Use of Event Studies to Estimate Brand Value: A Comparison of Methodologies

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ABSTRACT

Stock market event studies are often used to estimate the impact of an unanticipated event on stock returns of a company. Traditionally, these analyses focus on developing estimates of abnormal returns attributed to the event or some measure of post-event loss in shareholder value. In 1989 Mark Mitchell used an event study to estimate the impact of the 1982 Tylenol poisonings on Johnson & Johnson's share returns. Mark Mitchell was able to demonstrate that (1) Johnson & Johnson share returns were significantly impacted by the poisonings, and (2) such an impact translated, at least in part, to a depreciation of brand name capital.

This study sets forth the basic framework of Mark Mitchell's 1989 analysis and wherever appropriate, provides possible alternatives to his methodologies. Using several alternative approaches including, but not necessarily limited to, consideration of the incremental values associated with the Tylenol brand name, cost to develop the brand, alternative market factors, and changes in income streams I compare changes in brand value to brand name capital depreciation estimated by Mitchell. In some instances the aforementioned approaches are used in conjunction with aspects of Mitchell's methodology. The results tend to provide more accurate estimates of the loss in brand value possibly associated with the 1982 poisonings.

Thanks and Dedication

The author would like to thank Roger Waud, Ph.D., Dr. Thomas Lutton Ph.D., and Richard Theroux, Ph.D. for their valuable insights and helpful comments throughout these past months.

I would like to dedicate this work to my wife Eileen for putting up with mood swings, long hours, distractions and seemingly endless economic discussions. It has been her love and support (along with my children) that has provided me the incentive to complete what was started long ago. I would like to thank my parents for their faith and hope and my brother and sisters for being willing to help in any way. They pushed as hard as they dared all the while avoiding judgment. I also would like to thank my in-laws for their "subtle" hints and gentle nudges. Lastly, to the many people who in some way might have touched this work, I thank you and am grateful.

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1) Introduction

Traditional analysis of intellectual property ("IP") assets typically involves consideration of various asset specific factors such as the cost to develop, anticipated income associated with ownership and/or transactions within the market involving products with similar characteristics.[1] These traditional valuation methodologies, often referred to as the Cost Approach, Income Approach, and Market Approach, rely on fundamental economic theory and utilize many of the same market factors present in more complex economic analyses.

The application of one or more of these methodologies involves estimates of asset value based on different perspectives. For example, the cost, income and market approaches involve analyses of factors occurring at different points in time (e.g., past, future and present). This allows for estimates of value based on different perspectives. Application of these methodologies also allows for consideration of the various elements that potentially influence the value of an IP asset, as well as, how these elements might be quantified.

These methodologies provide estimates of value that are independent of one another. Therefore, while it is possible to use one or more of these methods to value an IP asset, each approach is developed independently. As such, it is important to consider potential benefits and drawbacks possibly associated with any given approach.

The broad application and general acceptance of these basic methodologies greatly reduce the need for alternative valuation methodologies. In fact, it is difficult to envision a valuation technique that is not rooted, at least in part, to the cost, income or market approach. Stock market event study analysis is no exception.

Stock market event study analysis ("event study") relies on the theory of market efficiencies (*i.e.*, markets are assumed to be efficient such that the price within the market will reflect all information as it becomes available within the market (*see,* for example, Fama, 1970, 1996, 1998 and Fama, Fischer, Jensen, and Roll, 1969). This assumption facilitates analyses of specific events or more specifically, how the event impacted firms within the market. This assumption also incorporates applications of these basic valuation techniques. For example, the cost, income and/or market approach reflect some of the basic methods for processing information as it becomes available within the market.

Event studies, in addition to providing an understanding of the impact of an event, have been used to develop analyses of value. In 1989, Mark Mitchell ("Mitchell") used an event study to estimate the impact on Johnson & Johnson's share returns resulting

[1] Much of this analysis will focus on the valuation of IP assets. In terms of valuation methodologies, IP assets have many of the same properties of other assets such as capital goods, land, etc. In some instances, the intangible aspects often associated with IP might require different considerations. However, for the most part, special consideration is not required for valuations of IP.

from the 1982 poisonings. Based on this analysis, Mitchell concluded Johnson & Johnson's shareholders suffered a loss in brand name capital depreciation directly attributable to the poisonings.

The analytical framework established by Mitchell provided an exciting and practical application of event study. Much like any analysis, there are areas that would benefit from further analysis. Mitchell's interpretation of results, assumptions and market factors are inconsistent in ways. However, the basis of his analysis is strong and can provide useful insights when all relevant data are considered. These are the issues that will be discussed throughout this study.

In the section to follow, I provide a brief discussion of Mitchell's methodology and his results. I then attempt to reconstruct his analysis using the same methodology but with slight modifications to several underlying assumptions. Finally, I provide several alternative approaches and compare the results to Mitchell's estimate of brand name capital depreciation.

2) Review of Relevant Literature

There is a tremendous amount of research that has been done involving applications of event studies. Much of the current research explores various applications of event studies and their use in determining the impact of an event on shareholder value. The soundness of event studies, as well as the wide variety of applications, has made it a very common subject for financial economics literature.

Event studies typically follow the same type of general guidelines but often differ with respect to subject matter. Event studies can be used to analyze (1) events that are common among different firms even if the other firms are not in the same market; and/or (2) events that are specific to a firm or group of firms within the same market.

Despite an abundance of research highlighting different applications of event studies, there are few event studies that focus on firm specific IP. For example, event studies have been used to explore issues associated with IP value (Austin, 1993), brand impacts and product tampering (Mitchell, 1989) and (Dowdell, Govindaraj, and Jain, 1992) and (Hill and Schneeweis, 1983), and product recalls (Peltzman and Jarrell, 1985 and Rubin, Murphey and Jarrell, 1988).

Instead, most event studies involving IP tend to focus on the impact of an event on some general or indirect element of a firm's IP.[2] These event studies might typically focus, at least indirectly, on broader IP issues (e.g., brand name, firm reputation, etc.) and how issues might be impacted by events such as airline crashes (Chalk, 1987), (Chance and Ferris, 1987), news announcements within the market (MacKinlay, 1997) and possible overreactions (Dissanaike, 1993), release of public information (Mitchell and Mulherin, 1994), merger announcements (Salinger, 1992), industry disasters (Brown, Castanias, and Daley, 1983), private antitrust litigation (Bizjak, Coles, 1995), anti-competitive mergers (Fridolfsson and Stennek, 2000), even federal indictments (Bosch and Eckard, 1991) can be linked to a potential IP issues. These issues typically have focused on the potential impact that an event might have on a firm's reputation or image within a market. With the exception of Mitchell 1982 however, most studies typically focus on overall shareholder value.

There also exists a significant amount of research that attempts to utilize other tools to estimate the value of IP. This would include, but not necessarily be limited to reviews of changes in firm value caused by FDA-mandated recalls (Rubin 1992), patent citation analysis, (Hall, Jaffe and Trajtenberg, 2001), (Harhoff, Narin, Scherer, Vopel, 1999), valuation of R&D investment (Hall, 1993), innovation (Hall, 1998) analysis of royalties (Gu and Lev, 2000),

Additionally, there is an abundance of relevant literature covering valuation of IP assets as well as application of the cost, income and market approaches. These three approaches are often considered fundamental valuation methods and as such, they

[2] This is different than an event study designed to provide an estimate of value associated with an IP asset.

dominate much of the literature. There exists a variety of textbooks dedicated to this topic (e.g., valuation of IP assets) including: Reilly and Schweihs, (1999) and/or Smith and Parr, 1998.

3) Discussion of Event study

Stock market event analyses provide estimates of the effects of a specific, unexpected event on share returns of individual firms.[3] Models are developed to estimate the relationship between a firm's share returns and share returns of a benchmark group such as a portfolio of similar firms, returns across an industry or some estimate of market returns. Often times, a simple OLS regression is sufficient to develop the analysis.

As previously mentioned, event studies are presumed to occur within efficient markets. Customers within the market are rational and behave in a profit maximizing way. The market processes all information as it is received. As new information is released and absorbed in the market, firm returns reflect the new information by reaching a new equilibrium price.

Event studies have at least two distinct time periods. The *estimation period*, defined as the period prior to the occurrence of the event, and the *event period* defined as the period beginning immediately after the occurrence of the event and continuing out for some identified period of time.[4] Regression analysis is used to estimate the relationship between a firm's returns (dependant variable) and share returns of a benchmark group such as a portfolio of similar firms, returns across an industry or some estimate of market returns. [5] An estimate of the typical market model is represented by the following equation:

$$R_{it} = a_i + b_i R_{mt} + e_{it} \text{ where } E_{it} \sim N(0, Var)$$

Where:

R_{it} is defined as the return for an individual stock at time t and,
R_{mt} is defined as the average return for the market at time t.

This model seeks to identify returns (R_{it}) as a linear function of a proxy for market returns.[6] Share return data for the variables are used in a regression analysis covering the estimation period. The regression results in parameter estimates of a_i, b_i which are used to predict returns ($\boldsymbol{R}_{it}$) for the event period. These values can be interpreted as the share returns that might have existed *but-for* the event.

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[3] Event studies almost always involve analyses of stock returns of publicly traded firms. Conceptually, it might be possible to estimate the impact of an even on a private company if sufficient data were available. These data would most likely involve some measurement of performance (e.g., revenues, profits, costs, gross margins, etc.) as well as an exogenous variable thought to influence the chosen measure of performance.

[4] In some instance three periods are estimated.

[5] This could be a market index such as the S&P500 or it might be represented by average returns over a designated industry portfolio.

[6] For the market returns, I used both the CRSP returns and S&P returns for the market return variable. Both yielded similar results (they were not significantly different from one another). In order to fully replicate Mitchell's model I report only the results from the CRSP data.

Abnormal returns are the difference between *but-for* returns and the actual over the event period. Estimates of abnormal returns are simply:

$AR_{it} = Actual\ \acute{R}_t - (a_i + b_i R_{mt})$.

Where:

AR_{it}	Designates abnormal returns at time t
$Actual\ \acute{R}_{t+1}$	Designates actual returns at time t (during event period),
R_{it}	is defined as the return for an individual stock at time *t* and,
R_{mt}	is defined as the average return for the market at time *t.*
a_i *and* b_i	are parameter estimates.

The null hypothesis often set forth in an event study is that an event did not significantly impact the firm. This hypothesis can be tested using abnormal returns over a period of time. Specifically, c*umulative abnormal returns* ("CAR") summed throughout the event period, can be tested to determine if they are statistically different from zero.[7] Through the use of CAR it is possible to track abnormal returns occurring over a number of trading days. Since outcomes of many events are not immediately known, the CAR allows for consideration of abnormal returns over a predefined period of time. By considering abnormal returns that coincide with an event it is possible to establish the impact on CARs over several days and to capture the impact of an event as it unfolds over time.

[7] *See*, Campbell, John, Y., Andrew W. Lo, and A. Craig MacKinlay, "The Econometrics of Financial Markets," 1997, p. 160.

4) Setting up an Event Study

The results of an event study are driven by a variety of different elements and assumptions including, but not necessarily limited to, the type of event, time periods considered, products and/or firm involved, market factors, and which proxy for market return was. Set forth below are elements of event studies that should be considered both in the development of an appropriate event study as well as in the interpretation of results.

4.1) Consideration of the Event

Whether developing the framework or interpreting results of an event study, it is essential to recognize factors at issue as well as develop an understanding of various issues specific to the event. Consideration should be given to the specifics pertaining to the estimation and event periods, the potential impact associated with an event, and the scope of the event. A firm-specific event for example, might tend to be limited in scope (i.e., the impact is not felt outside of the firm). Conversely, an industry specific event might yield broader more general results.

Interpretation of the event might be relatively straightforward if similar situations have occurred within the market. For example, firms announcing restated earnings are experiencing much more volatile results in the wake of the Eron disaster. At the same time, the market might become more efficient in its understanding of an event, becoming more apt at interpreting and predicting the impact of an event.[8]

Additionally, the scope of the event will often dictate the market return proxy used. Therefore results of an event study across multiple firms or industries might vary with the use of market returns (e.g., S&P500) or industry returns.

4.2) Selection of an Appropriate Estimation Period

Since the estimation period generates parameter estimates used to predict post-event estimates of returns, efforts should be made to ensure that returns realized during the period are typical and representative of performance prior to the event. An extended estimation period for example, might include other elements or events that should not be considered within the scope of the analysis. Additionally, factors such as the timing of the event (e.g., singular occurrence or cyclical), leakage or early release of information, *familiarity* associated with an event or the ability of the market to accurately predict (or discount) an event, and the expected duration of the event should be considered in the framework of the analysis.

[8] Mitchell reported CAR for other instances of product tampering. In each case the CAR is less than impact realized by Tylenol. *See*, Mark Mitchell, 1989.

4.3) Selection of an Appropriate Event Period

Determination of the event period will also depend on various factors including, but not necessarily limited to, market perception, predictability of outcome, and foreknowledge of the event. Since the event period defines the time period by which abnormal returns are estimated, consideration should be given to ensure that the impact of the event could be measured more accurately. For example, an event period that is not long enough would exclude abnormal returns beyond the defined period. Similarly, an event period that is too long might potentially dilute the impact of the event by incorporating elements of unrelated events.

Determination of an appropriate event period might also be influenced by the market reaction to the event as well as its ability to interpret new information and speed by which the information is processed. The speed and ability to process information will be dependent on several factors including the reliability of data, understanding of key issues, predictability of future events, etc. Information that is immediately disseminated throughout the market might support selection of a shorter event period. Alternatively, the first recognized occurrence of an event might require a longer event period to ensure that abnormal returns are properly included.

4.4) Other Factors to be Considered

In addition to the above issues, other factors could possibly influence the results of an event study. These factors should be considered when developing the event study framework. Significant events occurring within the estimation period or event period will be reflected in the results of the analysis. A review of these other potential issues might allow for more accurate estimates from the model.

4.4.1) Firm Specific Events

Firm characteristics such as reputation, market position (market power), and degree of exposure can influence market perception of an event. For example, the impact of an event associated with a single firm in the market (possibly a product recall) will be dependent upon, among other thing, the perception of the event and/or the ability of the firm to handle the event. Alternatively studies involving a cross section of firms might be influenced by common or distinguishable factors that exist among firms in the group.

4.4.2) Industry Specific Events

In addition to consideration of various firm specific traits, it also is appropriate to consider factors specific to an industry when developing an event study. If for example, the impact of an event is perceived to be industry wide, it might be appropriate to base an analysis on returns of an industry portfolio (e.g., a hypothetical portfolio of similar stocks

within the industry) as opposed to market returns.[9] This might include analysis of industry specific issues possibly impacted by an event. For example, following the 9/11 tragedies, airline stocks reflected the markets anticipation of consumer migration away from the product. This reflected a firm specific event (only a few airlines had planes directly involved) yet the events were interpreted as an industry wide problem.

4.4.3) Product Specific Events

Lastly, it is appropriate to consider potential impacts on firms given product specific events (e.g., product recall, tampering, defects, etc). Product specific events would most likely be dissimilar to an industry specific event. Specifically, the potential for more movement within the market (shifting market share among participants) is greater for product specific events. The possibility that an event will result in a simple shift in share, following a product specific event, might preclude the use of an industry portfolio as a market index. Additionally, a product specific event with the potential to cause customers to exit the product market might require additional consideration as to the scope and framework of the model.

4.4.4) Nature and Predictability of an Event

The market's ability to accurately predict or appropriately discount should also be considered when developing an event study. The premature disclosure (or possible *leakage*) of information concerning an event will be immediately reflected in a firm's stock returns. Accordingly, estimates as to the beginning and end of estimation periods and event period could become more difficult. Additionally, there is potential for reduced CAR due to blurred time periods.

[9] This is discussed further in section 5.

5) Brand Name Capital Depreciation and the Tylenol Poisonings

In his 1989 article, Mitchell used an event study to estimate the impact on Johnson & Johnson's share returns resulting from the 1982 Tylenol poisonings. Based on this analysis, Mitchell concluded Johnson & Johnson's shareholders suffered a loss in brand name capital depreciation directly attributable to the poisonings. Following his conclusion that the Tylenol and Johnson & Johnson brand names were impacted, Mitchell sought to quantify the loss in shareholder value that is directly attributed to depreciation of theses brands.

In the following sections, I provide an overview of Mitchell's methodology and discuss his results regarding the change in Tylenol's brand value. Additionally, I review possible shortcomings incorporated in his methodology. Following the discussion of Mitchell's analysis, I re-estimate the impact of the 1982 poisonings on Tylenol's brand incorporating several changes in key assumptions. In doing so, I attempt to address issues that are either overlooked or improperly accounted for by Mitchell. Finally, I develop an alternative estimate of a loss in brand value. It is this value that is compared to estimates of brand value generated using other recognized techniques.

5.1) Methodology Set Forth in Mitchell's 1989 Article[10]

5.1.1) Analysis of the Poisonings - Event Study

Prior to the 1982 poisoning, Tylenol was one of the most successful brands in the pain reliever market. It had approximately 37 percent share of the market and was responsible for approximately 10 percent of the nonprescription market.[11] Following the 1982 poisonings Johnson & Johnson experienced a dramatic change in its business.

To estimate the potential impact of the 1982 poisonings on Johnson & Johnson's daily returns Mitchell used an estimation period of 252 days (e.g., September 30, 1981 through September 28, 1982).[12] This estimation period was used to estimates three different regression models (*see,* Table 1):

(1) Johnson & Johnson returns against Market Returns ("Johnson & Johnson Market Model");

[10] *See*, Mitchell, Mark L., *The Impact of External Parties on Brand-Name Capital: The 1982 Tylenol Poisonings and Subsequent Cases*, Economic-Inquiry; 27(4), October 1989, pages 601-18.
[11] DeCourcy Hinds, Michael, "Tylenol Spotlights a $6 Billion Industry", *The New York Times*, October 10, 1982.
[12] In his article, Mitchell used September 30, 1982 as the day that the event began. According to Mitchell, this was the day that the market received notice of the first two deaths. However, a review of Johnson & Johnson's share prices indicates that there was a decline of $1.00 between September 28 and 29, 1982. This seems to imply that there might have been some impact as early as September 29, 1982. Accordingly, I used that date as the first day of the event period.

Market returns were based on an equally weighted market return generated from the Center for Research in Security Prices ("CRSP") data for NYSE and AMEX stocks. The equation can be written as:

$$JJR_t = a_i + b_i R_{CRSP} + e_{it} \text{ where } e_{it} \sim N(0, Var)$$

Where:

JJR_t is defined as Johnson & Johnson's returns at time t and,
R_{CRSP} is defined as the market return at time t.

(2) Johnson & Johnson returns against Drug Industry Returns (defined as a portfolio of comparable firms and referred to as "Johnson & Johnson Drug Industry Model");

Drug Industry Returns were based on a portfolio of equally weighted returns of twenty-two (22) firms (excluding Johnson & Johnson) producing over the counter drugs. The equation can be written as:

$$JJR_t = a_i + b_i R_{DrugIndustry} + e_{it} \text{ where } e_{it} \sim N(0, Var)$$

Where:

JJR_t is defined as Johnson & Johnson's returns at time t and,
$R_{DrugIndustry}$ is defined as the market return at time t.

(3) Drug Industry Returns against Market Returns;

Based on previously defined variables, the equation is written as:

$$R_{DrugIndustry} = a_i + b_i R_{CRSP} + e_{it} \text{ where } e_{it} \sim N(0, Var)$$

Table 1 summarizes Mitchell's results based on the three regressions. As set forth in Table 1, Mitchell's parameter estimates are significant. Estimates of coefficients are used to predict returns during the event period. Predicted returns are compared to actual returns for the event period with the difference between predicted and actual returns defined as *Johnson & Johnson's abnormal returns*. Abnormal returns are aggregated (on a cumulative basis) over the event period. These values, CAR, are used to test the null hypothesis.

The null hypothesis in an event study is that the event did not impact share returns; therefore CAR are not statistically significant from zero. Table 1 sets forth the CARs generated from Mitchell's three models. The representative CAR (for each day in the event window) is used to estimate a t-stat based on the following equation:

$$t\text{-}stat = \mathrm{CAR}_i\,(\tau_1,\tau_2)/\sigma_i$$

where

$\mathrm{CAR}_i(\tau_1,\tau_2)$ is defined as the CAR of security *i* from τ_1 to τ_2 where τ_1 and τ_2 represent points of time within the event window;

and

$$\sigma_i = \{\sigma^2[\sum_{i,Nf}(1 + 1/(N_e + (R_{mt} - R_m) / CSSR_{mt})] + N_f(N_f - 1) / N_e]^{1/2}$$

As can be seen from Table 1, CARs obtained from Johnson & Johnson's Market Model and Drug Industry Model are statistically significant immediately following the poisonings. Consequently, null hypothesis that CAR not significantly different from zero can be rejected.

Table 1

Mitchell's Regression Results and Estimates of Abnormal Returns

		Johnson & Johnson Return		Johnson & Johnson Return		Drug Industry Portfolio	
Dependent Variable							
Independent Variable		Market Return		Drug Industry Portfolio		Market Return	
		Value	standard error	Value	standard error	value	standard error
	Estimate of α	0.0007	(0.0010)	-0.0001	(0.0009)	0.0008	(0.0003)
	Estimate of β	1.3544	0.1337	1.1376	(0.0880)	1.1896	(0.0463)
	R^2	0.29		0.40		0.72	
Date	**Event Day**	**CAR**	**t-value**	**CAR**	**t-value**	**CAR**	**t-value**
September 30, 1982	1	-0.060	-3.01	-0.050	-2.98	-0.009	-0.42
October 1, 1982	2	-0.054	-2.44	-0.050	-2.46	-0.003	-0.42
October 4, 1982	3	-0.111	-4.10	-0.103	-4.16	-0.006	-0.68
October 5, 1982	4	-0.173	-5.54	-0.162	-5.65	-0.009	-0.88
October 6, 1982	5	-0.129	-3.67	-0.130	-4.02	0.001	-0.10
October 7, 1982	6	-0.186	-4.83	-0.186	-5.25	0.000	0.02
October 8, 1982	7	-0.148	-3.56	-0.145	-3.79	-0.003	-0.19
October 11, 1982	8	-0.156	-3.50	-0.139	-3.38	-0.015	-0.98
October 12, 1982	9	-0.206	-4.43	-0.176	-4.05	-0.026	-1.57
October 13, 1982	10	-0.229	-4.56	-0.184	-3.98	-0.040	-2.30
October 14, 1982	11	-0.233	-4.43	-0.172	-3.54	-0.054	-2.97
October 15, 1982	12	-0.258	-4.69	-0.194	-3.83	-0.057	-2.97
October 18, 1982	13	-0.219	-3.81	-0.147	-2.78	-0.064	-3.19
October'19, 1982	14	-0.219	-3.66	-0.151	-2.76	-0.059	-2.85
October 20, 1982	15	-0.249	-4.01	-0.179	-3.14	-0.061	-2.86
October 21, 1982	16	-0.226	-3.52	-0.149	-2.53	-0.068	-3.05
October 22, 1982	17	-0.253	-3.82	-0.155	-2.56	-0.086	-3.73
October 25, 1982	18	-0.272	-3.98	-0.181	-2.88	-0.080	-3.39
October 26, 1982	19	-0.241	-3.43	-0.154	-2.39	-0.077	-3.15
October 27, 1982	20	-0.265	-3.67	-0.176	-2.65	-0.078	-3.13
	Average $CAR_{11\text{-}20\ Days}$	-0.244	-3.850	-0.166	-2.800	-0.068	-3.09

5.1.2) Analysis of the Poisonings - Mitchell's Estimate of Brand Name Capital Depreciation

Based on the results set forth at Table 1, Mitchell concludes that Johnson & Johnson had significant abnormal returns following the 1982 poisonings. Additionally, Mitchell estimates an *Average* $CAR_{11\text{-}20\ day}$ for each of the models. For his analysis however, Mitchell only focuses on the Drug Industry Portfolio Return. Based on this model, negative average $CAR_{11\text{-}20\ day}$ of 16.6 percent can be estimated. This represents the loss of Johnson & Johnson's shareholder value resulting from the poisonings.

Mitchell's selection of the average CAR is ultimately defined by the event period set forth in his analysis. Mitchell never actually defines an event period. Instead he focuses on the twenty days following the event (e.g., the period from September 30, 1982 through October 27, 1982). For this time period CARs are reported for each day in the event period as well as the average CAR for October 14 – 27, 1982 (e.g., $CAR_{11,20\ day}$ – *see,* Table 1).

As previously mentioned, Mitchell bases his analysis on results obtained from the drug industry portfolio model. According to Mitchell, it is appropriate to use this estimate of industry returns since, in his view, it includes part of the overall decline in Johnson & Johnson returns that might be attributed to a change in drug industry returns following the poisonings. By comparing Johnson & Johnson's returns to an average return for a portfolio of similar companies (e.g., Drug Industry Returns), Mitchell allegedly minimizes this problem.

Having estimated the percentage decline in shareholder value, Mitchell applies the *Average* $CAR_{11\text{-}20\ day}$ (e.g., 16.6 percent) to Johnson & Johnson's market cap based on the share price on September 29, 1982 (the day before news of the poisonings).[13] This yields an estimated decline in shareholder value which is attributed to the poisonings of approximately $1.44.

Having developed a total estimate of loss in shareholder value, Mitchell attempts to isolate the impact on both Johnson & Johnson's and Tylenol's brand names by subtracting direct costs incurred by Johnson & Johnson attributable to the poisonings. For example, following the poisonings, Johnson & Johnson claimed a $50 million after tax business interruption expense.[14] Additionally, Mitchell considered costs of $100 million for disposal of capsules and $5 million in lawsuits.[15] All total, Mitchell estimated that Johnson & Johnson experienced "out-of-pocket costs resulting from the poisonings"

[13] The article seems to incorrectly report the date of the market cap calculation as September 9, 1982. Mitchell indicated that he chose this data because it is the "day before the market received notice of the poisonings…" Since the poisonings supposedly were reported on September 20, 1982, it seems that the information above is incorrectly reported. *See,* Mitchell, Mark, L., "The Impact of External Parties on Brand-Name Capital: The 1982 Tylenol Poisoning and Subsequent Cases", The Journal of Economic Inquiry, October 1989, pp 601-618.

[14] *See, for example, Business Week,* "J&J Will Pay Dearly to Cure Tylenol," November 29, 1982 and Mark Mitchell, 1989, p 612.

[15] *See,* Mark Mitchell, 1989, pp 611.

of approximately $200 million.[16] This results in an estimated loss of brand value (for Johnson & Johnson and Tylenol) of $1.24 billion (e.g., $1,440 million - $200 million). "as a measure of the decline in the value of Johnson & Johnson Tylenol's brand names." (a more detailed breakdown of these costs is set forth at Table 5 below).[17]

[16] *See,* Mark Mitchell, 1989, pp 611.
[17] *See,* Mark Mitchell, 1989, pp 612.

6) Analysis of Fundamental Principles and Review of Assumptions Set Forth in Mitchell's Methodology

Mitchell's estimates of value associated with Johnson & Johnson's and Tylenol's brand names are dependent on the interpretation or treatment of several fundamental issues set forth in his analysis. I have reviewed Mitchell's analysis and wherever possible, identified key areas where a methodological adjustment or implementation of an alternative approach might be appropriate. These are not drastic changes to the methodology set forth by Mitchell. Instead, they represent slightly different approaches or alternative interpretations of data. However, since Mitchell's estimate of brand name capital depreciation relies on only a few basic concepts, adjustments to the underlying methodology or assumptions will not alter the results dramatically.

The following analysis is not unlike Mitchell's. Wherever appropriate, I have adjusted underlying data assumptions or reconsidered potential interaction between data in this analysis. I do not purport to have *corrected* Mitchell's analysis. In many ways, Mitchell's analysis is an outstanding piece of research. I do however try to demonstrate the need to incorporate as much information as possible into such an analysis.

6.1) Mitchell's Estimate of $CAR_{11,20\ day}$ Potentially Overstates the Shareholder Loss Attributed to the Poisonings

Mitchell argues that it is "impossible to judge the exact date when most of the information concerning the poisonings was accessible to investors."[18] Recognizing this fact as well as the potential for daily fluctuation of CAR during the event period, it is understandable why Mitchell estimates his model using an average CAR. By averaging CAR over time, Mitchell is able to potentially avoid bias that might be reflected in daily estimates. Mitchell's use of average of CARs values is appropriate, however, his decision regarding the time period over which this value is estimated (e.g., $CAR_{11,20\ day}$) seems too broad to provide an accurate estimate of Johnson & Johnson's loss of shareholder value. For example, as set forth at Table 1, the CAR at days 4, 5, and 6 are -17.3 percent, -12.9 percent and -18.6 percent respectively. From just these three data points, it is clear that use of an average of CAR allows Mitchell to smooth potential swings in CAR value.

Mitchell develops his analysis using the average CAR value for a 10-day period at the end of his event period. Despite the significance of this assumption, Mitchell does not provide any insight as to why a 10-day period is appropriate (especially recognizing that any number of other possibilities existed). In fact, Mitchell's use of both an extended time period over which the average CAR is estimated (e.g., 10 days) as well as his assumption that this time period should occur at the end of the event period (e.g., days 11 through 20) yields results that are considerably greater that what might occur given slightly different assumptions. For example, the estimated average CARs based on a shorter time period (e.g., through day 7) are -14.8 percent for the market return model

[18] *See*, Mark Mitchell, 1989, pp. 607-08.

and –14.5 percent for the drug industry portfolio model. When compared to the average CAR through the last day of the event period (e.g., CAR_{20} equal to -26.5 percent for the market return model and -17.6 percent for the drug industry model) it is clear that estimates of abnormal returns can differ significantly over time.

Additionally, there seems to be a significant divergence between the two return models set forth by Mitchell (e.g., market return model and drug industry portfolio model) towards the latter part of Mitchell's event period. For example, as the values of CAR for the market return model increases from -14.8 percent to -26.5 percent other models seem to diverge from these results. Table 2 sets forth the difference in CARs estimated in two of Mitchell's models (e.g., the market return model and drug industry portfolio model). As can be seen at Table 2, the divergence starts off relatively small but continues to increase through the end of the time period (e.g., day 20).

Table 2

CARs Estimated by Mitchell Based on Industry and Market Returns

	Market Return Model	Drug Industry Portfolio Model	CAR Values
Event Day	**CAR**	**CAR**	**Difference**
1	-6.00%	-5.00%	-1.00%
2	-5.40%	-5.00%	-0.40%
3	-11.10%	-10.30%	-0.80%
4	-17.30%	-16.20%	-1.10%
5	-12.90%	-13.00%	0.10%
6	-18.60%	-18.60%	0.00%
7	-14.80%	-14.50%	-0.30%
8	-15.60%	-13.90%	-1.70%
9	-20.60%	-17.60%	-3.00%
10	-22.90%	-18.40%	-4.50%
11	-23.30%	-17.20%	-6.10%
12	-25.80%	-19.40%	-6.40%
13	-21.90%	-14.70%	-7.20%
14	-21.90%	-15.10%	-6.80%
15	-24.90%	-17.90%	-7.00%
16	-22.60%	-14.90%	-7.70%
17	-25.30%	-15.50%	-9.80%
18	-27.20%	-18.10%	-9.10%
19	-24.10%	-15.40%	-8.70%
20	-26.50%	-17.60%	-8.90%
Average $CAR_{1,8\ Days}$	-12.71%	-12.06%	-0.65%
Average $CAR_{1,10\ Days}$	-14.52%	-13.25%	-1.27%
Average $CAR_{1,20\ Days}$	-19.44%	-14.92%	-4.52%
Average $CAR_{11,20\ Days}$	**-24.35%**	**-16.58%**	**-7.77%**

6.2) Mitchell Does Not Attempt to Control for Potential Impacts of Other Events that Occurred During the Event Period

Mitchell's analysis is based on the assumption that the market received information regarding the poisoning as of September 30, 1982. According to Mitchell, this was the day that the market received notice of the first two deaths, however, a review of Johnson & Johnson's share prices indicates that there was a decline of $1.00 between September 28 and 29, 1982. This seems to imply that there might have been some impact as early as September 29, 1982. Accordingly, it seems reasonable to use this date as the first day of the event period.

Following the announcement of the poisonings, additional events occurred within the market. Although these events occurred as a result of the poisonings, it is unlikely that all these events impacted (either directly or indirectly) the value of Tylenol's brand name, however, Mitchell's analysis makes no attempt to account for this potential problem.

Set forth in Table 3 are dates during the event period as well as a brief summary of market information reported for those dates.[19] As can be seen from Table 3, there are several key announcements that seemed to have resulted in a decline in actual returns for that date. For example, the share price of Johnson & Johnson declined $2.25 per share (6 percent) between October 4 and 5, 1982. This seems to coincide with announcement that (1) Johnson & Johnson had stopped making capsules; and (2) the FDA was looking into the ways of improving package safety. While it is possible that the 6 percent decline (or some portion thereof) is reflective of the actual poisonings, it might also be possible that all or some of that decline is attributed to these other announcements.

[19] It should be noted that market price data are in 1982 dollars. Sources for this table are listed together in the bibliography.

Table 3

Date	J&J's Closing Price	Actual Returns	Information Announce to the Market	Possible Costs Anticipated
9/30/1982	43 1/8	-7%	The FDA issues a warning against buying Extra-Strength Tylenol capsules. Officials announce that the poisonings occurred after leaving the plant. Johnson & Johnson recalls 4.7 million capsules.	Increase in costs due to product recall.
10/1/1982	43 7/8	2%	The sixth and seventh victims are identified. Johnson & Johnson includes a second batch of capsules in their recall.	
Weekend			Over the weekend, the FDA ordered all bottles of Extra Strength Tylenol off the shelves in Chicago. North Dakota banned Tylenol sales and Colorado ordered stores to remove all Tylenol capsules.	
10/4/1982	41 ¼	-6%	**Market digests weekend news. No additional relevant corresponding story found.**	Lost sales In North Dakota and Colorado due to Weekend announcement.
10/5/1982	39	-5%	Johnson & Johnson announces that they stopped making Regular and Extra Strength capsules. Reports of lowering of earning predictions and brokers' recommendations. It is reported that one lawsuit had been filed. The FDA announces the formation of a task force on drug packaging and product safety.	Costs associated with production stoppage. Cost attributed to lawsuit. Cost to develop new packaging.
10/6/1982	41 ¾	7%	Commercials for Tylenol are stopped. Production at one of plants making Tylenol stopped.	
10/7/1982	40 3/8	-3%	Tylenol asks retailers to pull all packages of Tylenol capsules off the shelves.	Lost revenues from Regular Strength Capsules. Reduced margins due a potential increase in retailers' costs (forcing J&J to lower prices or take more shelf management responsibility.
10/8/1982	42 5/8	6%	Tylenol announces that it is working on a new tamper-proof package. The company would exchange tablets for capsules. Tylenol also announces that they have begun a consumer attitude study.	
Weekend			Over the weekend it is reported that retail sales of all drug products are down from year ago levels. Announcement of mandatory regulations for tamper-resistant packaging were being developed.	
10/11/1982	43 ½	2%	Estimated cost to replace more than 22 million Tylenol capsules exceeds tens of millions of dollars.	
10/12/1982	41 ½	-5%	**No Relevant Corresponding Story Found**	
10/13/1982	42	1%	**No Relevant Corresponding Story Found**	
10/14/1982	41 7/8	0%	**No Relevant Corresponding Story Found**	
10/15/1982	40 7/8	-2%	Over-the-counter drug makers asked the government to require tamer-resistant packages for their products.	
10/18/1982	43 3/8	6%	**No Relevant Corresponding Story Found**	
10/19/1982	43 ½	0%	**No Relevant Corresponding Story Found**	
10/20/1982	43 1/8	-1%	**No Relevant Corresponding Story Found**	
10/21/1982	44 ¼	3%	**No Relevant Corresponding Story Found**	
10/22/1982	43 5/8	-1%	**No Relevant Corresponding Story Found**	
10/25/1982	41 ¼	-5%	**No Relevant Corresponding Story Found**	
10/26/1982	42 3/8	3%	**No Relevant Corresponding Story Found**	
10/27/1982	42 ¼	0%	**No Relevant Corresponding Story Found**	

Announcements reflect additional costs that may or may not have been anticipated following the poisonings. For example, it is possible that the news of a stop in production was not necessarily a surprise. However, the market might not have anticipated the inclusion of regular strength capsules (which where not associated with the poisonings). Similarly, the market might have anticipated that an FDA ruling regarding packaging would have increased production cost thereby reducing margins for Tylenol as well as for the entire over-the-counter drug market industry.[20] By using an

[20] As it was, Tylenol ended up developing a tamper-resistant pack that increased its packaging cost by 2.4 cents. These increased costs resulted in a change in Johnson & Johnson share price as the market correctly anticipated that Tylenol would end up absorbing the increased packaging cost, as opposed to being able to

average CAR estimated over the latter part of an event window, Mitchell increases the possibility that elements reflected in the abnormal returns are not directly related to brand loss associated with the poisonings. That is to say that each additional piece of information obtained by the market, over the event period, has the potential to significantly impact returns during the event period without the impact being directly related to brand value.

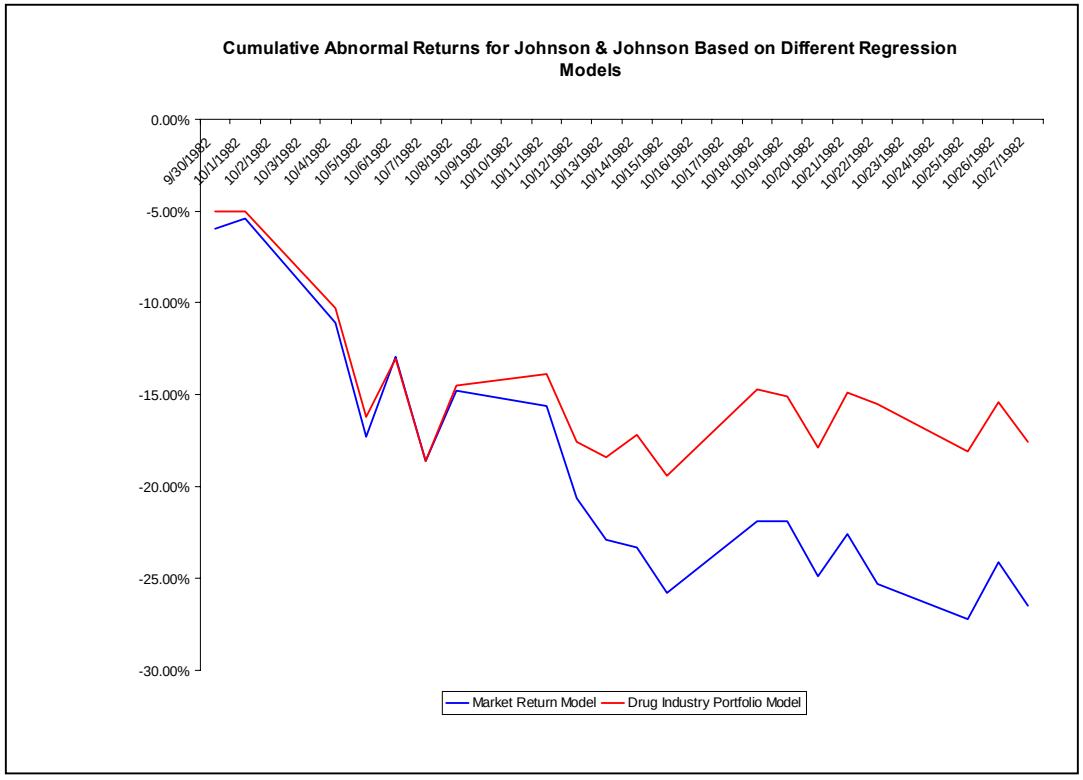
passing along the costs to end-users. *See,* for example, *The New York Times,* "Tylenol Will Reappear in Triple-Seal Package," Eric Pace, November 12, 1982; *PR Newswire*, New York, November 11, 1982; *The Chicago Tribune*, "Consumers Will Pay Little for More Capsule Safety," Persinos, John F., May 25, 1986.

Table 4

Comparison of CAR Values Estimated by Mitchell

Event Day	Market Return Model CAR	Drug Industry Portfolio Model CAR	CAR Values Difference
1	-6.00%	-5.00%	-1.00%
2	-5.40%	-5.00%	-0.40%
3	-11.10%	-10.30%	-0.80%
4	-17.30%	-16.20%	-1.10%
5	-12.90%	-13.00%	0.10%
6	-18.60%	-18.60%	0.00%
7	-14.80%	-14.50%	-0.30%
8	-15.60%	-13.90%	-1.70%
9	-20.60%	-17.60%	-3.00%
10	-22.90%	-18.40%	-4.50%
11	-23.30%	-17.20%	-6.10%
12	-25.80%	-19.40%	-6.40%
13	-21.90%	-14.70%	-7.20%
14	-21.90%	-15.10%	-6.80%
15	-24.90%	-17.90%	-7.00%
16	-22.60%	-14.90%	-7.70%
17	-25.30%	-15.50%	-9.80%
18	-27.20%	-18.10%	-9.10%
19	-24.10%	-15.40%	-8.70%
20	-26.50%	-17.60%	-8.90%
Average $CAR_{1,8\ Days}$	-12.71%	-12.06%	-0.65%
Average $CAR_{1,10\ Days}$	-14.52%	-13.25%	-1.27%
Average $CAR_{1,20\ Days}$	-19.44%	-14.92%	-4.52%
Average $CAR_{11,20\ Days}$	**-24.35%**	**-16.58%**	**-7.77%**

Figure 1



As can be seen from Table 4 and Figure 1, the average CAR varies depending on the time period considered. By taking the average CAR toward the end of the event period (e.g., Average $CAR_{10\text{-}20\ Days}$) the value might tend to be greater (*see,* Table 4 and Figure 1). Since the Average CAR is the basis for Mitchell's estimate of decline in shareholder value, larger Average CAR would result in larger estimates of shareholder loss. By estimating the Average CAR based on the first few days of the event period (e.g., $CAR_{1,\ 8}$) Mitchell's analysis of brand name capital depreciation would be $340 million less. For example, based on an estimated market cap of $8.67 billion as of September 28, 1982, the estimated loss to Johnson & Johnson would have been approximately -12.71% (based on the Market Return Model). Applying estimates of costs set forth by Mitchell (e.g., $200 million) an estimate of brand name capital depreciation would be approximately $900 million (e.g., (($8.66 billion * 12.71%) - $.2 billion) which is almost $340 million less than Mitchell's estimate.[21]

[21] Mitchell used the average CAR for event period days 11 through 20 (October 14 through October 27, 1982). In his opinion, the use of the average CAR for the later time period allowed elements of uncertainty to subside. Using this time period however increases the estimated loss in Johnson & Johnson shareholder value. Specifically, Mitchell estimates that Johnson & Johnson suffered a decline of 24.4 percent in relation to the market. This equated to a loss of $2.11 billion to Johnson & Johnson shareholders (losses to shareholder of other drug companies were also estimated to be over $6 billion) *see*, Mitchell 1989, p. 608.

6.3) Estimates Should be Based on the Market Return Model Instead of the Drug Industry Portfolio Model

Mitchell's use of the drug industry returns represents an additional problem in his analysis. Any impact that might have been realized in the drug industry would be separate of the brand depreciation being estimated by Mitchell. Additionally, even if other firms within the industry experienced a decline in daily returns it seems reasonable that such a decline would not be representative of Tylenol's brand name capital depreciation.

Also, the market had never experienced events similar to the Tylenol poisonings. It is reasonable to expect estimates of any potential impact on Johnson & Johnson would be unique within the industry. In other words, there was no evidence that other firms producing over-the-counter drugs were targeted. Therefore the impact realized, as far as share value and firm specific losses are concerned, would be driven by characteristics unique to Johnson & Johnson.

Additionally, Johnson & Johnson's share price suffered because the company was directly attacked. Other firms within the industry might have experienced some form of negative externality associated with the poisonings (which might be appropriately compared to industry wide affects) but only Johnson and Johnson was seen as the target. Therefore, the impact on share returns should be estimated based on the overall market.

Lastly, it is possible that results based on Johnson & Johnson's relationship with the drug industry (e.g., the drug industry portfolio model) include industry specific elements that are independent of the Tylenol brand name.[22] It also is possible that industry returns include customer movements (or shifts in market share) resulting from the poisonings.

One such example occurred within two weeks of the first reported poisoning when American Home Products announced that it was increasing production of *Anacin-3* (the only other major acetaminophen product) to handle the increase in orders that resulted from people moving away from Tylenol products.[23] This shift in share is also exemplified by post-event reports indicating a decline in Johnson & Johnson's market share from 37 percent prior to the poisonings to approximately 7 percent.[24]

Instead of using returns estimated in the drug industry portfolio model, I used a proxy for market return (e.g., S&P 500).[25] (also estimated and discussed by Mitchell).

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[22] For example it was assumed that the over-the-counter drug industry realized losses associated with, among other things, increased packaging cost of approximately $500 million. *See, The Chicago Tribune*, "Consumers Will Pay Little for More Capsule Safety," Persinos, John F., May 25, 1986.
[23] *See*, *The New York Times,* "Anacin's Maker Moves to 24-Hour Plant Shifts," UPI, October 12, 1982.
[24] *See, The New York Times,* "Advertising: Pointing the Way for Tylenol," Eric Pace, November 17, 1982.
[25] Mitchell estimated three different models, one of which was based on an overall market variable (Mitchell used CRSP data for his industry returns). The results obtained using the S&P 500 are similar to

The market model, though potentially yielding larger CAR over Mitchell's 20 day period, seems to represent a more reasonable approach to estimating the impact of the poisonings.

results obtained in Mitchell's analysis, however, not having access to all data, I was unable to fully analyze data used by Mitchell

7) Replication of Mitchell's Analysis Based on *Revised* Data

To estimate the impact on Johnson & Johnson's and Tylenol's brand name, I limit the post-event time period to eight days (e.g., from September 29, 1982 through October 8, 1982). This revised event period will potentially limit the influence of other factors that might have occurred following the poisonings while still incorporating relevant event specific information. For example, Table 3 indicates that by October 8, 1982, the coverage of the poisonings had been greatly reduced. Additionally, there was very little new information being reported. Much of the earlier speculation and supposition had been verified or disproved. Additionally, by October 8 there seemed to be recognition within the market that the event was limited in scope. Accordingly, by the eighth trading day (almost two full trading weeks after the announcement of the first poisoning) the market might have been in a better position to fully assess both short and long term impacts.

Set forth in Table 5a are the parameter estimates based on the different time period. Table 5b show abnormal returns over 20 days (the same number of days reported by Mitchell). Figure 2 shows the level of divergence between actual and predicted values for 20 days following the event.

As can be seen from Table 5b the average CAR for the shorter time period is less than the $CAR_{11,20}$ used by Mitchell ($CAR_{1,8}$ is -11.4 percent compared to a $CAR_{11,20}$ of approximately –16.6 percent). Given the application of Mitchell's methodology, a lower average CAR will ultimately result in a smaller estimate of brand name capital depreciation. For example, applying the average $CAR_{1,8}$ (e.g., -11.4 percent) to an estimate of Johnson & Johnson's shareholder value (approximately $8.661 billion) yields an estimated loss in shareholder value of $.927 billion (based on the adjusted market return model)[26]. This is significantly less than estimates of $2.11 billion and $1.44 billion (based on the market return model and drug industry portfolio model respectively) set forth by Mitchell.

[26] As demonstrated by Mitchell the decline in shareholder value attributed to the market return model is greater than the decline in shareholder value associated with use of the drug industry portfolio return (*see,* Mitchell, 1989). Accordingly, it seems reasonable to expect that the drug industry portfolio model, over the shorter time period, would also result in a decline in shareholder value that is less than the market return model. However, due to mergers and acquisitions within the pharmaceutical industry over the last 15 years, it is very difficult to replicate the exact portfolio of industry returns used by Mitchell. Additionally, for reason set forth in the body of this analysis, the use of the drug industry portfolio model is not as useful as the market return analysis. Therefore, there was no attempt made to estimate the model, over the shorter time period, using the drug industry portfolio model.

Table 5a

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.6474
R Square	0.4191
Adjusted R Square	0.4168
Standard Error	0.0141
Observations	252

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0357	0.0357	180.3489	0.0000
Residual	250	0.0495	0.0002		
Total	251	0.0851			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0013	0.0009	1.4608	0.1453	-0.0005	0.0030	-0.0005	0.0030
Market Return	1.2316	0.0917	13.4294	0.0000	1.0510	1.4122	1.0510	1.4122

Table 5b

Johnson & Johnson

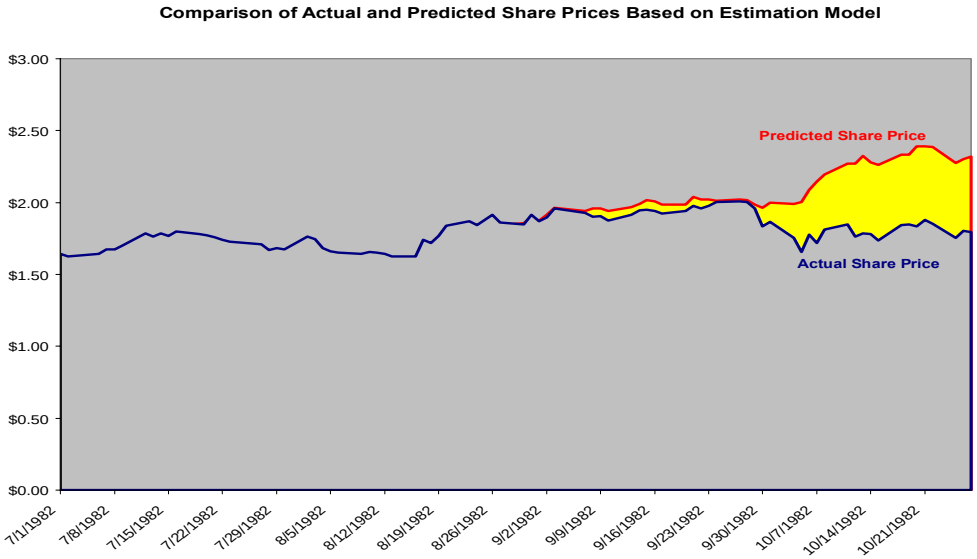
Event Day	Date	Abnormal Returns (Predicted less Actual)	Cumulative Abnormal Return (CAR)	t-stat
1	**29-Sep-82**	-0.0064	-0.006	-0.69
2	**30-Sep-82**	-0.0541	-0.054	-5.07
3	**1-Oct-82**	0.0003	-0.054	-2.62
4	**4-Oct-82**	-0.0564	-0.110	-4.52
5	**5-Oct-82**	-0.0606	-0.171	-5.90
6	**6-Oct-82**	0.0290	-0.142	-3.89
7	**7-Oct-82**	-0.0619	-0.204	-4.88
8	**8-Oct-82**	0.0329	-0.171	-3.70
9	**11-Oct-82**	-0.0129	-0.184	-3.60
10	**12-Oct-82**	-0.0470	-0.231	-4.31
11	**13-Oct-82**	-0.0101	-0.241	-4.20
12	**14-Oct-82**	0.0150	-0.226	-3.84
13	**15-Oct-82**	-0.0160	-0.242	-3.97
14	**18-Oct-82**	0.0308	-0.211	-3.24
15	**19-Oct-82**	0.0029	-0.208	-3.07
16	**20-Oct-82**	-0.0338	-0.242	-3.37
17	**21-Oct-82**	0.0263	-0.216	-2.90
18	**22-Oct-82**	-0.0134	-0.229	-2.97
19	**25-Oct-82**	-0.0068	-0.236	-3.02
20	**26-Oct-82**	0.0153	-0.221	-2.70

Average $CAR_{1\text{-}8\ Days}$ -0.114

Other Estimated Average CARs

Average $CAR_{1\text{-}10\ Days}$ -0.133
Average $CAR_{10\text{-}20\ Days}$ -0.228
Average $CAR_{1\text{-}20\ Days}$ -0.180

Figure 2



Following Mitchell's methodology, direct costs associated with the poisonings are subtracted from an estimate of total decline in shareholder value. These results are set forth at Table 6. As can be seen in Table 6, Johnson & Johnson reported estimated expenses for disposal of product ($100 million), business interruption expenses ($124 million before taxes). In addition to several of the direct costs reviewed by Mitchell, I considered several indirect costs that also might be relevant. For example, promotional discounts ($100 million), reduced margins ($ .75 million), lawsuits filed by families of the victims, etc. were costs reflected in stock returns following the poisonings and should be considered in the estimation. An upper bound estimate of these costs would equal approximately $377 million.[27]

[27] In his analysis Mitchell only accounts for $200 million. It is possible that he did not consider certain elements such as reduced margins and promotional spending.

Table 6

Estimated Decline in the Value of Johnson & Johnson's and Tylenol's Brand Names Using the Methodology Set Forth By Mitchell in His Analysis

	As Set Forth in Mitchell's Analysis of Brand Name Capital Depreciation	Based on Revised Data Assumptions as well as the Inclusion of Additional Costs
	($ Millions)	
Price of JNJ on September 28, 1982		47 1/8
Price of JNJ on September 29, 1982	46 1/8	
Estimated Number of Shares[1]	187,774,957	187,774,957
Estimated Market Cap[1,2]	$ 8,661	$ 8,849
Average $CAR_{1, 8}$		
Average $CAR_{11, 20}$		
Total Estimated Loss in Shareholder Value		
Cost Adjustments[1,3]		
Disposal of Capsules	$ (100)	$ (100)
Business Interruption Expense	$ (50)	$ (124)[4]
Damages from Law Suits (min $ 5 million per death)	$ (35)	$ (35)
Additional Cost - not itemized by Mitchell	$ (15)	$ (15)
Additional Cost Not Considered by Mitchell		
Brand Development Cost – Advertising		$ (3)[5]
Brand Development Cost - Incentives and Promotions		$ (100)[5]
Total	$ (200)	$ (377)
Total Loss to Johnson & Johnson's and Tylenol's Brand Names	$ (1,238)	$ (632)

Notes:

1) Estimated based on information provided in Mitchell's article.
2) Market Cap equals price multiplied by number of shares which were estimated based on information provided in Mitchell's article.
3) Mitchell estimates Johnson & Johnson' total cost following the poisonings to be $200 million. It is unclear if his inclusion Of both $100 million for disposal of capsules and $50 million business interruption expense in anyway represent elements of the same costs. In addition to these cost, Mitchell factored in other costs including *Damages from Law Suits* and *Additional Costs*.
4) Represents the reported $50 million (set forth by Mitchell) converted to a pre-tax expense of approximately $124 million.
5) Estimated based on data reported following the poisonings.

Sources:

1) Various Industry Articles
2) Mark Mitchell's 1989 article "The Impact of External Parties on Brand-Name Capital: The 1982 Tylenol Poisonings and Subsequent Cases."

8) Application of Alternative Valuation Methodologies

The cost, income and market approach are recognized as fundamental valuation methodologies from which any derivation might originate. A review of more complex analyses often reveals elements of one of these approaches.

An essential element, seemingly overlooked in Mitchell's analysis, pertains to an assessment based on *pre-event* estimates of brand value. Specifically, a reality check should be performed against any estimate of brand name capital depreciation. Such a check would tend to focus on the pre-event value of a brand as well as estimates of brand name capital depreciation.

Estimates of brand name capital depreciation should be consistent with pre-event estimates of brand value. Accordingly the pre-event value of a brand would most likely **not be less** than an estimate of brand name capital depreciation. This notion seems to be supported by Mitchell in his analysis. Specifically, in his discussion of various empirical studies [e.g., Klein and Leffler (1981); Klein, Crawford and Alchian (1978) as well as Jarrell and Peltzman (1985); Chalk (1986; 1987); Mitchell and Maloney (1989) and Benjamin and Mitchell (1989)] Mitchell agrees that "if a firm cheats by reducing product quality below the expected level, the value of its brand-name capital declines **to zero** and the price premium which consumers were willing to pay for the firm's products is lost."[28] (emphasis added)

Mitchell defines his results in terms of "brand name capital depreciation." Recognizing that brand name capital is an intangible asset held by Johnson & Johnson (e.g., both the Johnson & Johnson and Tylenol brand names) it is unclear how an intangible asset such as brand name capital, might depreciate to that point that the value is negative. For example, it is easy to understand how the value of the intangible asset might be equal to zero (i.e., the IP has no value).[29] An asset with a negative value however, would imply some type of cost associated with the ownership of an asset.[30] It is not reasonable to expect a firm to incur cost associated with an established brand name. Instead, the firm most likely would drop the brand completely thereby leaving the option to begin a new brand name (that would not be associated with a negative value).

Accordingly, an estimate of value attributed an existing brand name would most likely represent the maximum amount that could be lost though some element of brand

[28] *See*, Mark Mitchell (1989), p. 602 citing Klein and Leffler (1981); Klein, Crawford and Alchian (1978) as well as Jarrell and Peltzman (1985); Chalk (1986; 1987); Mitchell and Maloney (1989) and Benjamin and Mitchell (1989).

[29] This might reflect a new asset, an unproven asset, an asset that has lost its value as far as the market is concerned, etc.

[30] For example, some forms of IP (e.g., patents) have maintenance fees that might be associated with ownership. An IP asset with no recognizable value could conceivably be viewed as having a negative value if maintenance fee were included in the firm's expected value of the asset. The firm would benefit in such cases by getting rid of the IP "asset" (having no value). This would reduce costs associated with ownership that are not recouped by use.

name capital depreciation. Once brand value has been completely eroded (e.g., brand value equals zero) it is reasonable to expect that losses would not continue further.[31]

8.1) The Cost Approach

Valuation of an IP asset using the cost approach focuses on various costs associated with the development of the asset. An estimate of value is derived from an analysis of costs required to replace or reproduce the IP asset. Application of the cost approach requires some understanding as to both the availability and substitutability of other assets. Additionally, it becomes important to recognize benefits provided by an IP as well as how these benefits impact a firm's utility.

In some instances, the cost approach might be used to define the basic value associated with an IP asset. For example, a firm owning an IP asset might seek to, at the very least, recoup its cost to develop the asset. Similarly, a firm most likely would not pay more for an IP asset than the cost (to the firm) to redesign or reproduce the asset.

One important element in application of the cost approach is consideration of the types of costs and how these costs might impact an estimate of value. For example, elements of value attributed to an IP asset might be derived from features associated specifically with the asset. A brand name or trademark might attribute most of its value to unique features recognized within the marketplace. Similarly, an asset might also derive value based on its functionality within the market. For example, a process patent might incorporate the most advanced technology available thereby creating a barrier to entry within the marketplace and most likely adding increased value to the asset.

8.1.1) Reproduction v. Replacement Costs

Reproductive costs would include the costs necessary to develop an exact copy of an asset. Using reproduction cost to estimate an assets value would attempt to account for actual history of costs attributed to an asset. These costs would most likely be fully represented in the value of the asset. However, some attempt to adjust for elements of obsolescence (given current technologies, product levels, growth in market, etc.) might be required.

Replacement costs would include costs required to develop an asset that is comparable to or substitutable for the asset being valued. Replacement costs might incorporate elements not included in the initial development of an asset. For example, the cost to develop a high-speed computer today is significantly different from costs ten years ago. Similar to reproduction cost, an estimate of value based on replacement cost might also incorporate an adjustment for obsolescence that might be relevant.

[31] For example, a firm that realized a complete loss in the value of its brand could simply discard the brand and start over. In short, the firm would not be expected to hold an asset that had negative value. The ability to switch funding to develop a new brand, distance itself from the old brand, etc. would most likely prevent brand name capital from depreciating beyond zero.

Regardless of which cost element is considered, the analysis is rooted in the past. The inability to consider future elements potentially constrains the application of the cost approach.

8.1.2) Application of the Cost Approach – Tylenol Poisonings

It is possible to review costs that are reported and make basic assumption pertaining to the application of these costs. A review of tradepress, public documents and company financial documents available for Johnson & Johnson (as well as data specific to Tylenol) provide insight as to historic costs possibly associated with the development of the Tylenol brand. Despite limited availability of data pertaining to direct costs incurred in the development of the Tylenol brand, I was able to track several costs that might be considered to be specific to brand development. These costs are set forth in Table 7a).

Table 7a can be viewed as containing two separate measures of costs: (1) cost associated with brand development prior to September 1982 (*see,* Table 7b), and (2) cost associated with brand development following the poisonings.

In his 1989 analysis, Mitchell estimated total cost attributed to the poisonings was $200 million (*see,* Mitchell, 1989). The $200 million consisted of an estimated $100 million for disposal of the Tylenol capsules, an after tax charge of $50 million and approximate $50 million in cost associate with litigation and other expenses. To be consistent with Mitchell, I included these cost in my analysis. Additionally, I adjust for costs associated with advertising following the poisonings, coupons and promotions and adjust the $50 million to be pre-tax. This results in approximately $327 million in cost following the poisonings (*see,* Table 7a).

Additionally, I attempted to estimate cost to Johnson & Johnson to develop the Tylenol brand prior to the 1982 poisonings. These estimates are set forth in Table 7b. Costs reported in 7b are based on various ratios that existed prior to the 1982 poisonings. Based on these ratios, data from 1968 – 1982 were estimated. Assuming a varying allocation of costs over this time period, I estimated the cost of brand development, in 1982 dollars, to be $397 million.

Use of the cost approach in conjunction with an event such as the Tylenol Poisonings represents a unique application of the methodology. Specifically, an analysis of cost becomes additive and some consideration should be placed on the timing of costs. The poisonings, for example, might require two cost analyses. The first one based on costs to develop the Tylenol Brand prior to September 30, 1982 (the first reported date of the poisoning). The second part of the analysis might consider costs associated with actions following the poisoning that are also relevant in an estimate of value.

In the case of Tylenol, both time periods speak to the value of the brand and it is important to consider how costs in each period are reflected in the value. A preliminary review reveals costs associated with the development of the Tylenol brand estimated to

be $397 million prior to September 1982 (*see,* Table 7b) and $327 million following the poisonings (*see,* Table 7a). This might imply that Johnson and Johnson considered the value of the Tylenol brand name to be approximately $723 million (reported in 1982 dollars). However, this does not fully provide an understanding as to the impact of the poisoning on the Tylenol brand name.

Table 7a

Summary of Cost Attributed to the Tylenol Poisonings

Cost Category	Estimated Value
Estimated Cost of Brand Development Prior to September 1982	**$396.6 million[1]**
Cost Attributed to Poisonings	
One Time Charge	**$223.9 million[2]**
Advertising	**$2.8 millon[3]**
Coupons and Promotions	**$100 million[4]**
Subtotal of Expenses Following the Poisonings	**$326.7 million**
Subtotal of Expenses Prior to the Poisonings	**$396.6 million**
Grand Total of Estimated Cost Directly Related to Tylenol Brand	**$723.3 Million[5]**

Notes:

1) Data for OTC Tylenol were available only for 1980-1983. Sales data for 1968 through 1979 are estimated based on these data (*i.e.,* OTC Tylenol Sales divided by Total Johnson and Johnson Sales (*see,* Table 7b).
2) After tax charge of $50 million - Based on J&J's tax rate in 1981 (40.3 percent) this would be equivalent to $124 million in pre-tax dollars. Additionally, Mitchell added an additional $100 million for "disposal of the capsules" (*see,* Mark Mitchell, 1989). It is unclear if this pre-tax charge of $100 million is included is the same as the part or all of the after tax charge of $50 million. I included these cost in my analysis to be consistent with Mitchell's understanding of cost. If these costs were excluded the estimate of value based on cost would be approximately $623.3 million.
3) Johnson & Johnson spent approximately $2.8 million in a public relations campaign following the poisonings.
4) Johnson & Johnson issued coupons good for $2.50 off the price of Extra-Strength Tylenol. This could be viewed as a reduction in the brand premium compared to before the event. Based on assumed sales, cost associated with this promotion could range from $55 million (assuming 22 million coupons were used) to $100 million (assuming 40 million coupons used). It could be argued that the actual number of coupons used is not relevant to the cost analysis since Johnson & Johnson would have established a *maximum* amount it was willing to pay in discounts. Accordingly, the issuance of $100 million in coupons would be a strong indication of Johnson & Johnson's willingness to reinvest in the Tylenol brand. This willingness might be valued as, at least, $100 million.
5) Total might not add due to rounding.

Table 7b

Estimation of Cost Allocated to Brand Development in the Years Prior to the Poisonings

Percent Allocation of Media Cost	Year	Total Sales for Johnson and Johnson	Total Sales of OTC Tylenol[1]	Sales of Tylenol in Prescription Form[2]	Total Sales of Tylenol in Current Year Dollars	Tylenol Media Cost[3]	Cost Allocated to Brand Development	CPI Medical Index (Base = 1982)	Cost Allocated to Brand Development in 1982	Other Promo Cost[4]	Promo Dollars
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	**(10)**	(11)	(12)
					(4) * (5)		(1) * (7)				
48%	1982	$5,761	$355	$80	$435	$44	$21	$1	**$21**	$9	**$9**
51%	1981	$5,399	$339	$62	$401	$40	$20	$1	**$23**	$8	**$9**
54%	1980	$4,837	$261	$53	$314	$31	$17	$1	**$21**	$6	**$8**
57%	1979	$4,212	$251	$51	$302	$30	$17	$1	**$23**	$6	**$8**
60%	1978	$3,497	$208	$42	$250	$25	$15	$1	**$22**	$5	**$7**
63%	1977	$2,914	$173	$35	$209	$21	$13	$1	**$21**	$4	**$7**
66%	1976	$2,523	$150	$31	$181	$18	$12	$1	**$21**	$4	**$6**
69%	1975	$2,225	$132	$27	$159	$16	$11	$1	**$21**	$3	**$6**
72%	1974	$1,937	$115	$23	$139	$14	$10	$0	**$22**	$3	**$6**
75%	1973	$1,612	$96	$20	$115	$12	$9	$0	**$21**	$2	**$5**
80%	1972	$1,318	$78	$16	$94	$9	$8	$0	**$19**	$2	**$5**
85%	1971	$1,141	$68	$14	$82	$8	$7	$0	**$18**	$2	**$4**
90%	1970	$1,002	$60	$12	$72	$7	$6	$0	**$18**	$1	**$4**
95%	1969	$901	$54	$11	$65	$6	$6	$0	**$18**	$1	**$4**
100%	1968	$801	$48	$10	$57	$6	$6	$0	**$18**	$1	**$4**
								Sub Total	**$305**		**$91**
								Total Cost	**$397**		

1) Data for OTC Tylenol were available only for 1980-1983. Sales data for 1968 through 1979 are estimated based on these data (*i.e.,*OTC Tylenol Sales divided by Total Johnson and Johnson Sales).

2) Data for prescription sales of Tylenol were available only for 1980-1983. Sales data for 1968 through 1979 are estimated based on the relationship between OTC Tylenol Sales and prescription sales set forth in these data.

3) Media cost data were available only for 1982. These data were reported quarterly therefore an estimate of Media cost was constructed without incorporation post event spending.

4) In addition to medial cost (advertising) there was one reference to a separate promotional cost. These costs were assumed to be independent of other costs and attributed only to brand development..

One possible way to consider the impact of the event, given the cost approach, is to consider incremental costs incurred in rebuilding or salvaging the brand. As set forth in the aforementioned analysis, Johnson and Johnson incurred approximately $327 million in costs directly resulting from the poisoning. These costs reflect direct spending in support of the Tylenol brand following the poisonings and include promotional spending, coupons, destruction of goods, lawsuits, etc.

It also might be possible to consider the incremental costs associated with the event as a means by which obsolescence might be measured. The event sufficiently tarnished the Tylenol brand name. Following the poisonings, the value of the Tylenol brand name most likely was considerably less than the estimated $400 million spent by Johnson and Johnson to develop it. Johnson and Johnson incurred these additional costs in hopes that it would be able to bring the Tylenol brand back to pre-poisoning value. In other words, but-for the poisonings, Johnson and Johnson would not have incurred these additional costs.

8.2) The Income Approach

8.2.1) Background of Income Approach

Estimations based on the current value of future cash flows are essential to the *income approach.* Using the income approach, it is possible to assess value attributed to certain elements possibly associated with an IP asset. For example, specific elements of future income, such as the incremental revenue attributed to an asset, can be valued independently of other elements. This facilitates analysis of incremental benefits including, but not necessarily limited to cost savings based on improved technology, the ability to preclude entry into a market (e.g., barriers to entry), revenues generated from different income streams including premiums associated with an IP asset, royalties or license fees, access to additional technology (e.g., cross license agreement) possibly attributed to IP assets.

8.2.2) IP Assets and the Income Approach

The flexibility of the income approach often makes it the preferred method given the other two approaches. Using the income approach, for example, it might be possible to estimate the incremental value associated with specific elements of IP assets including control of rights associated with an IP asset, relief from royalties, barriers to entry, revenue from various licensing agreements, and other types of income.

8.2.2)1. Elimination or reduction of IP assets from the market

It is possible to analyze potential income streams resulting from the elimination of an IP asset from a market. This might include, but not necessarily be limited to, a firm's

increased revenues associated with control over essential technology within the market, patent rights, forced used of alternative technologies, market power possibly transferable to other markets (i.e., possibly the ability to bundle a group of products by incorporating a key IP asset).

8.2.2)2. Relief from royalty

This involves an analysis of a hypothetical royalty agreement. Specifically, this approach considers royalty income actually earned or a hypothetical rate that the owner of an IP asset would save by not having to license the IP asset from another party.[32]

8.2.2)3. Creating Barriers to Entry

IP assets are often exclusive allowing the owner to maintain some type of control over the IP. In some instances the control or the IP asset itself can create a barrier to entry within a market. An owner's control of an IP asset potentially allows for *monopoly* profits for the product (depending on actual and potential competition within the market). Additionally, firms might seek to take advantage of economic rents generated from (1) monopoly prices that might exist due to limited competition; (2) larger margins possible due to cost savings generated by the IP; and (3) alternative revenues (e.g., licensing fees).

8.2.2)4. Licensing Revenue

IP asset holders might utilize the income approach to value an anticipated revenue stream generated from licensing fees associated with an IP asset.

8.2.2)5. Income Possibly Associated with a Brand Name and/or Trademark

Brands exist within markets as nonphysical characteristics used to differentiate products. Successful brands convey elements of quality, reliability, acceptance, taste, etc. Brands help to facilitate companies' indirect communications with consumers. This communication can take the form of quality assurance with the brand acting as a implied contract that exist between manufacturer and consumer (*see,* Klein, Crawford and Alchian 1978)[33]

If an implied contract exists, it is reasonable to assume that there is some element of costs associated with the presence of the contract. For example, the price premium associated with brand name is the return that a manufacture expects given an increased level of quality, reliability associated with the product. Similarly, customers most likely would be willing to accept slightly higher prices (on branded goods) if customers in the market felt that purchasing a product with a preconceived level of quality (transmitted by brand application) enabled them to be assured of the value of the branded product. .

[32] Reilly, Robert, F., Robert P. Schweihs, "Valuing Intangible Assets," 1999, pp 194-95.
[33] Klein, Benjamin, Robert G. Crawford and Armen A. Alchian. "Vertical Integration, Appropriate Rents, and the Competitive Contracting Process." Journal of Law and Economics, October 1978, pp. 297-326.

Additionally, the existence of brands allows for reduced transaction costs in that brands rely on indirect communication and information conveyed at the point of sale. This allows firms to capitalize on the most efficient way to communicate information such that the consumer remembers the brand.

8.2.3) Estimates of Lost Revenues Associated with the Poisonings

A review of tradepress surrounding the Tylenol Poisonings demonstrates how important the Tylenol brand had become to Johnson & Johnson. Prior to the poisonings, Tylenol had more than 35 percent of the OTC pain-reliever market and accounted for more than 15 percent of Johnson and Johnson's total earnings.

In 1981 Johnson & Johnson's total sales equaled approximately $5.4 billion with Tylenol sales accounting for 6 percent or approximately $.339 billion.[34] Similarly, Johnson & Johnson's gross profits in 1981 were $838 million with approximately $91 million attributed to the Tylenol brand. Using only these data it is possible to develop a rough estimate of income possibly associated with the Tylenol brand name.[35] For example, it is possible to establish an estimate of value based only on Tylenol's 1981 gross profits which assumes no future growth. This estimate would be approximately $910 million.[36]

The $910 million would most likely be considered an upper bound estimate of losses in Tylenol brand value. However, for this number to represent the loss in Tylenol value, the vale of the Tylenol brand name (following the poisonings) would have to be very close to a zero value (with very little future expected value associated with the brand). There is no indication all value was lost. However, even with $910 million as an upper bound, assuming all was lost, it seems relatively clear that Mitchell's estimated loss of brand name capital of approximately $1.22 billion is drastically overstated.

Immediately following the poisonings, there was considerable uncertainty associated with the viability of the brand. It was unclear if Tylenol sales would be able to hit pre-event levels. Many felt that Johnson & Johnson would have to abandon the Tylenol brand in favor of another brand or simply a different supply arrangement (e.g., supply on a generic or private label basis).

A review of Johnson & Johnson total sales as well as net margins provided an understanding as to what the firm was experiencing just prior to the poisonings. For example, I estimated data for the 11 years prior to the poisonings. According to these calculations the average increase in total sales was estimated to be approximately 16 percent. This value was compared to rate of growth in 1982 which was only 6.7 percent.

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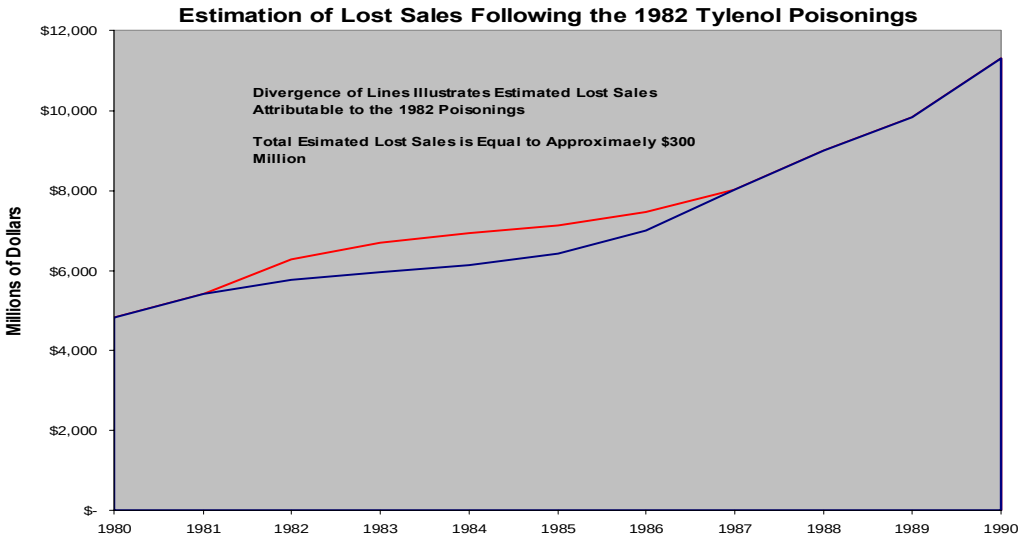
[34] Several industry articles indicate that Tylenol's contribution to Johnson & Johnson's total sales, prior to the poisonings, was closer to 7 percent.

[35] More thorough estimates of value attributed to the Tylenol brand are set forth later in this analysis.

[36] This assumes (1) gross profits of $91 million remain constant into the future; and (2) a discount rate of 10 percent.

Additionally, the 11-year average was compared to the following year (the first full year following the poisonings) in which total sales only grew by approximately 4 percent.

Figure 3



Based on these pre-event growth rates I estimated total sales and net income would have been "but-for" the poisonings. For example, if in 1982 the poisonings had not occurred, and total sales increased by the average of the previous 11 years (e.g., 16 percent), then it is possible to derive an estimate of total sales that might have occurred. This is illustrated in Figure 3. Figure 3 depicts a region that is simply the difference between the estimated sales (base on the 11 year average) and actual sales following the poisonings. Based on these data, estimates of lost income can range from approximately $255 to $350 million depending on the measure of income used.

8.2.4) Analysis of Incremental Revenue or Premiums Associated with the Tylenol Brand

In addition to an estimate based on future income streams, it might be possible to estimate the incremental value associated with the brand name. Specifically, by comparing margins associated with (1) Tylenol brand products; and (2) all other Johnson & Johnson products it might be possible to estimate the premium associated with the Tylenol brand.

Table 8a sets forth various financial data for both Johnson & Johnson and Tylenol products. As can be seen in Table 8a, Tylenol margins for 1980 and 1981 were 25 percent and 27 percent respectively. This is considerable more than estimated margins on all other Johnson & Johnson products (e.g., 14 percent in 1980 and 15 percent in 1981). These data can be used to estimate the premium associated with the Tylenol brand name.

For example, in 1981, Tylenol products realized gross profits of approximately $91 million on total sales of $339 (Cost of Goods Sold were estimated to be $248 million). Based on these figures it is clear that Tylenol sales earned a 27 percent gross margin. Also in 1981, Johnson & Johnson products (excluding Tylenol) realized gross profits of approximately $747 million on total sales of $5,061 million (e.g., 15 percent gross margin).

If it were assumed that in 1981 Tylenol products were only able to earn a margin comparable to all other Johnson & Johnson product (e.g., a margin of 15 percent compared to the 27 percent margin actually realized - *see,* Table 8a and Table 8b) then the total revenue associated with this Tylenol product would be less than the $339 reported. This assumes that the results of a change in gross margin would impact total sales instead of Cost of Goods Sold. In other words, if it were assumed that Tylenol products were unable to command a premium within the market, thereby earning returns equal to all other Johnson & Johnson products, it is reasonable to expect that total revenues associated with Tylenol sales would be less than they might have been had Tylenol been able to charge a premium. Additionally, it is reasonable to expect that Cost of Goods Sold would be independent of any premium the might be associated with Tylenol products.

Based on Tylenol's estimated Cost of Goods Sold in 1981 (e.g., $248 million) an applying the margins for all other Johnson & Johnson products (e.g., 15 percent) it is possible to get an estimate of $291 million (e.g., $248 million divided by 85 percent, *see,* Table 8b). This can be considered the revenues that would have been earned if Tylenol products were not able to command a premium in the market. Based on estimated sales of $291 million and keeping constant the cost of goods sold (e.g., $248 million), estimated gross profits for 1981, assuming a 15 percent margin, would be approximately $43 million (e.g., $291 - $248 = $43 million). This provides an estimate of the reduction in gross profit associated with a loss of premium of approximately $48 million (e.g., $91 million – 43 million).

Therefore, loss of any premium associated with the Tylenol brand might indicate that the market perception of the brand has changed. As a result, based on the aforementioned assumptions, Tylenol would experience a reduction in gross profits of $48 million. Assuming this value as constant, the net present value of the Tylenol brand name, prior to the poisonings, might be estimated at approximately $480 million (based on a 10 percent discount rate)

Table 8a

Analysis of Operating Margins for Johnson & Johnson and Tylenol Brand

(Estimates of Incremental Margins Possibly Attributed to the Tylenol Brand Name)

	1980			1981		
	Total Johnson & Johnson Sales	Johnson & Johnson Excluding Tylenol Sales	Total Sales of Tylenol	Total Johnson & Johnson Sales	Johnson & Johnson Excluding Tylenol Sales	Total Sales of Tylenol
	$Millions			$Millions		
Total Sales	$ 4,838	$ 4,577	$ 261	$ 5,400	$ 5,061	$ 339
Cost of Goods Sold	$ 4,125	$ 3,928	$ 197	$ 4,562	$ 4,314	$ 248
Operating Income	$ 713	$ 649	$ 64	$ 838	$ 747	$ 91
Operating Margin	14.74%	14.18%	24.52%	15.52%	14.76%	26.84%
Difference in Operating Margin			10.34%			12.08%
Estimated Premium Associated with Tylenol Brand Name			$ 27			$ 41

	1982			1983		
	Total Johnson & Johnson Sales	Johnson & Johnson Excluding Tylenol Sales	Total Sales of Tylenol	Total Johnson & Johnson Sales	Johnson & Johnson Excluding Tylenol Sales	Total Sales of Tylenol
	$Millions			$Millions		
Total Sales	$ 5,761	$ 5,406	$ 355	$ 5,973	$ 5,530	$ 443
Cost of Goods Sold	$ 4,923	$ 4,601	$ 322	$ 5,135	$ 4,794	$ 341
Operating Income	$ 840	$ 807	$ 33	$ 838	$ 736	$ 102
Operating Margin	14.58%	14.93%	9.30%	14.03%	13.31%	23.02%
Difference in Operating Margin			-5.63%			9.72%
Estimated Premium Associated with Tylenol Brand Name			$ (20)			$ 43

Sources:

1) Form 10-K 1982

2) SMITH BARNEY, HARRIS UPHAM & CO. Company Report - December 12, 1984 JOHNSON & JOHNSON (JNJ)

Table 8b

Estimation of Tylenol Revenues That Might Have Resulted From an Inability to Charge A Premium Associated with The Tylenol Brand

(Estimates of Incremental Margins Attributed to the Tylenol Brand Name)

	1981		
	Total Sales of Johnson & Johnson Products Excluding Sales of Tylenol Brand Products	Total Sales of Tylenol Brand Products	Tylenol Sales Based on Margins Associated with All Other Johnson & Johnson Product Sales
	$Millions		
Total Sales in 1981	$ 5,061	$ 339	$ 291
Cost of Goods Sold in 1991	$ 4,314	$ 248	$ 248
Gross Profit (Total Sales - COGS)	$ 747	$ 91	$ 43
Estimated Gross Margin	15%	27%	15%

Notes:

1) Results might not sum due to rounding.
2) Data are based on various financial data that are reported as rounded number.
3) Cost of Goods Sold was not reported in the financial data. Data used were estimated based on the difference between total sales and gross margin.
4) Gross Margin and Total Sales data for Tylenol were obtained from a different Source than the Johnson & Johnson data.
5) Revised Total Sales for Tylenol represents the Cost of Good Sold divided by (1-Gross Margin for all other Johnson & Johnson products).

Sources:

1) Form 10-K 1982
2) SMITH BARNEY, HARRIS UPHAM & CO. Company Report December 12, 1984 JOHNSON & JOHNSON (JNJ)

Even if the Tylenol name were to become worthless, Johnson & Johnson would most likely have been in a position to sell its pain relief product though any combination of alterative channels. For example, Johnson & Johnson could have opted to sell its pain relief product as: (1) a new brand name; (2) as a private label; (3) as an exclusive manufacturer or (4) as a generic product. In each case, expected returns would at least be equal to some internal hurdle rate established by Johnson & Johnson.

8.3) The Market Approach

The market approach relies on an analysis of comparable transactions. This approach is often constrained by the number of comparable transactions available within the market. Additionally, consideration of similar transactions within the market often requires considerable analyses and adjustment to ensure the applicability of any comparison.

8.3.1) Market Impact – Migration of End-Users

Estimates of brand name value also might consider potential losses associated with end-users migrating. Specifically, estimates of lost sales due to movement to other companies compared to migration out of the industry should be considered.

A review of various article and news reports following the poisonings indicates that Johnson & Johnson lost approximately 7 percent of its market share. However, a study by Dowdell et al. demonstrated that there were not significant positive returns for other companies. This would seem to imply that the markets expectation of a long-term shift away from Tylenol might have been limited. In fact, a report one year after the poisonings indicated that Tylenol had gained much of its market share back.[37]

It is possible to estimate lost sales during this time period based on Tylenol's reported loss of market share. According to industry reports, following the poisonings Tylenol market share fell to low of 7 percent.[38] Almost three months after the poisonings, Tylenol's market share had increase to approximately 24 percent (compared to 35 percent prior to the poisonings). Almost one year after the poisoning Tylenol had gained back much of its market share.

To estimate lost sales based on changes in market share, I reviewed possible trends in Tylenol market share. For example, one industry report estimated that the decline in Tylenol market share was approximately 27 percent following the poisonings. Based on this massive initial loss in market share, it might be possible to estimate the "upper-bound" estimate of lost brand value. Using an estimated brand value derived from income associated with brand premiums (e.g., $910 million, *see* Sect. 8.2.3 above) a decline in overall value of 27 percent (the decline in market share) would represent a loss

[37] *See,* Johnson & Johnson Company Report, 1983.
[38] *See,* Vise, David, "Tylenol: Sign of a Recovery: Johnson & Johnson Even Turns Experts Around," *The Washington Post,* December 19, 1982.

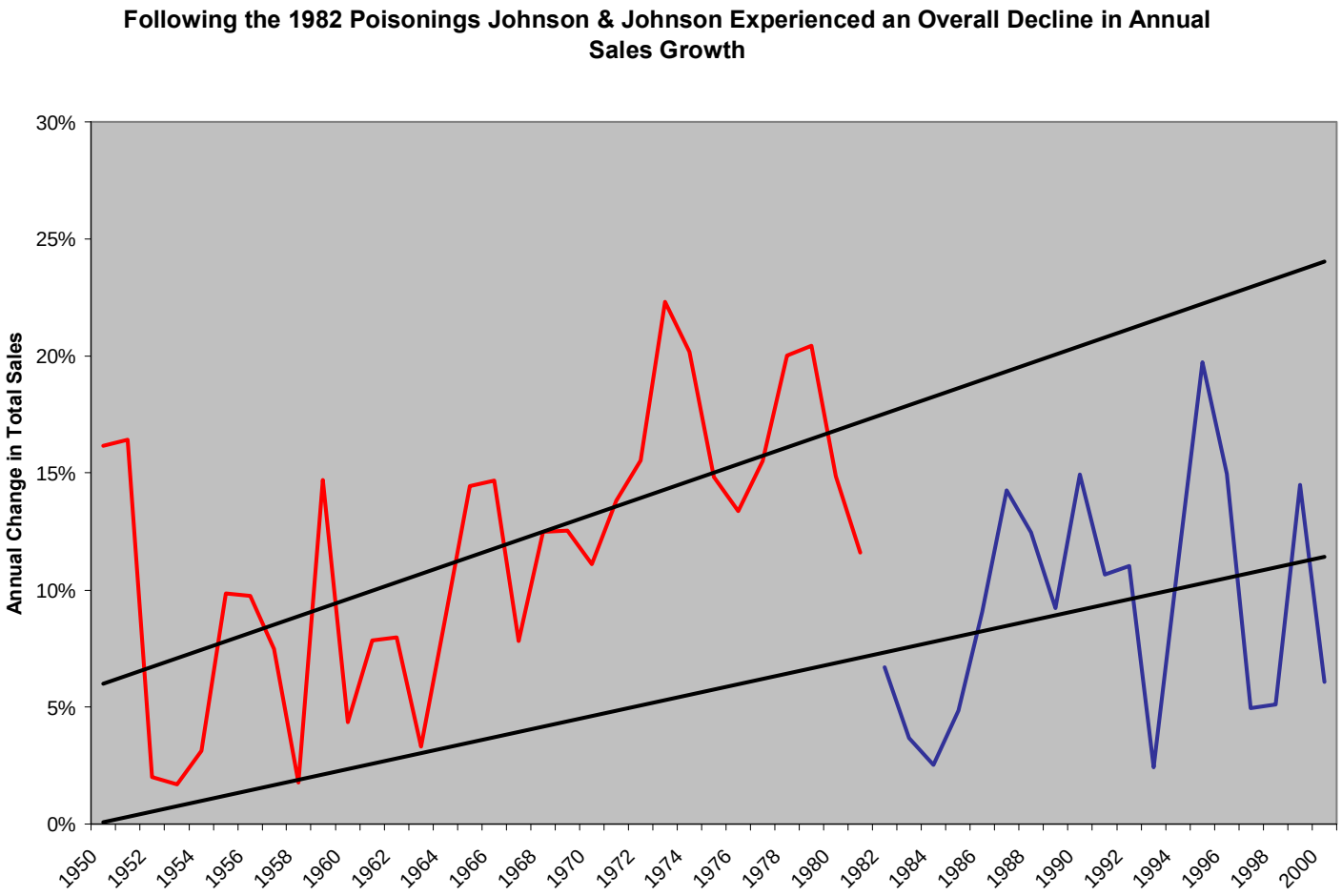
of approximately $246 million over the course of one year.[39] Using a less conservative approach it is possible to adjust the estimates loss slightly. For example, assuming Tylenol market share changed from 35 to 24 percent within over the course of three months, it is reasonable to estimate a monthly decline of approximately 9 percent for the first three months (e.g., assumed September 1982 market share was 35 percent, October 1982 market share was 32 percent, November market share was 29 percent, December was 26.4 percent and January was 24 percent). Following January, it was assumed that market share began a rebound and was back to 35 percent by November 1983. Based on these trends it is possible to estimate a deviation from actual market share prior to the event (e.g., 35 percent). Accordingly, each month would have sales that were not made due to the event (e.g., the difference between the "but-for" monthly market share and the actual, based on market share trends). The total deviation is summed over the entire time period, (on year) and an estimated value of $65 million results.

8.3.2) Impact outside of the brand

Finally, consideration should be given to the impact of the poisoning on Johnson & Johnson products other than Tylenol. That is to say the decline in shareholder value was not specific to an individual brand. In fact, Mitchell, in his analysis, recognized that the impact measured was for both Johnson & Johnson and Tylenol. As recognized by Bosch and Eckard (1991) "unavoidable inclusion of irrelevant lines introduces statistical noise which increases standard errors and reduces t-statistics developed to test the significance of the abnormal return." Given the structure of the analysis set forth by Mitchell, an adjustment for non-Tylenol losses cannot be made. However, as can be seen in Figure 4 below, Johnson & Johnson's realized a change in the growth of its annual sales following the poisonings. It seems unreasonable to expect that Tylenol sales depressed the growth rate so significantly. In fact, evidence indicates that within a relatively short time period Tylenol had regained much of what was lost following the poisonings.

[39] This is a conservative estimate simply because sales of Tylenol rebounded tremendously over the next year (e.g., 1983). An estimate of the decline in brand value based only on one year could reflect one possible scenario considered at the time (e.g., an assumption that market share would not stay down over an extended period of time).

Figure 4


Following the 1982 Poisonings Johnson & Johnson Experienced an Overall Decline in Annual Sales Growth
Annual Change in Total Sales
30%
25%
20%
15%
10%
5%
0%
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
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1996
1998
2000

9) Final Estimation of Loss in the Value of the Tylenol Brand

By 1984 Johnson & Johnson felt that Tylenol's recovery was assured.[40] Johnson & Johnson reported the Tylenol poisonings resulted in a onetime $50 million (after tax) charge. In addition to the $50 million charge, Tylenol reported estimates of lost sales attributed to the poisonings. Lost sales estimates were reported to be approximately $150 million over two years. Total losses set forth by Tylenol were estimated to be close to $200 million.[41] These estimates represent the low end of the spectrum with the high end occupied by Mitchell.

In Table 9, I compare results obtained by Mitchell to the results obtained from the various methodologies discussed in this analysis. Table 9 simply provides a summary of results. As can be seen from Table 9, the application of the various methodologies resulted in values of the IP asset (e.g., Tylenol brand name) that was drastically less than Mitchell's estimate. In fact, many of the results set forth in Table 9 are more similar to the $200 million that was once reported as the total loss associated with the poisonings.[42]

These results seem to demonstrate that certain methodologies yield similar results. As demonstrated at Table 9, the detail oriented approaches (e.g., cost and income approaches) were similar to each other. Additionally, these results emphasize the importance of a pre-event benchmark (even if just for a reality check). Lastly, it seems that much of the dispersion is likely attributed to (1) overreaction within the market, (2) failure to fully consider all relevant issues, and (2) fully account for all costs associated with the poisonings.

Despite several shortcomings, Mitchell's methodology provides a strong foundation into these types of analyses. However, his application of data and interpretation of events allow for potential errors in his analysis. As set forth in Table 9, the magnitude of Mitchell's results leads one to believe alternative factors are at issue as well.

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[40] SMITH BARNEY, HARRIS UPHAM & CO., Johnson & Johnson Company Report, December 12, 1984.

[41] *See,* SMITH BARNEY, HARRIS UPHAM & CO., December 12, 1984, and Paine Webber, 1986.

[42] *See, for example,* SMITH BARNEY, HARRIS UPHAM & CO., Johnson & Johnson Company Report, December 12, 1984, Paine Webber, Johnson & Johnson Company Report, 1986, various industry tradepress.

Table 9

Estimated Decline in the Value of Johnson & Johnson's and Tylenol's Brand Based on Different Methodologies

	Estimate of Value	Estimated Decline in the Value of the Brand	Estimate Loss of Brand Value for Both J&J and Tylenol[1]	Comments
	($ Millions)			
Mitchell's Methodology	**NA**	**$1,240**	**YES**	Mitchell indicated that this represented "a measure of the decline in the value of Johnson & Johnson & Tylenol's brand names." (*See,* Mark Mitchell, 1989)
Mitchell's Methodology - Adjusted for an Average CAR for the beginning of the event period	**NA**	**$900**	**YES**	Assumes Mitchell's treatment of costs is correct (e.g., $200 million total costs)
Mitchell's Methodology - Adjusted for an Average CAR and including adjustments for costs not considered by Mitchell	**NA**	**$632**	**YES**	
Estimate Based on Cost Approach	**$723**	**$327**	**NO**	Cost assumptions described above
Estimates Based on Income Approach				
Changes in Total Revenue	**NA**	**$350**	**NO**	Estimates yield different results based on the measure of income (e.g., total revenue, gross profits). Accordingly, the appropriate estimate of lost value might be between $255 and 350 million
Analysis of Incremental Rev. (Market Share Analysis)	**$910**	**$65 - $246**	**NO**	This assumes that the decline in value would be approximately 27 percent of the total brand value. This is approximately equal to the estimated loss in Tylenol's market share for the last few months of 1982. Given the short-lived nature of the disaster, this approach would certainly overstate any estimate of loss of brand name value.
Analysis of Premiums	**$910**	**$480**	**NO**	This assumes that any premium associated with the Tylenol brand name is reduced to zero. Once again, given the short-lived nature of the disaster, this approach would certainly overstate any estimate of loss of brand name value.

N/A – data not available

Note: One of the potential problems associated with Mitchell's methodology is that it fails to provide a means by which estimates of Tylenol value can be derived separate from Johnson & Johnson. Accordingly, several estimates reflect band value for both entities.

10) Summary of Results

The results set forth in Table 9 demonstrate that the application of different IP valuation methodologies can result in a variety of different results. However, a careful analysis of data represented in Table 9 indicates that several methodologies, when properly applied, yield results that are not too dissimilar. For example, an estimate of brand value based on the incremental cost following the poisonings ($327 million) is not too far from an estimate of brand value based on changes in total revenues ($350 million). Similarly, estimates of total brand value based on the cost approach ($723 million without an adjustment for obsolescence) could be compared to total brand value estimated based on an analysis of brand premiums (estimated to be $910 million).

Despite several similar results set forth in Table 9, there is one estimate of loss in brand name value that seems disproportion to all the rest, *i.e.,* Mitchell's estimate of $1.24 billion loss in brand name capital. This estimate is approximately $1.17 billion more than the minimum estimate reported (e.g., $65 million). One reason for the apparent anomaly in Mitchell's estimate is the inclusion of both Johnson & Johnson and Tylenol brands in the analysis. By basing his estimate on Johnson & Johnson share price, Mitchell is not differentiating between an impact on Tylenol's brand name and/or Johnson & Johnson's brand name. It might be possible to ignore this potential problem if, for example, the brand name and company name (and implied value) were the same. For example, the Coca-Cola name and the Coke product are often interchangeable. An event study, similar to the one set for by Mitchell, used to estimate an impact on Coca-Cola following a brand specific event would most likely be a more accurate representation of the impact of a brand name on a firm's value.

The other approximations set forth in Table 9 revealed few surprises. Estimates based on the cost and income approach might be expected to be similar simply due to the event. That is to say, post-event costs were identifiable and changes in income were measurable due to the coverage of the event as well as the nature of the event.

It is interesting to note however, the implications of both the premium analysis and the cost approach. The premium analysis has a built in "floor" such that sales of the product are assumed to always be nonzero. In other words, even without the Tylenol brand name, product sales could be made (1) by other firms; (2) via private labels; (3) as a generic product; or (4) under a new brand name. The value based on potential premiums represents some element of margin associated with the premium for Tylenol. Lacking a premium the loss in value could be a good estimate of the value associated with the Tylenol name.

Additionally, the cost approach provides a clear view of *incremental* costs incurred after the poisonings. These costs might be considered necessary to update the brand name (e.g., adjust for some element of obsolescence). Consequently an estimate of "total costs" pre and post-event should be evaluated as to the appropriateness of such an estimate of brand value.

11) Conclusion

Stock market event analyses provide estimates of the effects of a specific, unexpected event on share returns of individual firms.[43] Models are developed to estimate the relationship between a firm's share returns and share returns of a benchmark group such as a portfolio of similar firms, returns across an industry or some estimate of market returns.

Event studies should recognize factors at issue as well as develop an understanding of various issues specific to the event. Studies should be developed with a focus on specifics pertaining to the estimation and event periods, the potential impact associated with an event, and the scope of the event. Additionally, other factors such as firm specific, industry specific and product specific event might influence the model.

In 1989, Mark Mitchell used an event study to estimate brand name capital depreciation associated with the Tylenol poisonings. Based on this analysis, Mitchell concluded the total loss in Johnson & Johnson's shareholder value attributed to the poisonings is $1.24 billion.

I reviewed Mitchell's analysis and wherever possible, identified key areas where a methodological adjustment or implementation of an alternative approach might be appropriate. These were not drastic changes to the methodology set forth by Mitchell. Instead, they represent slightly different approaches or alternative interpretations of data. These slight adjustments to the underlying methodology or assumptions altered the results dramatically.

Additionally, I applied several other valuation methodologies and the results are set forth at Table 9. In each case, the resulting value of the IP asset (e.g., Tylenol brand name) was drastically less than Mitchell's estimate. Much of the dispersion is most likely attributed to (1) overreaction within the market, (2) failure to fully consider all relevant issues, and (2) fully account for all costs associated with the poisonings.

[43] Event studies almost always involve analyses of stock returns of publicly traded firms. Conceptually, it might be possible to estimate the impact of an even on a private company if sufficient data were available. These data would most likely involve some measurement of performance (e.g., revenues, profits, costs, gross margins, etc.) as well as an exogenous variable thought to influence the chosen measure of performance.

End Note

This work represents one basic approach to valuing IP assets. It is not intended to represent all possible methods nor is it intended to provide a comment regarding certain methods compared to others. Applications of methodologies set forth herein are intended to provide an illustration of possible approaches. All conclusions are based on analysis of a specific event (*i.e.,* the 1982 Tylenol Poisonings). The application of these methodologies outside of this one example would require considerations of different facts and assumptions as well as judgment as to the appropriateness of different methodologies.

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Background

Mr. Pearsall has extensive experience in economic research and consulting. He has drafted expert reports and performed extensive sales, profitability, and present value analyses to determine economic damages, including the calculation of lost profits, price erosion, reasonable royalty and prejudgment interest. He has been involved in a broad range of antitrust matters, including private cases and matters before various government agencies. His antitrust experience includes attempted monopolization, analyses of entry, predatory pricing, price-fixing, price discrimination, and, very generally, the exercise of market power. In addition to economic analysis of liability issues, he has drafted expert reports and analyzed damages associated with antitrust practices.

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