for small minus big firms return on month t

HML_t = Average monthly return for high book-to-market to low book-to-market on month t

UMD_t = Average return for the high prior return minus the low prior return on month t

2.2.2 Calendar-Time Abnormal Return Market Model

In order to calculate the abnormal return for each calendar month, we have also used the approach used by Lyon, Barber and Tsai (1999). The abnormal return is calculated as followed:

$$AR_{iT} = R_{iT} - E(R_{iT}) \quad (2)$$

where

AR_{iT} = the buy-and-hold abnormal return for security *i* for *T* period,

R_{iT} = the observed *T* period buy-and-hold return for security *i*,

$E(R_{iT})$ = expected buy-and-hold return for *T* period for security *i*

To calculate the buy-and-hold return across the reference portfolio, the following equation has been used:

$$R_{bh} = \sum_{i=1}^{n_s} \frac{\left[\prod_{t=s}^{s+T} (1+R_{iT})\right]-1}{n_s} \quad (3)$$

where s is the beginning period, T is the investment period, n is the number of securities being traded in month s.

For this approach as well, we have used the CRSP database for the construction of the calendar time portfolio with the same event estimation window and event horizon as mentioned. We used the CRSP database for the returns of the stock and ran a regression through Eventus calendar time monthly portfolio.

3: Findings & Analysis

3.1 Calendar time monthly abnormal return in the oil & gas sector

We have used the calendar time monthly abnormal return approach to assess the relative performance of M&A activities within the sector. From 2010-2017, there has been a total of 157 M&A transactions. Among those transactions, using the CSRP database, we have analysed the return of 93 stocks. The event horizon was 12 months, with $T_1 = -6$ (before six months of the event date) and $T_2 = +6$ (after six months of the event date). There have been multiple M&A activities by single firms and those overlapping events have also been considered. The portfolio has been constructed in two ways – equal-weighted and value-weighted. The value-weighted approach is more applicable in this case due to the significant differences in market capitalisation of the constituents. Finally, for the regression, ordinary least squared (OLS) method has been used.

3.1.1 Equal-Weighted

Table 5: C-T Monthly Market Model Abnormal Return Breakdown, Equal Weighted Index

Month	N	Mean Abnormal Return	Positive: Negative	Calendar Time t	Generalised sign Z
-6	93	-0.02%	40:53	-0.662	-1.236
-5	93	0.88%	39:54	-0.294	-1.443
-4	93	0.22%	48:45	0.903	0.423
-3	93	-0.21%	40:53	-0.582	-1.236
-2	93	-1.18%	41:52	-0.91	-1.028
-1	93	-0.67%	46:46	-0.088	0.112
0	93	5.48%	44:48	-0.997	-0.305
+1	93	-2.19%	35:57	-1.873*	-2.182*
+2	93	-1.17%	37:55	-1.019	-1.765*
+3	93	1.46%	45:48	0.243	-0.199
+4	93	0.11%	42:51	0.077	-0.821
+5	93	-0.79%	40:52	-0.804	-1.139
+6	93	-0.86%	36:56	-0.604	-1.974*

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 5, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns have been negative and the succeeding two periods from the event and the last month of the event window had negative abnormal returns which were statistically significant.

Table 6: Calendar Time Monthly Market Model Abnormal Return, Oil & Gas Sector, Summary

Months	N	Mean Compound Abnormal Return	Mean CT Portfolio Compound AR	Calendar time t	Generalised sign Z
(-6, -2)	93	0.67%	0.19%	-0.173	0.216
(+1, 0)	93	3.66%	2.97%	0.612	-0.514
(+1, +6)	93	-3.04%	-2.67%	-1.714*	-2.273*

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level

**Statistically significant at 1% significance level

From table 6, we can see that the return during the M&A is positive, even though not statistically significant. However, the post-M&A return has been -3.04% and is statistically significant. It means that the oil & gas sector underperforms after M&A activity.

3.1.2 Value-weighted

Table 7: C-T Monthly Market Model Abnormal Return Breakdown, Oil & Gas Sector, Value Weighted Index

Month	No of companies	Mean Abnormal Return	Calendar Time t	CSectErr t	Generalized Sign Z
-6	93	0.17%	-0.52	0.12	-0.96
-5	93	0.52%	-0.45	0.31	-1.16
-4	93	0.00%	-0.71	0.01	0.49
-3	93	-0.34%	-0.68	-0.33	-1.16
-2	93	-1.26%	-0.96	-1.34	-0.96
-1	93	-0.67%	-0.23	-0.46	-0.3
0	93	5.04%	-0.85	1.23	-0.86
1	93	-2.63%	-2.18*	-2.7**	-2.32*
+1	93	-1.53%	-1.09	-1.18	-2.53**
+2	93	-1.33%	0.25	1.02	-0.33
+3	93	-0.14%	-0.46	-0.09	-1.37+
+4	93	-1.04%	-0.83	-1.03	-1.48$
+6	93	-1.24%	-1.31+	-0.87	-2.11*

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 7, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns have been relatively unstable, concluding

in the last three months of negative returns. The last month has a -1.24% abnormal return that is not statistically significant.

Table 8: Calendar Time Monthly Market Model Abnormal Return, Oil & Gas Sector, Summary

Months	No of Companies	Mean Compound Abnormal Return	Mean CT Portfolio Compound AR	Calendar time t	Generalized Sign Z
(-6,-2)	93	0.67%	0.19%	-0.17	0.21
(-1,0)	93	3.66%	2.97%	0.61	-0.51
(+1,+6)	93	-3.04%	-2.67%	-1.71*	-2.27*

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 8, we can see that the return post M&A activity is negative and statistically significant. It means that the oil& gas sector performance does not improve post-M&A activity and has underperformed post-performance.

3.2 Fama-French four-factor model abnormal return in the oil & gas sector

Monthly calendar time return has been calculated using the Fama-French Four-factor model as well. From 2010-2017, there has been a total of 157 M&A transactions. Among those transactions, using the CSRP database, we have analysed the return of 93 stocks. The event horizon was 12 months, with $T_1 = -6$ (before six months of the event date) and $T_2 = +6$ (after 6 months of the event date). There have been multiple M&A activities by single firms and those overlapping events have also been considered. The portfolio has been constructed in two ways – equal-weighted and value-weighted. The value-weighted approach is more applicable in this case due to the significant differences in market

capitalisation of the constituents. Finally, for the regression, ordinary least squared (OLS) method has been used.

3.2.1 Equal-Weighted

Table 9: Fama-French Four Factor Model Abnormal Return, Oil & Gas sector, Equally weighted index

Month	N	Mean Abnormal Return	CSectErr t	Generalized Sign Z
-6	91	0.42%	0.34	-0.44
-5	91	0.16%	0.08	-1.91*
-4	91	-0.30%	-0.23	0.18
-3	91	-0.38%	-0.34	-0.86
-2	91	-1.82%	-1.62$	-0.44
-1	91	-0.95%	-0.75	-0.76
0	91	4.91%	1.21	-1.39+
1	91	-3.15%	-3.2***	-2.65**
+1	91	-1.55%	-1.1	1.61$
+2	91	0.45%	0.32	-0.86
+3	91	-0.65%	-0.41	-1.28
+4	91	0.24%	0.21	-0.55
+6	91	-0.99%	-0.72	-2.03*

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 9, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns have been relatively negative with a high statistical significance.

Table 10: Fama-French Four Factor Model Abnormal Return Oil & Gas sector, Equally Weighted Index, Summary

Months	N	Mean Compound Abnormal Return	CSectErr t	Generalized Sign Z
(-6,-2)	91	-0.91%	-0.29	-1.49+
(+1,0)	91	2.78%	0.66	-2.23*
(+1,+6)	91	-5.08%	-1.34+	-2.33**

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 10, we can see that the return post M&A activity is negative and statistically significant. It means that the oil & gas sector performance does not improve post-M&A activity and has underperformed after the activity. An initial return of 2.78% is offset by future negative returns.

3.3 Calendar time monthly abnormal return in the pharmaceutical sector

We have used the calendar time monthly abnormal return approach to assess the relative performance of M&A activities within the pharmaceutical sector. From 2010-2017, there has been a total of 62 M&A transactions. Among those transactions, using the CSRP database, we have analysed the return of 33 stocks (the N=28 as 5 of the stocks did not have CRSP values). The event horizon was 12 months, with $T_1 = -6$ (before six months of the event date) and $T_2 = +6$ (after 6 months of the event date). There have been multiple M&A activities by single firms, and those overlapping events have also been considered. The portfolio has been constructed in two ways – equal-weighted and value-weighted. Finally, for the regression, ordinary least squared (OLS) method has been used.

3.3.1 Equal-weighted

Table 11: C-T Monthly Market Model Abnormal Return Breakdown of Pharmaceutical Sector, Equal Weighted Index

Month	N	Mean Abnormal Return	Calendar Time t	CSectErr t	Generalized Sign Z
-6	28	1.74%	1.39$	1.03	0.23
-5	28	2.56%	0.31	0.74	0.23
-4	28	1.50%	2.18*	1.05	1.74*
-3	28	0.08%	0.025	0.04	-1.28$
-2	28	0.07%	0.28	0.02	0.23
-1	28	-1.51%	0.15	-0.87	0.23
0	28	6.82%	1.56$	1.71*	0.6
1	28	2.41%	1.54$	0.96	1.74*
+1	28	-0.39%	-0.19	-0.25	0.23
+2	28	2.82%	1.37+	2.32*	1.79*
+3	28	0.28%	0.22	0.14	0.22
+4	28	-1.39%	-0.13	-0.98	0.22
+6	28	-2.94%	-1.05	-1.11	-0.56

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 11, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns have been relatively unstable with the first three months after the transaction having more companies with positive returns than negative. The last month has a -2.94% abnormal returns that are not statistically significant.

Table 12: Calendar Time Monthly Market Model Abnormal Return, Pharmaceutical Sector, Equally Weighted Index, Summary

Months	N	Mean Compound Abnormal Return	Mean CT Portfolio Compound AR	Calendar time t	Generalized Sign Z
(-6,-2)	28	6.88%	3.61%	1.2	2.5**
(+1,0)	28	5.20%	7.19%	1.44	0.23
(+1,+6)	28	0.65%	-0.07%	0.43	0.98

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 12, we can see that the return pre and during the M&A activity is positive and statistically significant. The pre-M&A returns are significant due to anticipation of the upcoming activity and are representative of increased trading activity. Post-M&A returns are minimally positive at .65%. It means that the pharmaceutical sector performance does not improve post-M&A activit

3.3.2 Value-weighted

Table 13: C-T Monthly Market Model Abnormal Return Breakdown of Pharmaceutical Sector, Value Weighted Index

Month	N	Mean Abnormal Return	Calendar Time t	CSectErr t	Generalized Sign Z
-6	28	1.72%	1.45$	1.05	0.36
-5	28	2.56%	0.44	0.72	-0.01
-4	28	1.07%	1.99*	0.73	1.88*
-3	28	0.38%	-0.61	0.21	-1.14
-2	28	0.12%	0.32	0.04	-0.01
-1	28	-1.97%	0.03	-1.06	0.36
0	28	6.49%	1.48+	1.59+	-0.01
1	28	2.43%	1.64+	0.97	1.50$
+1	28	0.27%	0.11	0.16	0.74
+2	28	2.67%	1.46$	2.21*	1.92*
+3	28	-0.31%	-0.07	-0.14	0.35
+4	28	-1.81%	-0.24	-1.21	0.74
+6	28	-3.11%	-1.09	-1.21	-0.43

From table 13, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns have been relatively unpredictable with the first 3 months after the transaction generating positive returns followed by negative returns in the final two months. The last month abnormal returns are not statistically significant.

Table 14: Calendar Time Monthly Market Model Abnormal Return, Pharmaceutical Sector, Value Weighted Index, Summary

Months	N	Mean Compound Abnormal Return	Mean CT Portfolio Compound AR	Calendar time t	Generalized Sign Z
(-6,-2)	28	6.83%	3.21%	1.21	2.26*
(-1,0)	28	4.41%	6.54%	1.24	0.36
(+1,+6)	28	0.16%	-0.48%	0.54	1.50+

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 14, we can see that the return during the M&A is positive, even though not statistically significant. Post-M&A returns have been slightly positive at .16% but not statistically significant. It means that the oil & gas sector performs similarly post M&A activity.

3.4 Fama-French four-factor model abnormal return in the pharmaceutical sector

3.4.1 Equal Weighted

Table 15: Fama-French Four Factor Model Abnormal Return, pharmaceutical sector, Equally weighted index

Month	N	Mean Abnormal Return	CSectErr t	Generalized Sign Z
-6	28	0.56%	0.29	-0.49
-5	28	3.45%	1.04	-0.12
-4	28	-0.46%	-0.23	2.913**
-3	28	0.06%	0.03	-1.63
-2	28	-1.53%	-0.47	0.26
-1	28	-1.27%	-0.69	1.02
0	28	5.60%	1.571+	1.02
1	28	2.48%	0.97	0.26
2	28	-0.62%	-0.34	0.64
3	28	2.07%	1.634$	1.04
4	28	0.36%	0.20	1.04
5	28	0.57%	0.43	0.25
6	28	-1.94%	-0.84	-0.14

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 15, the mean abnormal return has been highest during the event month (T_0). However, the subsequent monthly returns are volatile with high statistical significance.

Table 16: Fama-French Four Factor Model Abnormal Return, Pharmaceutical Sector, Equally Weighted Index, Summary

Months	N	Mean Compound Abnormal Return	CSectErr t	Generalized Sign Z
(-6,-2)	28	2.98%	0.403	1.778*
(-1,0)	28	4.25%	1.025	0.264
(+1,+6)	28	2.89%	0.524	1.399+

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 16, we can see that the return post M&A activity is positive and statistically significant. It means that the pharmaceutical sector performance improves post-M&A activity and has overperformed after the activity.

3.4.2 Value-Weighted

Table 17: Fama-French Four Factor Model Abnormal Return, pharmaceutical sector, Value weighted index

Month	N	Mean Abnormal Return	CSectErr t	Generalized Sign Z
-6	28	0.84%	0.438	-0.399
-5	28	3.73%	1.093	-0.778
-4	28	0.07%	0.036	3.011**
-3	28	0.09%	0.045	-1.156
-2	28	-1.42%	-0.438	0.359
-1	28	-1.09%	-0.62	0.738
0	28	6.31%	1.73*	1.117
1	28	2.25%	0.866	0.359
2	28	-0.88%	-0.522	0.738
3	28	2.15%	1.691*	0.739
4	28	0.84%	0.501	1.132
5	28	1.43%	1.173	0.346
6	28	-1.72%	-0.737	-0.047

From table 17, the mean abnormal return has been highest during the event month (T_0) with high statistical significance. However, the subsequent monthly returns are volatile with varying statistical significance. The final month (6) has a negative return but with low statistical significance.

Table 18: Fama-French Four Factor Model Abnormal Return, Pharmaceutical Sector, Value Weighted Index, Summary

Months	N	Mean Compound Abnormal Return	CSectErr t	Generalized Sign Z
(-6,-2)	28	4.16%	0.577	1.495$
(-1,0)	28	5.13%	1.212	0.359
(+1,+6)	28	3.85%	0.709	1.495+

+ Statistically significant at 10% significance level
*Statistically significant at 5% significance level
**Statistically significant at 1% significance level

From table 18, we can see that the return post M&A activity is positive and statistically significant. It means that the pharmaceutical sector performance improves post-M&A activity and has overperformed after the activity with a return of 3.85% six-months after the M&A activity.

3.5 Limitations of the study

Primarily due to time constraints, our research was constrained in some ways. Our research was limited to the securities in the US market only. We could not test our research in other markets like Canada, United Kingdom, etc. In addition, the research is limited to only 2 sectors in the US Sectors. We have analyzed the returns of the acquiring

companies only and maybe the target firms returns in conjunction can change our findings. Our research incorporates two models for return calculation and we can incorporate more return models for our event study.

3.6 Future Research Scope

In the future, this research can be expaned in various ways. Post financial crisis M&A activities and their impacts on stock returns for other markets can be analyzed. More sectors can be included to get the bigger picture of the market. As only the acquirers' stock return has been analyzed, the target's return can be analyzed in conjunction as well. Different tests for event study can be conducted like Jacknife test, Tank test, Wilcoxon test and Twin Event study amongst others. Finally, a comparative study of the post M&A activity return can also be conducted within different geographic market

4: Conclusion

From the analysis, using both the Fama-French four-factor model and Calendar time monthly market model, we can say that most of the time the long-term returns in the months succeeding the M&A have either been negative or positive but statistically insignificant. This emboldens and reinforces the findings of traditional literature on event study on M&A activities for acquirer firms. This conforms with findings from Malatesta (1983) and Franks., Harris & Titman (1991) in the US market and Andre, Kooli and L'Her (2004) in the Canadian market. Nevertheless, there have been two instances when the long-term abnormal return for the pharmaceutical sector using Fama-French Four Factor model, both with equally weighted index and value-weighted index. This shows that despite the long-term underperformance, there have been instances when the immediate period after the M&A activities had generated positive statistically significant performance. The information of an ensuing M&A and the potential impact on companies' performance can drive up the price for the short-term, but in the long run, there has been no evidence of such impact.

Bibliography

Franks, J., Harris, R., Titman, S.,1991, The post-merger share-price performance of acquiring firms, Journal of Financial Economics 29.

Malatesta, P.,1983, The wealth effect of merger activity and the objective functions of merging firms, Journal of Financial Economics 11.

Fama, Eugene F., Fisher, L., Jensen, Michael C., Roll, R., 1969, The adjustment of stock prices to new information, International Economic Review 10

Lyon, John D., barber, Brad M., Tsai, C., 1999, Improved Methods for Tests of Long-Run Abnormal Stock Returns, The Journal of Finance, 54

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanation of asset pricing anomalies, Journal of Finance 51.

Andre, P., Kooli, M., L'Her, J., 2004, Long-Run Performance of Mergers and Acquisitions: Evidence from the Canadian Stock Market, Financial Management 33