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The Impact of Mergers and Acquisition Premiums on Financial Performance

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ABSTRACT

The purpose of this paper was to examine why so many M&A (Mergers and Acquisitions) continue to take place at steep premiums in spite of lower returns to shareholders. The pharmaceutical and biotechnology industries present a unique opportunity to investigate the financial impact on acquiring companies and of acquisition premiums. This paper empirically examines if post-merger financial performance is correlated to acquisition premiums. The paper analyzes M&A in the pharmaceutical and biotechnology industries with effective dates between January 1, 1998, and December 31, 2005

The analysis showed that acquisition premiums are positively related to long term under performance of the acquiring company compared to the period prior to the acquisition. The main contribution of this paper is the development of a framework and criteria for assessing the impact of acquisition premiums on post-merger financial performance.

1. INTRODUCTION

1.1 Objectives

Short supply of acquisition targets and their uniqueness in the pharmaceutical and biotechnology industries force firms to pay substantial premiums over the market values to acquire target firms. Acquisition premiums are considered to be high if there is no realizable economic gain from merging. M&A have been studied extensively by scholars who have concluded, through empirical research, that companies who pay a substantial increase over a company's current stock value are destroying wealth of shareholders. Empirical evidence in industries including pharmaceutical and biotechnology suggests that the synergistic benefits of acquisitions usually accrue to the shareholders of targets, a return of over 30% on average, while acquiring firms on average do not improve returns to shareholders (Bradley, Desai & Kim, 1988; Jensen & Ruback, 1983). Each year, we continue to witness a significant number of M&A in which one firm pays a substantial premium over the other firms' stock price in the

pharmaceutical and biotechnology industries. The purpose of this paper was to examine why so many M&A continue to take place at steep premiums in spite of lower returns to shareholders.

The pharmaceutical and biotechnology industries present a unique opportunity to investigate the financial impact on acquiring companies and of acquisition premiums. The challenges faced by the industries to sustain desired and expected revenue growth rates has resulted in the selection of M&A as an avenue for achieving growth. The acquisition premium is defined as the excess of the actual price paid for a firm compared to its price traded in the st1ock exchange.

1.2 Industry Background

The pharmaceutical industry has undergone a major transformation in the last few decades. After years of sustained growth, high profits, and record innovation in years prior to the 1990s, the pharmaceutical industry found itself facing a tide of hostile forces (Schwizer, 2005). It is a high stakes business where innovative products may yield high rewards; however the failure rate is commensurately great (Campbell, 2007). It finds itself struggling against consolidations, daunting stock market expectations and short-term operating pressures on earnings. It faces several dynamic forces including the U.S. government, which became the number one buyer of its products as an ever increasing number of baby boomers become eligible for Medicare. The Medicare Prescription Drug, Improvement, and Modernization Act, also known as the Medicare Modernization, became a federal law, enacted in 2003 in the United States, to help patients pay for the increasing cost of new and expensive drugs.

The worldwide scope of the industry is also in a state of transformation. All major pharmaceutical firms now have a global reach. The global pharmaceutical industry represents a market that in 2010 was worth roughly $670 billion (EvaluatePharma, 2011). Companies must overcome a range of regulatory hurdles in each country or region to bring their products to market. Regulations continue to vary by country.

1.3 Patent Cliffs

One overwhelming challenge the industry faces is the loss of $250 billion in annual sales by the year 2015 (Alzaraki, 2011) due to the loss of patent protection. Even the largest firms will not be able to make up for the loss solely by developing drugs in-house. Pharmaceutical companies are seeking other sources of revenue to make up for this loss.

Some of the companies with the largest patent cliff exposure are listed in Table A.

Table A: Patent Cliff Exposure 2012

(Source: Big Pharma and Patent Cliffs)

Vanguard: January 30, 2011

Company	Expected Sales of patent exposed drugs ($Mill.)	Patent Exposure as % of expected 2012 Net Sales
Abbott Labs	$0	0%
Glaxo Smith Kline	£1,195	4%
Johnson and Johnson	$4,284	6%
Schering-Plough Corp	$1,364	6%
Wyeth	$4,826	21%
Eli Lilly & Co	$6,077	26%
Sanofi-Aventis	$7,784	27%
Shire PLC	$1,102	32%
Bristol Myers	$7,608	33%
Merk & Co.	$8,249	35%
AstraZeneca plc	$11,110	39%
Pfizer	$17,751	40%
Forest Labs	$3,250	73%

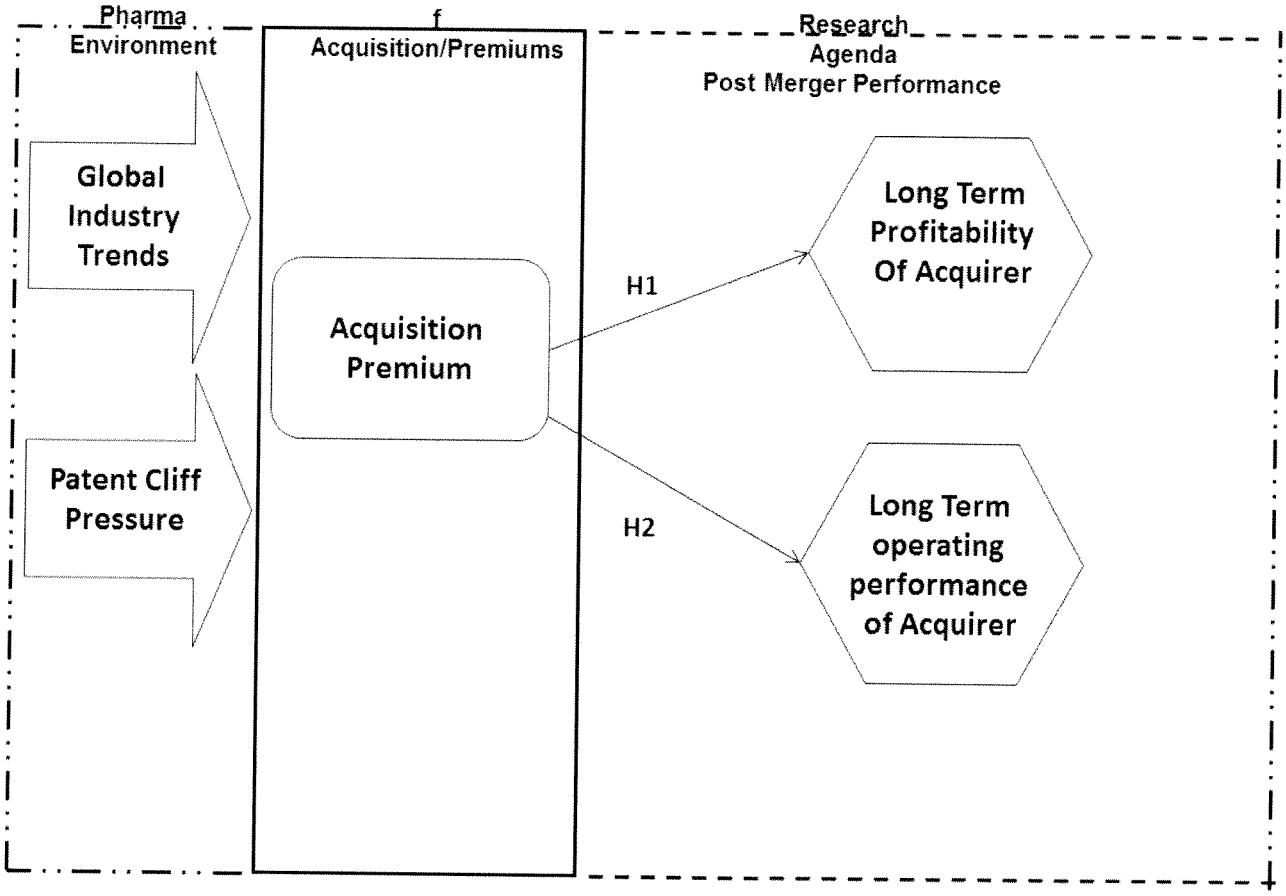
M&A are one way pharmaceutical companies fill the gap left by the patent cliffs. Companies may be willing to engage in acquisitions, as opposed to launching new drugs, believing that it may be less expensive to buy a company than to develop a new product internally (Javalgi, 2003). M&A have also become a necessary strategic option to capitalize on the complementary strengths of the acquiring company and the target firm with the discovery of new drug technologies in the biotechnology industry (Danzon et al., 2007). Since the relevant products and technologies are usually patent-protected and the human capital is highly specialized, acquiring a firm that owns complementary assets may be cheaper than trying to develop needed assets in-house. Acquiring other companies, and their product pipelines, will help the pharmaceutical companies assure growth in revenue. While some scholars argue that M&A generate agency problems (Jensen, 1986) that impede the combined firm from living up to its full potential in generating improved financial performance for shareholders, others argue (Weston, et al., 2004) that M&A create a new firm that is beneficial to both shareholders and customers. Since the net effect on financial performance remains inconclusive, it is necessary to conduct further research in this area.

1.4 Importance of Paper

Figure 1 illustrates the framework that was used for the analysis of premiums in M&A. This paper empirically examines if post-merger financial performance is correlated to acquisition premiums. The paper analyzes M&A in the pharmaceutical and biotechnology industries with effective dates between January 1, 1998, and December 31, 2005. While some scholars argue that M&A generate agency problems (Jensen, 1986) that impede the combined firm from living up to its full potential in generating improved financial performance for shareholders, others argue (Weston, et al., 2004) that M&A create a new firm that is beneficial to both shareholders and customers. Since the net effect on financial performance remains inconclusive, it is necessary to conduct further research in this area. The research is important for M&A in the Pharmaceutical and Biotechnology industries where takeovers require a significant amount of funds and also take up a considerable amount of time and effort on the part of the executives of the two firms (Hassan, et al., 2007).

The analysis relating to firms' post-M&A financial performance and acquisition premiums consists of two hypotheses. The first hypothesis, Hypothesis 1, examines whether profitability measures improve after M&A. The financial return measures analyzed are Return on Assets (ROA), Return on Equity (ROE) and Return on Invested Capital (ROIC). The method focused on profitability and efficiency by analyzing changes in accounting profit ratios from prior to the merger or acquisition to after the merger or acquisition. Examining financial performance in terms of accounting measures provides insights into whether expectations at the time of the merger are actually realized in the long term. It also provides evidence on inputs on the expected value of a merged entity. Beyond studying profitability measures, scholars have examined the use of return on assets proposed by Healy et al. (1992) to measure financial improvement in operating performance. Hypothesis 2 examines traditional accounting measures ROA and return on equity (ROE) were used to measure the operating performance of the acquiring company post-merger.

Figure 1 – Outline of Hypotheses



1.5 Contribution and Limitations

This paper contributed to existing literature by empirically investigating the companies engaging in acquisitions to determine if post-merger financial performance is correlated to acquisition premiums. What is sacrificed with this approach is the ability to generalize the findings and apply them to other industries. The unique nature of the pharmaceutical industry, however, and the rapid changes in the industry, provide an opportunity to examine a significant universe of observations empirically. Restricting the context to the pharmaceutical industry also helps ensure against concerns about internal validity by allowing for comparability across acquisitions.

The conclusions and the findings of the paper were limited to publicly held companies. This was necessitated because of lack of data on acquisition premiums and financial performance of privately held companies.

2. LITERATURE REVIEW

2.1 Post-performance Results - M&A in the Pharmaceutical Industry

Weston et al, (2004), argued that M&A create synergies that benefit both the acquiring company and the consumers. On the other hand Jensen & Ruback, (1983) argue that M&A activities create agency problems, resulting in less than optimal returns. The conclusions based on event studies done recently do not provide any definitive conclusions and they vary depending on the focus of the study and whether the study was based on the target company or the acquirer. Hassan, et. al, (2007) analyzed M&A focusing on the U.S. pharmaceutical industry in the period 1981-2004. Their study examined 405 M&A, analyzing short-term abnormal returns separating mergers from acquisitions and U.S.-based from foreign-based M&A targets. Their study found evidence of short and long-term abnormal returns, as well as accounting and efficiency effects. The tests also suggested that mergers with U.S.-based targets were not value destroying.

Loderer and Martin, (1992) examined financial performance post acquisition. This paper investigated 304 mergers and 155 acquisitions from 1965 to 1986 and documented statistically insignificant abnormal return over the 5 subsequent years for mergers and positive, but insignificant, abnormal return for acquisitions. Firth (1980) found an insignificant abnormal return of 0.01% over the 36 months following the bid announcement by examining 434 successful bids and 129 unsuccessful bids in the UK over the period 1965-1975. In contrast, Agrawal et al. (1992), Loughran and Vijh (1997), Asquith et al. (1983) and Andre´et al. (2004) documented significant and negative announcement period abnormal returns post-merger or acquisition. Andrade et al. (2001) find that for the acquiring companies, 100% cash deals are associated with better returns than transactions with stock.

Some researchers have investigated cross-border M&A with mixed results. Black et al. (2001) document significant negative returns to US bidders during the 3 and 5 years following cross-border mergers. Gugler et al. (2003) also demonstrate that cross-border acquisitions create a significant decrease in the market value of the acquiring firm over a 5-year post acquisition period. Conn et al. (2001) find no supporting evidence of post-acquisition negative returns for cross-border acquisitions.

A few studies investigate various effects of M&A in the pharmaceutical industry, albeit using a different methodological approach from the studies mentioned above. Nicholson and McCullough (2002) examine mergers between biotech and pharmaceutical companies to determine whether or not they are characterized by asymmetric information. These scholars conclude that uncertainty regarding the future cash flows from the accumulated R&D investments of technology based firms creates information asymmetry and may lead to different valuations by prospective acquirers and the stock market.

Danzon et al. (2007) investigated M&A in the biotech-pharma industry controlling for propensity to merge as defined by probability to merge due to patent expiration, depleted product pipelines and observable firm characteristics. Danzon et al. concluded that the acquiring firms with low expected earnings growth, and hence low market relative to book value of assets, are more likely to acquire another firm. When faced with approaching patent cliffs, however, the effect of earnings growth is insignificant.

Laamanen, (2007), examined acquisition premiums in the pharmaceutical and biotechnology industry. They conclude that acquisition premiums may be justified when target firms' resources are difficult for the market to value. An analysis of a sample of 458 acquisitions demonstrates that although higher premiums are paid for R&D-related assets, the premiums do not cause negative abnormal returns.

This paper builds on the studies above by examining both U.S. and foreign acquisitions for both the pharmaceutical and biotechnology industries from both a post-acquisition perspective.

3. RESEARCH METHODOLOGY

3.1 Overview

This section represents the methodology used in this paper and justifies the research approach and methods used within the paper's context. It provides an overview of each hypothesis, as well as the data collection techniques and the sample selection criteria. The effect of the merger/acquisition is examined for several measures of firm performance.

Research Hypotheses

The research question examined in this paper is what is the impact of the premium paid for these acquisitions on post-acquisition financial performance of the acquirer?

Hypothesis 1 Examine the post-acquisition financial performance and the impact of acquisition premiums on long-term underperformance of profitability

- The dependent variable is the difference of financial performance of acquirer 2 years post-acquisition, (post-two) and 1 year post-acquisition (post-one) EBITDA Margin (Earnings before interest taxes, depreciation and amortization, divided by Net Sales) and Net profit margin (Net Income divided by Net Sales), less 1 year prior to the transaction's announcement.
- The independent variable is acquisition premium calculated as follows: (2 months prior, 1 month prior, 1 week prior, 1 day prior, control premium) and log-sales.
- Statistical Methodology – *t*-Test, The Pearson and Spearman correlations

Hypothesis 2 Acquisition premiums are positively related to long-term under performance of financial returns of the acquiring company compared to the mean level for the pre M&A period

- The dependent variables used were Financial Performance of acquirer post-two and post-one, less prior-one for ROA (Return on Assets), ROE (Return on Equity), ROIC (Return on Invested Capital)
- The independent variables used were acquisition premium (2 months prior, 1 month prior, 1 week prior, 1 day prior, control premium)
- The statistical methodology used was *t*-Test and the Pearson and Spearman correlations

3.2 Sample

This paper draws on a number of different data sets. The sample consists of M&A with an announcement date and effective date between January 1, 1998 and December 31, 2005. Data for the acquisition premiums was extracted from the Factset Mergerstat/BVR Control Premium Study. It includes data on public companies in the U.S. market and non-U.S. market engaged in merger and acquisition activities.

The companies included in this paper include pharmaceutical firms, classified under the four digit Standard Industrial Classification (SIC) system 2834, 2835 and 2836. SIC code 2834.

4. FINANCIAL RESULTS

4.1 Results and Acquisition Premiums

Hypothesis 1 suggests that post M&A premiums are positively related to long-term underperformance of profitability of the acquiring company compared to the mean level for the pre M&A period. In other words, a higher premium means lower post M&A financial results as compared to financial results before M&A. Acquisition premiums were compared to profitability measures (EBITDA margin and Net Sales margin) one year prior to the M&A, compared to 1 and 2 years post-M&A. For hypothesis 1, a *t*-test, and the Spearman and Pearson correlations are used to compare the means of two variables; EBITDA Margins

(Earnings before interest, taxes, depreciation and amortization, net income/Sales), and Net Profit margins (Net Income/Sales) 1 year prior to the acquisition and 2 years post-acquisition. By using EBITDA, the impact of interest, taxes, depreciation and amortization are eliminated from the net income calculation. The EBITDA measurement excludes accrual accounting and eliminates the impact of varying tax-jurisdiction and different capital structures. The sales and EBITDA margins are consistent with prior studies on M&A (Hitt et al., 2001) and are effective performance measure in acquisitions because of the often large changes in assets and equity and potentially odd valuations observed in M&As.

4.2 Financial Performance and Acquisition Premiums

To test Hypothesis 1, we perform a *t*-test comparing the difference in the means of the EBITDA and Net Profit margins 1 and 2 years post-M&A to 1 year prior to the M&A. To analyze the results of the acquisition premiums paid and post financial performance, the Pearson and the Spearman correlations were performed between changes in EBITDA margins and Net Profit margins 2 and 1 year post M&A as compared to 1 year prior to M&A and acquisition premiums based on stock prices 2 months, 1 month, 1 week and 1 day prior to the acquisition. The acquisition premiums were calculated for five time periods as follows:

[Takeover Price/Stock Market Value (2 months, 1 month, 1 week, 1 day) -1]

The control premium was calculated using the unaffected common stock price, selected after analyzing each transaction and selecting the target company's common stock price unaffected by the acquisition announcement. The control premium is calculated as:

[Takeover Price/Stock Market Value (unaffected price) -1]

A control premium, computed by comparing the price ultimately paid for the acquisition to the unaffected stock price, was also analyzed.

4.2.1 EBITDA Margin - Descriptive Statistics

Table 1 presents the descriptive statistics for the variables used to examine the EBITDA margin and acquisition premiums used in Hypothesis 1. Twenty-two firms were excluded from the sample because the firm was no longer in existence, 1 or 2 years post- integration, the data was not available or extreme values for small firms distorted the statistical analysis.

Table 1 – EBITDA Margin Descriptive Statistics

Variable Description	*n* = Number of Observations	Mean	Standard Deviation
2 month premium	64	.231	.153
1 month premium	64	.208	.144
1 week premium	64	.167	.129
1 day premium	64	.133	.125
Control premium	64	.165	.138
EBITDA Margin Post-1 less prior-one (*t*+1 less *t*-1)	64	.008	.189
EBITDA Margin Post-2 less prior- 1 (*t*+2 less *t*-1)	64	-.026	.162

4.2.2 EBITDA Margin - t-Test

By examining the change in the means of each variable pre- and post-acquisition, the *t*-test examines the impact of the merger by comparing the change in annual outcomes post-acquisition, post-one (*t*+1), and post-two (*t*+2) to 1 year prior to the acquisition, prior-year, (*t*-1).

A *t*-test was performed examining whether the impact on the difference in the EBITDA margin post-two compared to prior-one is equal to zero or not equal to zero.

The null hypotheses for post-one and post-two are:

(EBITDA margin post-one) – (EBITDA margin prior-one) = "0"

(EBITDA margin post-two) – (EBITDA margin prior-one) = "0"

The alternate hypotheses for post-one and post-two are:

(EBITDA margin post-one) – (EBITDA margin prior-one) ≠ "0"

(EBITDA margin post-two) – (EBITDA margin prior-one) ≠ "0"

The *t*-test for the EBITDA margin is calculated a:s

$$t = \frac{\text{Mean (EBITDA Margin } t+1\text{) less (EBITDA Margin } t\text{-1)}}{\text{Standard Deviation (EBITDA Margin } t+1\text{) less (EBITDA Margin } t\text{-1)/ } \sqrt{n}}$$

The *t*-test for the EBITDA margin post-one as compared to prior-one is calculated as:

$$t = \frac{.008}{1.89/\sqrt{64}} = .333$$

The *t*-test for the EBITDA margin post-two as compared to prior-one is calculated as:

$$t = \frac{-.026}{1.89/\sqrt{64}} = -.1.10$$

4.2.3 EBITDA Margin- t-test – Results

No significant difference at the 0.05 level was found in the mean scores of the EBITDA margin for the year prior to the acquisition compared to 1 and 2 years post- acquisition. There is not enough evidence with this test, therefore, to reject the null hypothesis that there is a change in EBITDA margin pre- and post-acquisition.

4.2.4 EBITDA Margin – The Pearson Correlation -

The Pearson coefficients for the correlation between the premium variables and the changes in EBITDA margins are reported in Table 2.

Table 2 – EBITDA Pearson Correlation

Variable Description		EBITDA Margin - (post-two less prior-one)	EBITDA Margin (post-one less prior-one)
2 month premium	Pearson correlation Sig. (2-tailed)	.152 .230	.259* .039
1month premium	Pearson correlation Sig. (2-tailed)	.033 .797	.202 .109
1 week premium	Pearson correlation Sig. (2-tailed)	.120 .348	.224 .076
1 day premium	Pearson correlation Sig. (2-tailed)	.100 .433	.153 .226
Control premium	Pearson correlation Sig. (2-tailed)	.107 .400	.176 .164

*Significant at the 0.05 level

4.2.5 EBITDA Margin – The Pearson Correlation – Results

Table 2 shows the Pearson coefficients for the correlation between the premium variables and the changes to the EBITDA margins of the acquiring firm 1 and 2 years post-acquisition, compared to one year prior to the acquisition. Only the correlation for the 2 month premium ($r = .259$, $P < 0.05$) is statistically significant at the 0.05 level. No other correlations are found to be statistically significant. There is not enough evidence, based on the Pearson correlation test to reject the null hypothesis for Hypothesis 1.

4.2.6 EBITDA Margin - The Spearman Correlation

The Spearman coefficients for the correlation between the acquisition premium variables and the changes in EBITDA margin are reported in Table 3.

Table 3 – EBITDA the Spearman Correlation

Variable Description		EBITDA Margin - (post-two less prior-one)	EBITDA Margin (post-one less prior-one)
2month premium	Spearman correlation	.285*	.265*
	Sig. (2-tailed)	.023	.034
2 month premium	Spearman correlation	.175	.139
	Sig. (2-tailed)	.167	.274
2 week premium	Spearman correlation	.250*	.162
	Sig. (2-tailed)	.046	.200
2 day premium	Spearman correlation	.183	.163
	Sig. (2-tailed)	.148	.199
Control premium	Spearman correlation	.193	.169
	Sig. (2-tailed)	.126	.183

*Significant at the 0.05 level

4.2.7 EBITDA Margin - The Spearman Correlation – Results

Table 3 shows that there is a statistically significant correlation between the 2 month acquisition premium variables (*rho* = .285, $p < 0.05$) and (*rho* = .265, $p < 0.05$) the changes in the post-two and post-one year EBITDA Margins. The correlation for the 1 week premium and the post-two difference is also statistically significant (*rho* = .250, $p < 0.05$). The null hypothesis for Hypothesis 1 can be rejected. When the acquisition premium is adjusted for the price ultimately paid compared to the unaffected price, there is no statistically significant correlation between the changes to the EBITDA margins and the premiums for the other periods.

4.2.8 Net Profit Margin - Descriptive Statistics

Table 4 reports the descriptive statistics for the variables used to examine the Net Profit margin for Hypothesis 1. Twenty firms were excluded from the sample because the firm was no longer in existence 1 or 2 years post-integration, the data was not available, or extreme values for small firms distorted the statistical analysis.

Table 4 – Net Profit Margin - Descriptive Statistics

Variable Description	*n* = Number of Observations	Mean	Standard Deviation
2 month premium	66	.228	.151
1 month premium	66	.204	.140
1 week premium	66	.172	.125
1 day premium	66	.136	.122
Control premium	66	.167	.135
Net Profit Margin Post-one less prior-	66	.016	.184
Net Profit Margin Post-two less prior	66	-.010	.161

4.2.9 Net Profit Margin - t-Test

A *t*-test was performed examining whether the impact on the difference in the Net profit margin post-two compared to prior-one is equal to zero or not equal to zero.

The null hypotheses for post-one and post-two are:

(Net profit margin post-one) – (Net profit margin prior-one) = "0"

(Net profit margin post-two) – (Net profit margin prior-one) = "0"

The alternate hypotheses for post-one and post two are:

(Net profit margin post-one) – (net profit margin prior- one) ≠ "0"

(Net profit margin post-two) – (net profit margin prior- one) ≠ "0"

The *t*-test is calculated as

$$t = \frac{\text{Mean (Net Profit Margin } t+1 \text{) less (Net Profit Margin t-1)}}{\text{Standard Deviation (Net Profit Margin } t+1 \text{ less (Net Profit margin } t\text{-1)} / \sqrt{n}}$$

The *t*-test for the Net Profit margin 1 year post-acquisition as compared to 1 year prior to the acquisition is calculated as

$$t = \frac{.016}{.184/\sqrt{66}} = .727$$

The *t*-test for the Net Profit margin post-two compared to post-one is calculated as:

$$t = \frac{-.010}{.161/\sqrt{66}} = -1.00$$

4.2.10 Net Profit Margin - t-Test Results

The *t*-test indicates the differences in the mean scores of the Net Sales variables are not statistically significant at the 0.05 level. There is not enough evidence with this test, therefore, to reject the null hypothesis that there is no change in net profit margins.

4.2.11 Net Profit Margin – The Pearson Correlation

The Pearson coefficients were calculated for the correlation for each of the acquisition premium variables and changes in the net profit margins. The results are included in Table 5.

Table 5 – Net Profit Margin - Pearson Correlation

Variable Description		Net Profit Margin - (Post-two less prior-one)	Net Profit Margin – (Post- less prior-one)
2 month premium	Pearson correlation	.233	.148
	Sig. (2-tailed)	.060	.236
1month premium	Pearson correlation	.177	-.010
	Sig. (2-tailed)	.154	.937
1week premium	Pearson correlation	.278*	.078
	Sig. (2-tailed)	.024	.531
1 day premium	Pearson correlation	.248*	.123
	Sig. (2-tailed)	.044	.324
Control premium	Pearson correlation	.123	.036
	Sig. (2-tailed)	.325	.774

*Significant at the 0.05 level

4.2.12 Net Profit Margin – The Pearson Correlation – Results

Table 5 shows that the Pearson coefficients are statistically significant for the correlation between the 1 week and 1 day acquisition premium variables and the changes in net profit margins, post-two. The null hypothesis for Hypothesis 1 can be rejected. When the acquisition premium is adjusted for the price ultimately paid compared to the unaffected price, there is no statistically significant correlation in acquisition premium variables and the changes in the net profit margins.

4.2.13 Net Profit Margin – The Spearman Correlation

The Spearman coefficients were calculated for the correlation between the acquisition premium variables and the changes in net profit margins. The results are included in Table 6.

Table 6 – Net Profit Margin the Spearman Correlation

Variable Description		Net Profit Margin - (Post-two less prior one)	Net Profit Margin – (Post-one less prior-one)
2 month premium	Spearman correlation	.181	.095
	Sig. (2-tailed)	.145	.450
1 month premium	Spearman correlation	.115	-.014
	Sig. (2-tailed)	.359	.909
1 week premium	Spearman correlation	.316**	.068
	Sig. (2-tailed)	.010	.589
1 day premium	Spearman correlation	.249*	.102
	Sig. (2-tailed)	.044	.413
Control premium	Spearman correlation	.172	.072
	Sig. (2-tailed)	.168	.564

* Significant at the 0.05 level

** Significant at the 0.01 level

4.2.14 The Spearman Correlation – Results

Table 6 shows that there is a statistically significant correlation between the 1 week (*rho* = .316, $p < 0.01$) and 1 day acquisition premiums (*rho* = .249, $p < 0.05$) and the changes in the net profit

margins of the acquiring firm post-two. The null hypothesis for Hypothesis 1 can be rejected. When the acquisition premium is adjusted for the price ultimately paid compared to the unaffected price, there is no statistically significant correlation in net profit margin performance and acquisition premiums.

4.3 Financial Performance and Acquisition Premiums

To test Hypothesis 2, we perform a *t*-test, Pearson and the Spearman correlations comparing the difference in the means of ROA, ROE and ROIC post-two and post-one years to prior-one year.

4.3.1 Statistical Summary – Return on Assets (ROA)

Table 7 includes the descriptive statistics for the variables used to examine the Return on assets for Hypothesis 2. Twenty firms were excluded from the sample because the firm was no longer in existence 1 or 2 years post-integration, the data was not available or extreme values for small firms distorted the statistical analysis.

Table 7 – Return on Assets - Descriptive Statistics

Variable Description	*n* = Number of Observations	Mean	Standard Deviation
2 month premium	66	.226	.153
1 month premium	66	.197	.145
1 week premium	66	.163	.131
1 day premium	66	.129	.125
Control premium	66	.159	.138
ROA Post-one less prior-	66	-.084	.299
ROA Post-two less prior-	66	-.062	.325

4.3.2 ROA – t-Test

A *t*-test was performed examining whether the impact on the difference in the ROA post-two compared to prior-one is equal to zero or not equal to zero.

The null hypotheses for post-one and post-two are:

(ROA post-one) – (ROA margin prior-one) = "0"

(ROA post-two) – (ROA margin prior-one) = "0"

The alternate hypotheses are:

(ROA margin post-one) – (ROA margin prior-one) ≠ "0"

(ROA margin post-two) – (ROA margin prior-one) ≠ "0"

A *t*-test examining the impact on the difference in the ROA 1 year post- acquisition compared to 1 year prior to the acquisition is calculated as follows

$$t = \frac{\text{Mean (ROA } t+1\text{) less (ROA } t\text{-1)}}{\text{Standard Deviation (ROA } t+\text{) less (ROA } t\text{-1) / } \sqrt{n}}$$

The *t*-test for the ROA post-one compared to prior-one is calculated as

$$t = \frac{-.084}{.299/\sqrt{66}} = -2.33$$

The *t*-test for the ROA post-two compared to prior-one is calculated as

$$t = \frac{-.062}{.325/\sqrt{66}} = -1.55$$

4.3.3 ROA- t- Test Results

The *t*-test indicates the difference in the mean scores of the ROA variable is statistically significant at the 0.05 level for the pre- and post-acquisition difference in financial performance measured by ROA. The *t*-test value of -2.33 indicates that the difference in ROA is significantly different from "0". The *t*-test for 2 years post- acquisition is not statistically significant and the null hypothesis that there is a difference in the mean between pre- and post-ROA cannot be rejected.

4.3.4 The Pearson Correlation – ROA

The Pearson coefficients were calculated for the correlations between the acquisition premium variables and the changes in ROA pre- and post-M&A. The results are included in Table 8.

Table 8 – ROA Pearson Correlation

Variable Description		ROA - (Post-two less prior one)	ROA – (Post-one less prior-one)
2 month premium	Pearson correlation	.045	.257*
	Sig. (2-tailed)	.720	.039
1 month premium	Pearson correlation	.142	.235
	Sig. (2-tailed)	.258	.060
1 week premium	Pearson correlation	-.064	.118
	Sig. (2-tailed)	.612	.350
1 day premium	Pearson correlation	-.082	.123
	Sig. (2-tailed)	.515	.330
Control premium	Pearson correlation	-.033	.166
	Sig. (2-tailed)	.794	.186

*Significant at the 0.05 level

4.3.5 The Pearson Correlation – ROA - Results

Table 9 shows that there is a statistically significant correlation for the Pearson coefficients between the acquisition premium variable and changes in ROA post-one compared to prior-one for the 2 month premium ($r = .257$, $p < 0.05$). The null hypothesis that there is no association

between the acquisition premium and the changes in ROA pre and post-acquisition can be rejected with a statistical significance at the 0.05 level.

4.3.6 The Spearman Correlation – ROA

The Spearman coefficients were calculated for the correlation between the acquisition premium variables and the changes in pre and post-ROA. The results are included in Table 9.

Table 9 – ROA the Spearman Correlation

Variable Description		ROA - (Post-two less	ROA – (Post-one less
2 month premium	Spearman correlation	.135	.167
	Sig. (2-tailed)	.283	.183
1 month premium	Spearman correlation	.142	.189
	Sig. (2-tailed)	.260	.131
1 week premium	Spearman correlation	.189	.238
	Sig. (2-tailed)	.132	.056
1 day premium	Spearman correlation	.116	.248*
	Sig. (2-tailed)		.046
Control premium	Spearman correlation	.179	.330**
	Sig. (2-tailed)	.153	.007

*Significant at the 0.05 level

**Significant at the 0.01level

4.3.7 The Spearman Correlation – ROA – Results

Table 9 shows that there is a statistically significant correlation for the Spearman coefficients between the acquisition premium 1 day (*rho* = .248, $p < 0.05$) and control premiums (*rho* = .330, $p < 0.01$) and the changes in ROA post-one at the 0.05 and 0.01 levels, respectively. The null hypothesis that there is no relationship between acquisitions premiums and pre- and post - acquisition ROA can be rejected.

4.3.8 Statistical Summary – Return on Equity (ROE)

Table 10 reports the descriptive statistics for the variables used to examine return on equity in Hypothesis 2.

Table 10 – Return on Equity - Descriptive Statistics

Variable Description	n = Number of Observations	Mean	Standard Deviation
2 month premium	66	.227	.153
1 month premium	66	.202	.151
1 week premium	66	.163	.130
1 day premium	66	.128	.123
Control premium	66	.161	.137
ROE Post-one less prior-one	66	-.059	.209
ROE Post-two less prior-one	66	-.070	.228

4.3.9 ROE – t-Test

A *t*-test was performed examining whether the impact on the difference in the ROE post-two compared to prior-one is equal to zero or not equal to zero.

The null hypotheses for post-one and post-two are:

(ROE post-one) – (ROE prior-one) = "0"

(ROE post-two) – (ROE prior-one) = "0"

The alternate hypotheses are:

(ROE post-one) – (ROE prior-one) ≠ "0"

(ROE post-two) – (ROE prior-one) ≠ "0"

A *t*-test examining the impact on the difference in the ROE 1 year post-acquisition compared to 1 year prior to the acquisition is calculated as:

$$t = \frac{\text{Mean (ROE t+) less (ROE t-1)}}{\text{Standard Deviation (ROE t+1) less (ROE t-1)} / \sqrt{n}}$$

The *t*-test for the ROE 1 year post acquisition as compared to 1 year prior to the acquisition is calculated as:

$$t = \frac{-.059}{.209/\sqrt{66}} = -2.4$$

The *t*-test for the ROE 2 years post-acquisition as compared to 1 year prior to the acquisition is calculated as:

$$t = \frac{-.070}{.228/\sqrt{66}} = -2.6$$

4.3.10 ROE – t-Test –Results

The *t*-test indicates the difference in the mean scores of the ROE variable is statistically significant at the 0.05 level. There is enough evidence, therefore, to reject the null hypothesis the there is no difference in ROE post-two, post-one compared to prior-one.

4.3.11 The Pearson Correlation - ROE

The Pearson coefficients were calculated for the correlation between the acquisition premium variables and the changes in ROE margin pre- and post-acquisition. The results are reported in Table 11.

Table 11 – Return on Equity (ROE) - Pearson Correlation

Variable Description		ROE - (Post-two less prior one)	ROE – (Post-one less prior-one)
2 month premium	Pearson correlation	.020	.033
	Sig. (2-tailed)	.871	.791
1 month premium	Pearson correlation	.004	-.019
	Sig. (2-tailed)	.977	.882
1 week premium	Pearson correlation	.102	.092
	Sig. (2-tailed)	.414	.463
1 day premium	Pearson correlation	.062	.119
	Sig. (2-tailed)	.619	.342
Control premium	Pearson correlation	.115	.180
	Sig. (2-tailed)	.360	.147

4.3.12 The Pearson Correlation – ROE – Results

Table 11 shows that there is not a statistically significance based on the Pearson correlation between the acquisition premium variables and the changes in ROA post-two, post-one compared to prior-one. The null hypothesis that there is no association between the acquisition premiums and the changes in ROE pre and post acquisitions cannot be rejected.

4.3.13 The Spearman Correlation – ROE

The Spearman correlation coefficients were calculated between each of the acquisition premium variables and the differences in ROE pre- and post-acquisition. The results are included in Table 12.

Table 12 – Return in Equity (ROE) - the Spearman Correlation

Variable Description		ROE - (Post-two less prior one)	ROE – (Post-one less prior-one)
2 month premium	Spearman correlation	-.048	-.048
	Sig. (2-tailed)	.701	.703
1 month premium	Spearman correlation	-.004	.017
	Sig. (2-tailed)	.974	.890
1 week premium	Spearman correlation	.112	.120
	Sig. (2-tailed)	.371	.336
1 day premium	Spearman correlation	-.031	.031
	Sig. (2-tailed)	.805	.804
Control premium	Spearman correlation	-.035	.145
	Sig. (2-tailed)	.780	.245

4.3.14 The Spearman Correlation – ROE - Results

Table 12 shows that there is not a statistically significant correlation for the Spearman coefficients between the acquisition premium variables and changes in ROE pre- and post-

acquisition. The null hypothesis that there is an association between acquisition premiums and ROE pre- and post-acquisition cannot be rejected.

4.3.15 Statistical Summary – Return on Invested Capital (ROIC)

Table 13 includes the descriptive statistics for the variables used to examine return on invested capital (ROIC) for Hypothesis 2. Eighteen were excluded from the sample because the firm was no longer in existence, 1 or 2 years post-integration, the data was not available, or extreme values for small firms distorted the statistical analysis.

Table 13 – Return on Invested Capital (ROIC) Descriptive Statistics

Variable Description	n = Number of Observations	Mean	Standard Deviation
2 month premium	68	.225	.150
1 month premium	68	.202	.138
1 week premium	68	.167	.125
1 day premium	68	.133	.122
Control premium	68	.163	.134
ROIC Post -one less prior-one	68	.025	.222
ROIC Post-two less prior-one	68	.060	.234

4.3.16 ROIC – t-Test

A *t*-test was performed examining whether the impact on the difference in the ROIC post-two compared to prior-one is equal to zero or not equal to zero.

The null hypotheses for post-one and two are:

(ROIC post-one) – (ROIC prior-one) = "0"

(ROIC post-two) – (ROIC prior-one) = "0"

The alternate hypotheses for post-one and two are:

(ROIC post-one) – (ROIC prior-one) ≠ "0"

(ROIC post-two) – (ROIC prior-one) ≠ "0"

A *t*-test examining the impact on the difference in the ROIC 1 year post- acquisition compared to 1 year prior to the acquisition is calculated as follows:

$$t = \frac{\text{Mean (ROIC } t+1 \text{ less t-1)}}{\text{Standard Deviation (ROIC } t+1 \text{ less t-1)} / \sqrt{n}}$$

The *t*-test for the ROIC post-one compared to prior-one is calculated as:

$$t = \frac{= .025}{.222/\sqrt{68}} = .926$$

The *t*-test for the ROIC post-two as compared to prior-one is calculated as

$$t = \frac{.060}{.234/\sqrt{68}} = 2.0$$

The *t*-test indicates the mean of the ROIC variables is statistically significant at the 0.05 level for the difference in post-two ROIC compared to prior-one. There is not enough evidence with this test, therefore, to reject the null hypothesis for ROIC based on the post-one difference.

4.3.17 The Pearson Correlation - ROIC

The Pearson correlation coefficients were calculated for each of the acquisition premium variables in conjunction with the ROIC margin. The results are included in Table 14.

Table 14 – ROIC Pearson Correlation

Variable Description		ROIC - (Post-two less prior one)	ROIC – (Post-one less prior-one)
1 month premium	Pearson correlation	-.044	.102
	Sig. (2-tailed)	.719	.408
1 month premium	Pearson correlation	-.078	.008
	Sig. (2-tailed)	.527	.947
1 week premium	Pearson correlation	-.029	-.056
	Sig. (2-tailed)	.812	.652
1 day premium	Pearson correlation	-.065	-.051
	Sig. (2-tailed)	.600	.678
Control premium	Pearson correlation	-.077	-.005
	Sig. (2-tailed)	.534	.966

4.3.18 The Pearson Correlation Results – ROIC

Table 14 shows that there is not a statistically significant correlation between the control premium variables and the ROIC of the acquiring firm post-two and post-one compared to prior-one. The null hypothesis for Hypothesis 2 cannot be rejected.

4.3.19 The Spearman Correlation – ROIC

The Spearman correlation coefficients were calculated for each of the acquisition premium variables in conjunction with ROIC. The results are included in Table 15.

Table 15 – ROIC the Spearman Correlation

Variable Description		ROIC - (Post-two less prior one)	ROIC – (Post-one less prior-one)
2 month premium	Spearman correlation	.010	.082
	Sig. (2-tailed)	.933	.504
1 month premium	Spearman correlation	-.067	-.073
	Sig. (2-tailed)	.585	-.553
1 week premium	Spearman correlation	-.024	.042
	Sig. (2-tailed)	.312	.733
1 day premium	Spearman correlation	-.014	-.012
	Sig. (2-tailed)	.909	.924
Control premium	Spearman correlation	-.089	-.005
	Sig. (2-tailed)	.470	.968

4.3.20 The Spearman Correlation – ROIC - Results

Table 15 shows that there is not a statistically significant correlation, for the Spearman coefficients, between the acquisition premium variables and the difference in ROIC pre- and post-acquisition. The null hypothesis that there is an association between acquisition premiums and pre and post-acquisition ROIC cannot be rejected.

4.4. Summary of Findings

In this paper we hypothesize that acquisition premiums are positively related to long term underperformance of the acquiring company compared to the period prior to the acquisition. Our findings provide some support for this hypothesis as reported in the table above, however, the evidence is mixed. Support for this hypothesis includes some of the results for the EBITDA and Net profit margins, in addition to a strong statistical significance in a decline in ROA performance pre- and post-acquisition. Results from a limited number of studies analyzing the pharmaceutical and biotechnology industries are also mixed. Danzon et al. (2007) found that merged firms had slower growth in profit. Hassan, et al, 2007, found that there was no difference in long-term profit of the acquiring firm. This paper provides supporting evidence that premiums paid for M&A lead to long term under performance for measures of profitability two years post- acquisition compared to one year prior to the acquisition. For asset utilization the results for the ROA metric support the hypothesis that acquisition premiums lead to under performance of asset utilization for the period one year post-acquisition, compared to one year prior to the acquisition.

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