EFFECTS OF FOOD SAFETY RECALLS ON A FIRM'S SHAREHOLDER VALUE

by

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Abstract

This study focuses on the effects of food safety recalls on a firm's shareholder value. In this study, the effects of six recalls are studied using the event study method. Three models were used involving the daily stock returns for each recall, the daily prices from the S&P 500 and the S&P 500-Packaged Foods and Meats prices. Each of these models was used to determine the abnormal returns for the individual recalls during a determined event window. The four companies responsible for the recalls are all large, highly-diversified food production companies. Overall, the results from this study show there is short-term effect on shareholder values for the companies included in this study.

This is an important topic that was widely studied in the late 1990's and early part of the 2000's. There have not been any notable studies in this area in the past decade which is why this study is useful. Results of this study are comparable to those mentioned in the literature review section.

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Chapter 1 - Introduction

In 2011, the Centers for Disease Control and Prevention estimated that 47.8 million Americans were affected by foodborne illnesses resulting in approximately 128,000 hospitalizations and 3,000 deaths (CDC, 2012). In addition to affecting nearly 15% of the total United States' population, foodborne illnesses resulting in a food recall can impact a food company's overall value and reputation. This impact, which is usually assumed to be negative, is an inherent risk that all food manufacturers face when it comes to food safety incidents. In this paper, I will estimate the effect of six independent food recall events on the publically traded company which issued the recall.

1.1 – Food Recalls

The United States Department of Agriculture's (USDA) Food Safety Inspection Service (FSIS) is an agency that inspects and regulates all meat, poultry and processed egg food products. A recall is a firm's voluntary removal of product from retailers and/or distributors in order to protect consumers from consuming potentially harmful products. The FSIS holds the authority to recall products if a firm chooses not to voluntarily recall contaminated products.

A company may choose to recall one or more products for a wide variety of reasons. The reason for a recall may be due to something that is not considered a high health risk such as foreign materials, misbranding of the product, or undeclared ingredients in the product. This study will be focusing on higher risk product recalls that are attributed to microbial contaminations or in one case, an undeclared allergen that could also lead to severe health problems.

The FSIS classifies food recall events according to severity of the potential illness. Class 1 recalls are the most severe and are considered to be a high health risk. In the majority of Class 1 recall cases, the product has been contaminated with a microbial pathogen (*Listeria, E. coli O157:H7, Salmonella*, etc.) that is known to cause severe adverse health conditions. There are some cases where an undeclared allergen such as milk or peanuts, which are known to pose a serious health risk to some consumers, may be classified as a Class 1 recall. Class 2 recalls present a remote probability of health problems and are not deemed to be as hazardous as Class 1 recalls. Most often common causes of Class 2 recalls include foreign materials and the majority of undeclared allergens. Class 3 recalls are the least severe and pose no adverse health consequences. These are typically cases where a product was misbranded during production.

1.2 – Importance of Study

There are several reasons why information on how stock prices respond to a recall is considered useful. First, this data can be used to determine potential firm and industry level benefits of adopting a particular food safety intervention. This could include upgrading a piece of equipment, developing and implementing a crisis management plan in processing plants, or a broad adoption of an industry quality management system such as the Hazard Analysis and Critical Control Points (HACCP) system. Secondly, it is interesting to determine how the size, scope, and severity of the recall influence the magnitude of the reaction to the recall. Lastly, the magnitude of the stock market's reaction can be compared to the direct costs assessed by the firm (Salin, and Hooker 33-46).

1.3 – Objectives

The main objective of this paper is to quantify the effect of a food recall event on a company's shareholder value. I will accomplish this by using an event study time series method to estimate impacts of six meat recalls for four individual companies. Using this method, I will compare abnormal and normal returns to estimate the effect of the recall. More specific objectives of this paper are to:

1. Determine how the stock prices of large, well-diversified companies react to meat recalls.
2. Compare the results discussed in previous studies to the findings from this study.

Chapter 2 - Literature Review

In this chapter, I will review the work that has been done previously in this area. There have been several studies done concerning how product recalls have affected a company's shareholder value; however, most of these studies have focused on the automobile and drug industries. Studies by Dranove and Olsen; Hartman; and Jarrell and Peltzman are examples of work in these industries. In the past decade, there has not been a lot of work done to estimate how a food recall will affect a company's shareholder value. There were, however, two similar studies conducted in 1999 and 2001 which examined the effect of food recalls on overall food company value. These two studies will be discussed more in depth because of the closeness to this study. In addition, I will briefly review some literature that pertains to this study that looks at the effects of food recalls on consumer demand and estimate the effects on specific commodity prices and the futures market.

2.1 - Analysis of Food Safety Recalls on Shareholder Value

The first study, by Salin and Hooker in 1999, focuses on recalls due to microbiological contamination. This paper presents the first qualitative analysis of firm-specific reputation impacts that are assessed by considering the changing valuation of publically traded food processing firms (Salin, and Hooker 33-46). To do this, Salin and Hooker isolated four independent recalls occurring between 1996 and 1998. The three companies examined in the study were 1) Odwalla, Inc. with their 1996 apple juice recall, 2) IBP, Inc. with two independent recalls of recalled beef contaminated with *E. coli O157:H7* in 1998, and 3) Sara Lee Corp., who recalled hot dogs and deli meats that tested positive for *Listeria*.

The most severe recall in terms of number of deaths and illnesses in this study was the Sara Lee Corp. recall, which consisted of 15 million pounds of hot dogs and deli meats that were linked to 21 deaths and more than 100 illnesses in 21 states. The two IBP recalls were treated as independent events because of a seven month separation of the two events. The first IBP recall consisted of 282,128 pounds and the second recalling 556,226 pounds of ground beef. Neither of these recalls resulted in any reported illnesses. The Odwalla incident resulted in one death and 66 illnesses. The size of this recall was so vast that the product amount being recalled was undetermined. When a company recalls an undetermined amount of product, it is usually because the amount of product is so large that the company cannot determine a time frame within which the contaminated products were produced and will accept any product returns.

These events were chosen for the study based on specific criteria. The Sara Lee Corp. recall and the Odwalla recalls were chosen because of their instrumental role in policy reform. Shortly after the Odwalla case, the Food and Drug Administration (FDA) began requiring that fresh fruit and vegetable juices that had not been treated by pasteurization to eliminate microbial contaminates were required to carry a warning label. Sara Lee's recall led the USDA to strengthen regulations for ready-to-eat products. The two IBP cases were chosen because they were fairly close together in time and Salin and Hooker wanted to see if the two recalls could be treated as independent recalls (Salin, and Hooker 33-46).

Using the event study methodology, Salin and Hooker were able to measure the impact of the recall event on a company's shareholder value. After collecting daily closing stock prices for the three firms as well as prices from Standard and Poor's (S&P) 500 and S&P 500-Food indices, daily returns were calculated as the percentage change. Following MacKinlay's

methods on an event study, Salin and Hooker calculated the normal and abnormal returns for various time periods surrounding the events.

The overall results of this study showed that the Sara Lee Corp. event had no statistical effect on daily stock prices. This could be due to the fact that Sara Lee Corp. is a large, diversified company that operates in many other areas that were not affected by the recall. Being smaller firms, Odwalla and IBP both experienced substantial drops in returns. Ultimately, IBP's two cases could not be isolated and treated independently. The first recall showed significant abnormal returns in both models for all event windows. The second, however, showed no discernible abnormal returns for any time frame. It was suggested that the lack of reaction to IBP's second recall could indicate that the market had "learned" from the initial recall. The lesson that Salin and Hooker believed the market learned is that the initial recall suggested to investors that IBP reacts well to contamination incidents and that there should not be any long-term effects on the company's financial health. Odwalla's post-recall stock prices failed to reach pre-recall levels during the study's duration. Compared to the other companies in the study, Odwalla is a very small company. Initially, Odwalla's price had plummeted substantially, but had begun to steadily return to normal levels. However, after the announcement of a small child's death, threats of future liabilities concerned investors and recall costs cut severely into the relatively small sales.

Wang, Salin, Hooker, and Leatham (2002) used the same data from the previous study to further study how multiple recalls by the same company impacts shareholder values. In this study, however, Wang *et al.* used a GARCH model which accounts for heteroscedasticity effects. The GARCH model was necessary to uncover time-varying volatility in the series and to produce more efficient results. Using this type of model, Wang *et al.* found two things that are relevant

to this study. The first is that repeated recalls by the same company did not have strong reactions. The second is that volatility spillovers across the firms suggest potential industry-wide repercussions from bacterial contamination incidents (Wang, Salin, Hooker, and Leatham 979-987).

Michael Thomsen and Andrew McKenzie conducted a similar study to these two in 2001. In Thomsen and McKenzie's analysis, the primary objective was to examine the reduction in a food company's value that was a direct result of a food contamination incident. Using the same event study approach mentioned above, Thomsen and McKenzie focused solely on meat and poultry recalls. Instead of isolating and analyzing the effects on specific firms, Thomsen and McKenzie broke the data down by recall class. After removing overlapping data to avoid clustering, there were thirty Class 1 recalls, thirty-seven Class 2 recalls, and twelve Class 3 recalls.

Results of this study showed that announcements of Class 1 recalls did impact the stock market negatively. Evidence showed that the market does respond significantly on the day of the announcement and that the six trading days after the announcement are when the most adverse price movements occur. The results also showed that the losses tend to persist for a period of at least one month after the recall announcement. In addition, the cumulative abnormal returns (CARS) continued to decline for approximately two months following the recall. Lastly, they found that when looking at the market as a whole and not an individual company, it takes several trading days for the market to fully adjust to the new information. While this study provides pertinent information, it is important to note that the patterns found in this study could be due to the size and composition of the study and that individual recalls and small samples may have different results.

Class 2 recalls did not report any negative effect on stock market prices. Thomsen and McKenzie conclude that a reasonable explanation for this is that, since Class 2 recalls only reflect safety violations that pose minor health risks, the market may view the recall as a sign of corporate responsibility and may actually improve customer relations. Because the sample of Class 3 recalls was so small, the test statistics were not included. However, Thomsen and McKenzie did note that Class 3 recalls are similar to Class 2 recalls in that they do not have any significant impact on stock prices.

2.2 - Further Analyses of Consumer and Market Reactions to Food Safety Recall Events

The purpose of reviewing the next pieces of literature is to gain perspective on how the event study method and recall data can be applied to analyze different aspects of the meat and produce industries. All areas of the agricultural industry are closely related and when an event that affects one area of production occurs, typically, that event will also impact another level or sector of production.

2.2.1 – Consumer Reaction to Recalls

In this section, I will look at how a large recall containing beef will not only impact the consumer's perception of that particular company's beef, but it may also influence their perception of beef in general. In addition to understanding how a shareholder's value is affected, it is also important to note how consumers and the market respond to breaches in food safety. Much of a company's success is measured on how well their product is received by consumers as well as their performance in the market place. It is also important to remember that shareholders are also consumers and, while they may have more loyalty to a company than the average consumer, their reaction to a recall is most likely not that different from any other consumer.

Today, consumers have become more aware of issues regarding their nutritional well-being. Consumers are far more concerned with the nutritional value and the health risks associated with a food product than ever before. At the same time, they are also receiving information faster than ever with the use of technology and social media. In just an instant, news of a company's recall can reach consumers in every corner of the nation and can just as quickly influence the consumer's perception of the company in question and its products. There have been several studies that have looked at consumer reaction to food recalls and how reports in the media change a consumer's perception of a specific company or product.

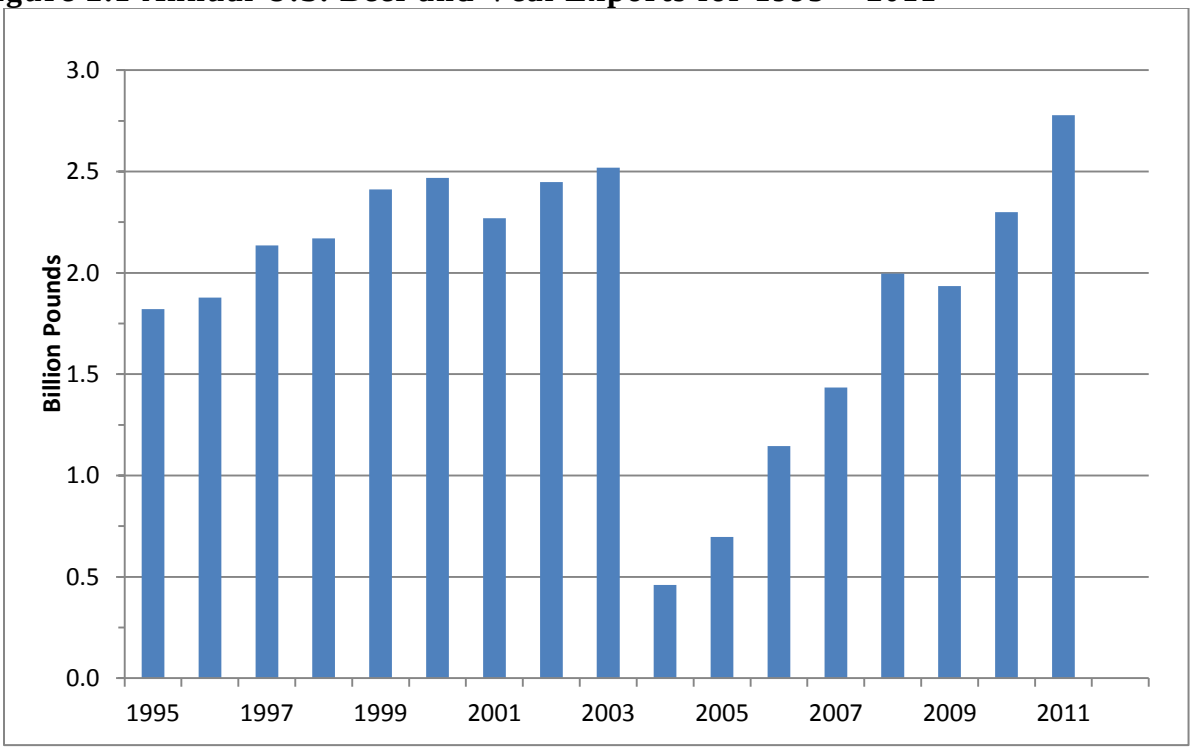
A 2008 survey study by Stinson *et al.* on how household attitudes about food defense and food safety change following a highly visible nationwide food recall shows that U.S. residents were less confident that the nation's food supply was safe from natural or accidental contamination following a large nationwide recall such as the 2006 spinach recall mentioned below. Consumers are also holding the government increasingly more responsible for food defense and food safety (Stinson, Ghosh, Kinsey, and Degenefee 1272-1278).

Piggott and Marsh (2004) conducted a general study on how food safety information impacts U.S. meat demand. Piggott and Marsh found that adverse publicity regarding food safety concerns does significantly impact meat demand for beef, pork and poultry though impacts lasted only a quarter or two.

However,, the 2003 recall issued by Verns Moses Lake Meats for roughly 10,000 pounds of raw beef that was presumed to be contaminated with *Bovine Spongiform Encephalopathy* (BSE) had a long-term effect. Even though this small processor from Washington issued a relatively small recall, the news spread throughout the world quickly and consumers reacted drastically.

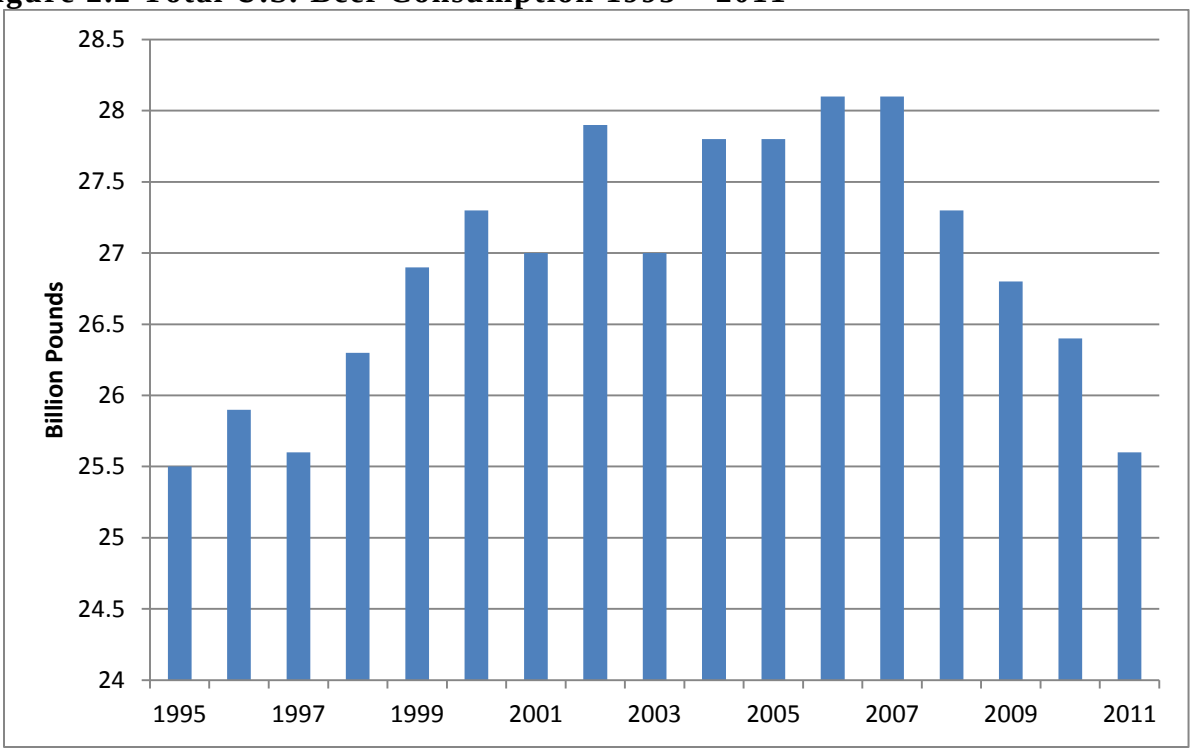
As a result of the BSE case, over 100 countries closed market access and banned U.S. beef products. Canada continued importing as the United States' only remaining major importer of beef, although restrictions were implemented immediately so that only boneless beef from animals less than 30 months of age was accepted. The January 2004 *World Agricultural Supply and Demand Estimates* (WASDE) report estimated beef exports to drop 91.6 percent from 2.62 billion pounds to 220 million pounds. Actual exports for 2004 were 3 million pounds.[1] Figure 2.1 shows all U.S. beef and veal exports from 1995 through 2011. In the long-run, the reaction from U.S. consumers shows a different response than that from importing countries. Figure 2.2 shows total U.S. beef consumption from 2002 through 2011. Domestic consumption actually increased from 2003 to 2004. This may be because the United States is known to have one of the safest food supplies in the world and U.S. consumers tend to be very trusting when it comes to the safety of their food.

Figure 2.1 Annual U.S. Beef and Veal Exports for 1995 – 2011



[1] Data Source: USDA-FAS Global Agricultural Trade System.

Figure 2.2 Total U.S. Beef Consumption 1995 – 2011



A 2009 study by Schlenker and Villas-Boas showed that U.S. consumer demand and international trade were significantly affected by the 2003 BSE incident. They also estimated the response to earlier BSE coverage made by Oprah Winfrey on her popular television show. On her show, Oprah announced that 'mad cow disease' could make AIDS look like the common cold, which is highly overstated (Schlenker, and Villas-Boas 1140-1152). This single statement caused the futures prices for beef to drop significantly.

In 1982, over 80 percent of milk produced in Oahu, Hawaii was contaminated with pesticide. This led to eight recalls of milk and dairy products within two months. In turn, milk demand fell considerably. Smith, van Ravanswaay and Thompson estimated the impact and size of the sales loss associated with the recalls. They found that the sales loss included 41.7 million pounds of milk that could have been sold but was not because of the decrease in demand following the pesticide incident. They also found that the media coverage following the incident

did have a significant impact on sales and that negative coverage had a larger impact than positive coverage (Smith, van Ravenswaay, and Thompson 513-520). Because the paper by Smith *et al*. was among one of the first empirical studies in this field, it provides some interesting concepts, one concept being that media coverage plays a significant role in the overall impact of the recall on both consumer demand and the reaction in the markets. Even though it has now been 30 years since the study by Smith *et al.* and the means through which media coverage is disseminated, the fact that consumer reaction has not drastically changed in this time frame proves that there is a strong, unchanging trend in consumer behavior when it comes to negative media and food recalls.

Another more recent study that estimates consumer response is Arnade, Calvin, and Kuchler's analysis of the 2006 *E. Coli* O157:H7 contamination in spinach. Arnade *et al.* found that the long-run impact did not affect the total consumption of leafy greens, but there was a shift in consumption from spinach to other leafy green vegetables for a short period of time.

2.2.2 – Market Reaction to Recalls

While information reaches consumers at a very rapid pace, the same is true for the market place. In an efficient market, the price of a stock will reflect all previous public information and will instantly change to reflect new public information. In most of the literature that focuses on market reactions to a recall, an immediate reaction is noticeable. In several of the studies, adverse effects can be witnessed in prices on the day the even occurred. According to the literature, the same is also true for the first four to six days after the event.

The study by Lusk and Schroeder (2002) is an analysis of the effects of meat recalls on short-run futures prices. Using the event study method and data similar to the two studies

mentioned above, Lusk and Schroeder found that, in general, recalls do not have a direct impact on daily lean hog or live cattle prices.

While Lusk and Schroeder looked at meat recalls in general, McKenzie and Thomsen (2001) also used the event study methodology to analyze how recalls due to *E. Coli* O15:H7 affected wholesale and farm-level beef prices. In addition to the Lusk and Schroeder study, this more specific study found that *E. Coli* recalls do adversely affect wholesale beef prices in the short-run but do not affect live cattle prices.

A more recent study looked at the reaction of the commodity markets to the H1N1, or 'swine flu,' media coverage. When the H1N1 epidemic hit the U.S. in 2009 and it was inappropriately labeled as the 'swine flu,' consumers of U.S. pork worldwide panicked. Attavanich, McCarl and Bessler (2011) found that the media coverage was associated with a significant and temporary negative impact on the futures prices of lean hogs.

In this section, it is important to remember that even though these studies focus on either consumer or market reactions to recall events, information from one sector can be translated into the other. Market response is ultimately driven by consumer demand. The literature reviewed in this chapter is just a sample of the work that has been done in this field to provide important statistical findings that are crucial in understanding the effects of recall announcements on the stock market. After reviewing the results, it can be summarized best by saying that the effect will vary according to recall size, scope, and severity. Other factors such as the company's size and/or reputation, external events, and media coverage may also amplify or suppress the effect.

2.3 – Other Literature Regarding Non-Food Related Recalls and Stock Price Impacts

The literature discussed in this section does not look at food recalls specifically, but rather recalls across all industries. The study by Davidson and Worrell (1991) looked at all recalls from 1968-1987, excluding all recalls or problem product announcements in the automobile industry. There were several hypotheses in Davidson and Worrell's study, but those with the most relevance to this study were: 1) that abnormal returns associated with recalls that replace the product or return the purchase price were more negative than the announcements of a product repair, and 2) that government-ordered recalls would have significantly more negative abnormal returns than voluntary recalls (Davidson III, and Worrell 467-473). The results from this study found that the returns for products that are replaced or the purchase price is returned are significantly more negative than when the products are repaired. This finding is relevant to the food industry in that a food company cannot simply repair a product that is contaminated with bacteria and thus can only replace the item or return the purchase price. The findings for the second hypotheses showed only little evidence that government-ordered recalls produced more negative returns than voluntary recalls (Davidson III, and Worrell 467-473). As mentioned above, the majority of the recalls in the food industry are voluntary. A large reason for this is that food companies want to ensure consumers that their health and safety is a top priority to the company.

The study by Pruitt and Peterson (1986) is essentially the same study as Davidson and Worrell's. Using the same methods and data, the key finding of this study is that security prices continued to react significantly for approximately two months following the initial recall announcement.

2.4 – Food Safety Insurances, Regulations and Recall Management Studies

The next studies are focused on ways to effectively manage recalls and regulations and insurance policies to reduce breaches in food safety. While these studies do not look at the impacts of recalls on shareholder value, the underlying theme is to analyze methods of improving food safety and reducing recall incidents which will ultimately benefit shareholders. There are a few key areas to focus on when discussing the minimization of food contamination. The government has played an integral role in improving industry-wide safety regulations. At the same time, companies are becoming increasingly more concerned with management efficiencies as well as the consumers' well-being.

Role of Government

As mentioned above, the USDA FSIS is the agency that regulates food safety inspections and monitors food recalls which contain meat, poultry and eggs. While most companies take it upon themselves to voluntarily recall contaminated products, the government is needed to assist in the food contamination process (Skees, Botts, and Zeuli 99-111). Without government regulation, some smaller companies may not believe there is an incentive to invest a significant amount of money, time, and labor in food safety inspection technology and processes. Larger companies, however, may see a return on the investment and therefore may be more apt to invest in a quality control process regardless of regulations.

All meat, poultry and egg products are federally inspected by the FSIS. Food processors are also required to implement a Hazard Analysis and Critical Control Points (HACCP) throughout the production process. The implementation of the HACCP system is another way

the FSIS is able to effectively identify the source of a contamination and thus help the company contain the recall.

However, with the amount of food being produced in the U.S. increasing and given the numerous laws regulating food safety, the efficiency of the government's role in the recall process has been analyzed.

Two very similar studies, both by Hooker, Teratanavat, and Salin, (2005) examined the performance and efficiency of regulatory process carried out in accordance with government regulations as well as the efficiency of the plant managers. Overall, these studies found that government assistance in contamination discovery and throughout the recall process is effective. The studies contrast in that one study found that management in the smaller sized plants were more efficient in resolving the incident where the other paper found that larger sized plants who have more of an incentive to implement higher safety standards were more efficient.

Alternatives to Regulation

An alternative to regulation that is proposed by Skees, Botts, and Zeuli (2001) is the potential for companies to purchase insurance policies that would cover direct and indirect recall expenses. There are some incentives associated with insurance policies of this nature. Food processing firms have to consider the potential legal costs they would face if their products were to harm a consumer (Skees, Botts, and Zeuli 99-111). It is nearly impossible and would be incredibly costly for a processing firm to be able to achieve completely safe food production with absolutely no risk of contamination. While insurance will never be able to completely replace regulation, it is possible that it could be a viable option in addition to regulations since food processing companies operate under high risk.

Chapter 3 – Data

The recall data for this study were obtained from the USDA FSIS recall reports. All recalls containing meat and poultry products are recorded chronologically and are publically available. The data set contains over 800 observations resulting from all reported meat recalls from 2000 through 2011. The data includes all meat recalls for beef, pork, chicken, turkey and other miscellaneous meat products. Out of these recalls, there were 112 observations representing 37 publically traded companies. Seven companies are responsible for 68 of the 112 recalls. The companies selected in this study are not meant to be representative for all large diversified food companies. This sample will be looked at on an individual company basis.

In this study, I have selected six independent recall observations that represent four companies. The four companies selected are all representative of large meat and other processed food product companies that are, for the most part, well diversified. These companies are all publically traded through the New York Stock Exchange (NYSE) or the NASDAQ stock markets. The companies are ConAgra Foods, Hain Celestial Group, King Soopers (owned by Kroger) and Smithfield.

3.1 – Company Profiles

ConAgra Foods is a well-established manufacturer, packager, and distributor of consumer and commercial food products. Now in business for more than 150 years, this company has endured through war, depression and other hard economic times. Prior to the first ConAgra recall in 2002, ConAgra's net sales were $27.6 billion dollars with cash dividends per stock share at $0.93. Today, ConAgra's net sales have dropped to approximately $13.3 billion. ConAgra's well diversified portfolio includes 48 branded product lines that are sold worldwide.

The first two recalls, CAG 1.1 and CAG 1.2, occurred in 2002 on June 30 and July 19 respectively. ConAgra Foods' recall, CAG 1.1, originally consisted of 354,200 pounds of ground beef products processed in the Greely, Colorado beef plant. The nationwide recall included a large variety of beef cuts suspected to be contaminated with *E. coli O157:H7*. On July 19, 2002, a second announcement, CAG 1.2, occurred expanding the recall to 19,000,000 pounds following a review of plant practices and company records by FSIS. In the weeks following the recall, one death occurred and more than 45 people in 23 states reported illnesses linked to the contaminated ground beef. In November of 2002, the USDA temporarily shut down the Greely plant due to repeated failures to prevent fecal contamination of carcasses. These two recalls are being treated independently in this study. The following graph shows the daily closing stock prices for a two-year period surrounding recall events CAG 1.1 and CAG 1.2. The decline in closing prices begins on July1, 2009, one day after the initial recall date, and continues through July 22, 2009, three trading days after the expanded recall occurred.

The next ConAgra recall in this study, CAG 2, is a 2007 recall of an undetermined amount of pot pies contaminated with *Salmonella.* The October 11th recall of pot pies containing beef, chicken and turkey were produced in the Marshall, Missouri, plant and more than 17 million pounds were recovered through the recall. More than 165 cases of sickness, including 20 hospitalizations, were linked to the pot pies. Stock prices for ConAgra had begun to fall approximately two weeks prior to the event recall and persisted for about three weeks after the announcement.

The next three recalls occurred within the last five years. Being more recent, information surrounding these recalls were subject to social media and therefore were more widely broadcast. The HAIN recall involving Hain Celestial's frozen chicken products occurred on February 4,

2009. More than 983,700 pounds of chicken entrees that contained peanuts contaminated with Salmonella were recalled nationwide. However, the source of contamination was not the chicken but the peanuts.

Three weeks prior to Hain's recall, the Peanut Corporation of America announced that its peanut supply had been infected with *Salmonella*. The Peanut Corporation of America was a peanut-processor based in Virginia. The company supplied peanuts and other peanut products to food processors, such as Hain Celestial. Shortly after this incident, the Peanut Corporation of America shut down permanently and several administrative employees, including the owner, were charged with fraud, conspiracy and obstruction of justice. Hain Celestial is smaller than the other companies in this study, yet they can still be classified as a large, well-diversified company.

In the year prior to the recall, Hain recorded net sales just over $1 billion with a per share net income of $1.40. This was a nearly 43 percent increase in net sales in just two years and was the first year for the company to exceed $1 billion in net sales. Although Hain was not at fault for the breach in food safety, recalling more than 983,700 pounds of product resulted in a net loss of approximately $25 million. Today, there are over 30 brands listed under the Hain Celestial Group and the company operates internationally. Net sales have once again reached pre-recall levels at $1.1 billion and net income per share is reported at $1.23.

The Kroger Company is one of the world's largest grocery retailers. There are seven grocery store chains, including King Soopers, operated under Kroger Co. On July 22, 2009, a Denver branch of a King Soopers grocery store recalled 466,236 pounds of ground beef containing *Salmonella.* This recall will be denoted as KR for the remainder of the paper.

Financial reports for 2008 show that net sales were $76 billion with a net income per share of $1.90. The net sales for the year in which the event occurred, 2009, were also around $76.7 billion, but the net income per share dropped significantly, 94.2%, to $0.11. Today, Kroger's net sales are approximately $98.6 billion.

Smithfield Foods is a large international food processor with more than 10 brand names in 12 countries. Smithfield Foods' recall (SFD) of Portobello mushroom flavored pork loins on May 4, 2011, is the most recent recall in this study. This recall consisted of 216,238 pounds of pork product that contained an undeclared allergen. While these pork products were not contaminated with a microbiological pathogen like the other recalls, some undeclared allergens are still considered to be a high health risk and fall in the Class 1 category. Smithfield Foods is another strong company with more than $13 billion in net sales and a per share income of $2.21 in 2012. Immediately prior to the recall, Smithfield's net sales were at $12.2 billion with a net income of $3.12 per share.

Chapter 4 – Methods

This chapter will be used to describe the methods used to complete this study. The most common method for analyzing stock returns is the event study method. In this study, I chose to use three different models to estimate the effects of the recalls on the shareholder value. This chapter will give a description of the models and methods and the results will be discussed in the next chapter.

4.1 - Event Study Method

The event study method is commonly used to measure the impact of a specific event on the value of a firm. This method can be applied many ways in the fields of finance and economics. The event study method can be very useful in situations where the marketplace is considered to be rational because the effects of the event will be reflected immediately.

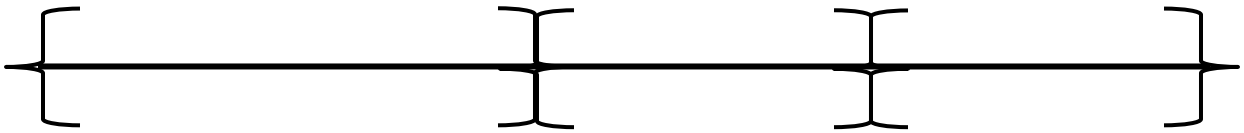
The procedure for conducting an event study is fairly simple. The first step is to determine when the event took place and define the event window. It is important to determine whether the actual event date or the day after the event should be used as the "actual event." This is important because if the food recall is not issued until after the close of the market, then the next day should be used as the event day in order to show the immediate reflection in the market. For this study, the event day that was used as ***t=0*** is the day listed in the official FSIS recall. It is important to note that the recalls CAG 1.1 and CAG 1.2 are related and therefore the time periods for these two recalls overlap. The event day for CAG 1.1 is the initial recall date and the event date for CAG 1.2 is the date of the recall expansion.

Once the event day is set, it is important to determine the event window which is the period over which the security prices will be examined. Typically, the event window should be larger than the period of interest in order to capture the full effect and includes days prior to and following the event. After the event window is set, an appraisal of the event's impact requires a measure of an abnormal return. Typically, recalls are only examined for four to six days prior to and after the event day; however for this study, I chose to analyze ten days prior to the event and ten days post recall event. Daily returns were calculated as the percentage change using closing share prices and excluding dividends.

The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window. The normal return is defined as the expected return without conditioning on the event taking place (MacKinlay, 13-39). For firm ***i*** and event date ***t*** the abnormal return can be found using:

$$AR_{it} = R_{it} - E(R_{it})$$

where AR_{it} is the abnormal return, R_{it} is the actual return that occurred as a result of the recall and $E(R_{it})$ is the normal return that would be expected if there were no recall event. For all models, the actual return is the natural log of the ratio of today's price, ***t***, to yesterday's stock price, ***t-1***. The test period for this study, is the 20 day period surrounding the recall event. The estimation period is the 30 days prior to the time the event window started. In this study, the timeline can be pictured as:



Once the abnormal returns are found, the cumulative abnormal returns (CAR) are estimated. The CAR is the sum of the differences between the expected (normal) return and the actual return and is often used to evaluate the impact of an announcement on a stock price.

The three models used in this study are similar in approach and execution. The difference in the three models is the benchmark expected returns. The purpose of using such similar models is to 1) check for consistency in the results and 2) verify that the information is disseminating through the market at an efficient rate.

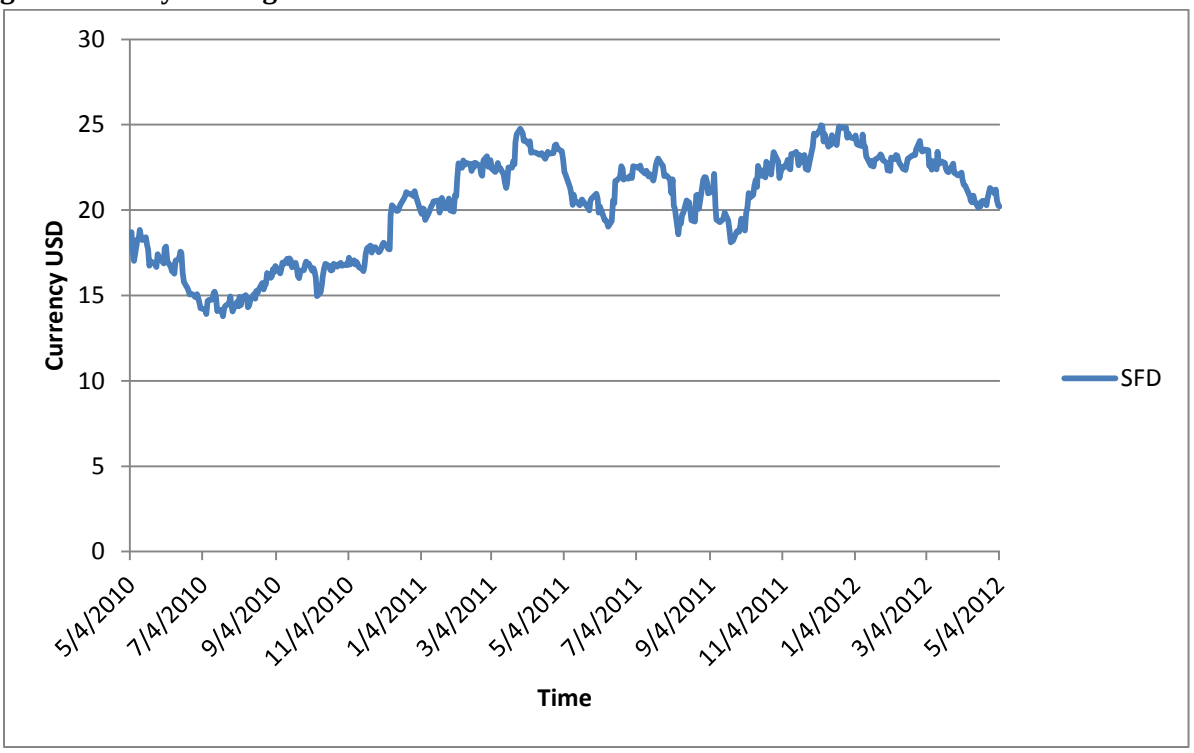
4.2 - Model 1 Using Historical Daily Stock Prices

In the first model, historical 30-day daily stock prices are used to estimate the average return for the 30 day estimation period from ***t-40*** to ***t-10***. In this study, this value is referred to as the normal return because it is what would be expected if there was no recall event. This value is then held constant for each day during the test period. The expected normal return for Model 1 is calculated by

$$\bar{R} = Average\ ln\left(\frac{P_t}{P_{t-1}}\right)$$

The normal return is then subtracted from the actual return to give us the abnormal return. I chose to use the daily stock prices as a benchmark in this model because using the company's historical stock prices are a good estimator to show the company's average performance. Below is an example of the daily closing stock prices from the recent SFD recall that were used in Model 1. Figure 4.1 includes actual daily closing prices for a two year window surrounding the SFD recall for Smithfield Foods from 2010-2012. Figures depicting two years of daily closing prices for each of the other recalls can be found in the appendix.

Figure 4.1 Daily Closing Stock Prices for Smithfield Foods 2010-2012

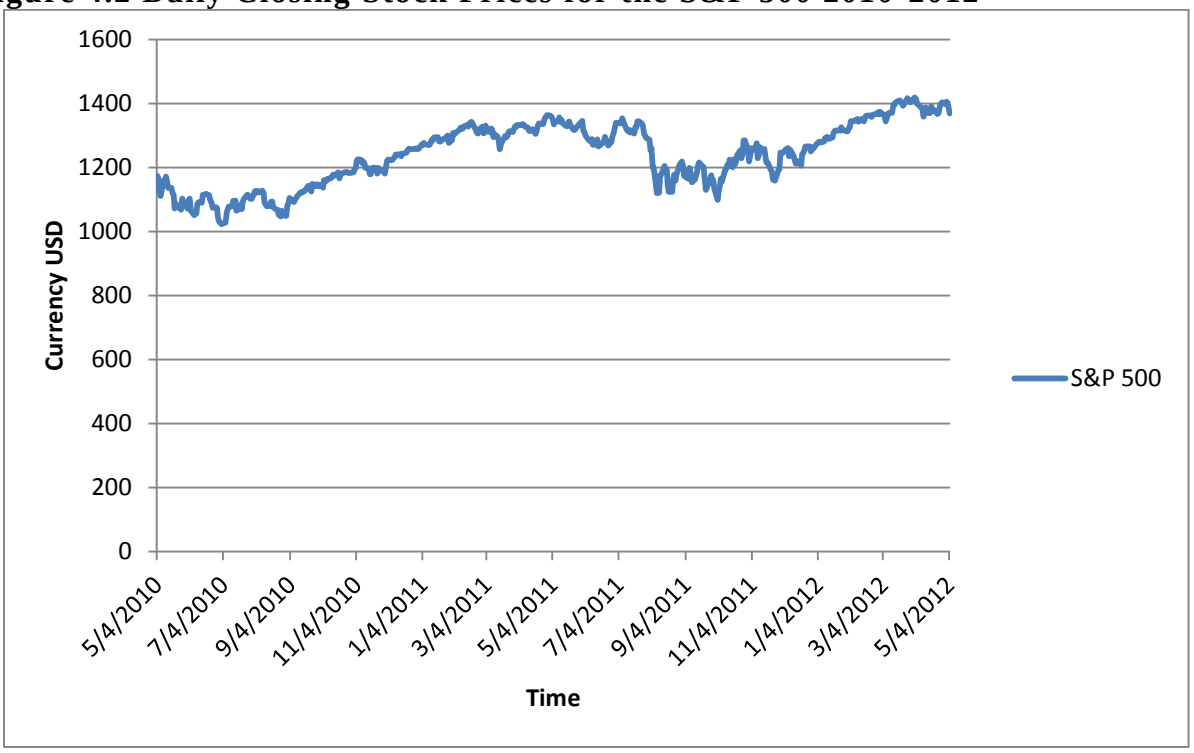


4.3 – Model 2 Using S&P 500 Prices

The second model uses the prices from the Standard and Poor's (S&P) 500 index as the benchmark. The S&P 500 is a stock market index based on the market capitalizations of the leading publically traded companies in the U.S. stock market. Using the adjusted mean return from the same time window shows how the individual company's stock prices reacted to the recall compared to the S&P's index. Figure 4.2 is an example of the daily closing prices for the S&P 500 for a two year period corresponding with the SFD recall. Figures depicting two years of S&P 500 daily closing prices corresponding with each of the other recalls can be found in the appendix. The expected normal return for Models 2 and 3 are calculated by

$$R = \ln(\frac{P_t}{P_{t-1}})$$

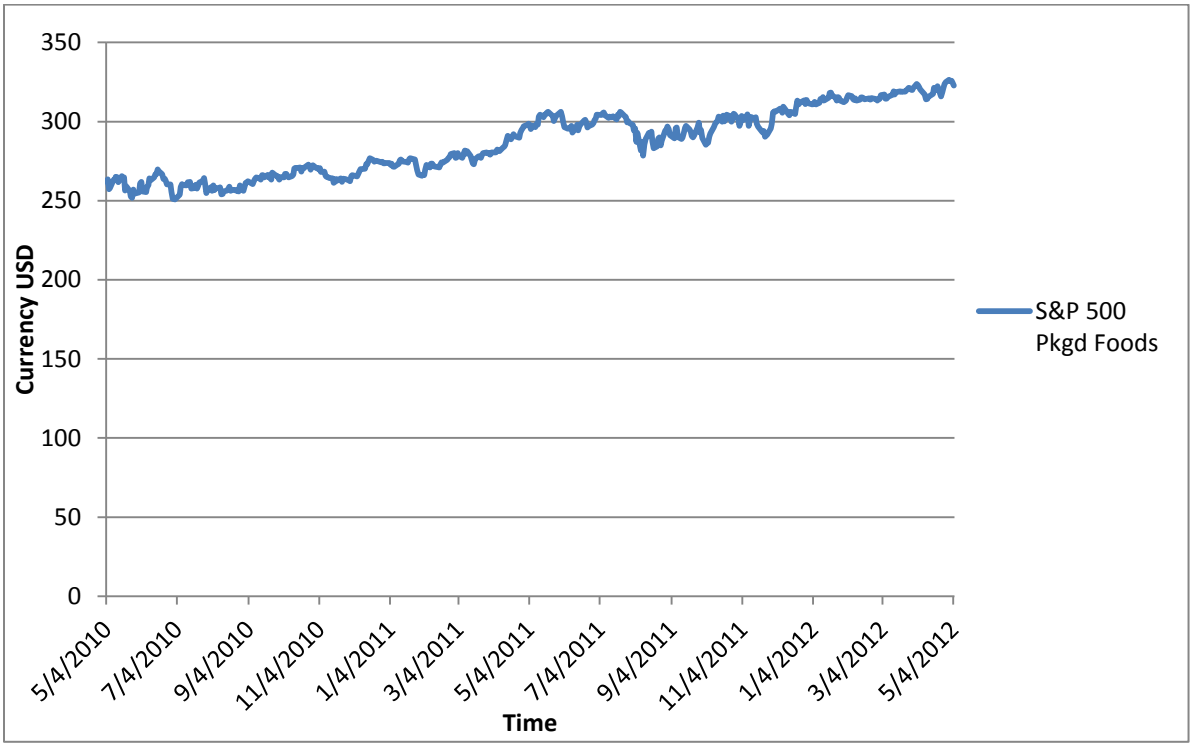
Figure 4.2 Daily Closing Stock Prices for the S&P 500 2010-2012



4.4 – Model 3 Using S&P 500-Packaged Foods and Meats Prices

The third model is very similar to the second. This model uses the prices from the S&P 500's Packaged Foods and Meats index as a benchmark. This index was selected because it is the index used by a large majority of processed food companies as a financial comparison. This index would be expected to track market condition of meat companies better than the more aggregate S&P 500.

Figure 4.3 Daily Closing Stock Prices for the S&P 500-Packaged Foods 2010-2012



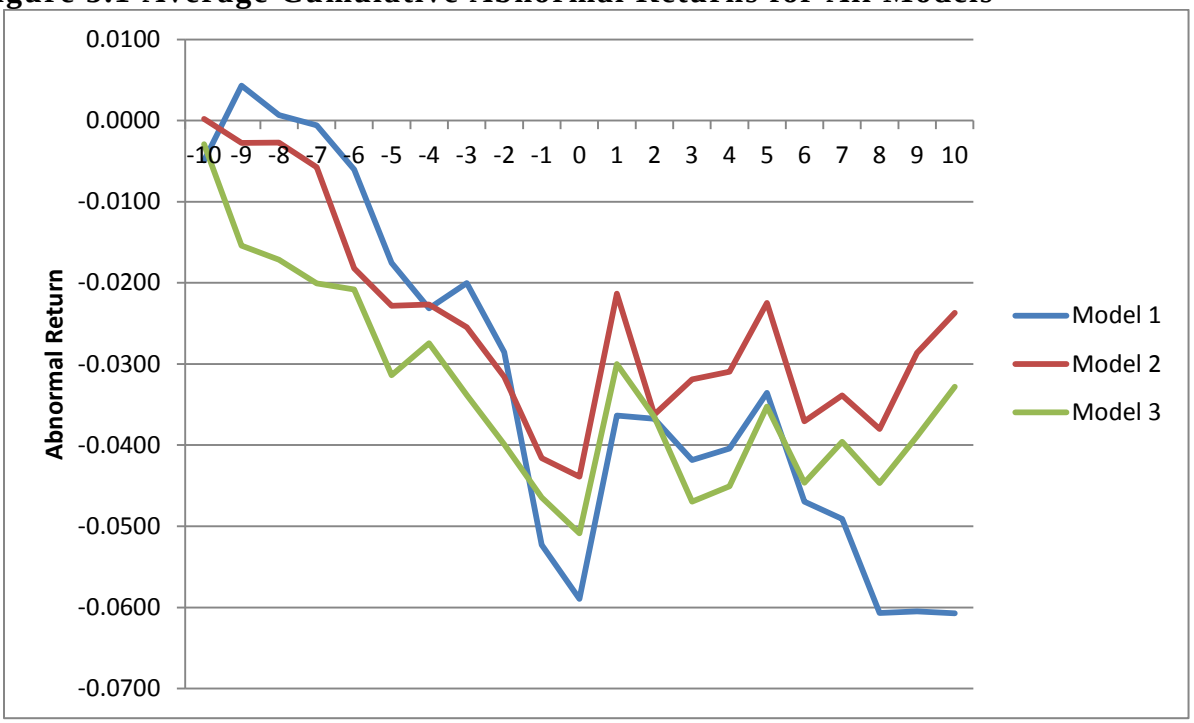
Chapter 5 – Results

This chapter will be a discussion of the results from this study. Conclusions will be made on how the individual recalls affected each company as well as looking at the overall effect of all the recalls on the financial markets. In the latter part of this chapter, I will compare the results of this study to those of previous studies.

5.1 – Study Results

The results from this study showed that in general, there was an overall negative effect on shareholder value for the six recalls. Figure 5.1 shows the average CAR's for the three models. The trend is similar for all of the models, which indicates consistency between the models. Looking at the general effects of all of the recalls, this figure indicates that there was some anticipation of an event that possessed a negative reaction. In some cases, this may have been attributed to some level of leakage of information in the media. The sudden increases on day 1 after the recall can be attributed to the reaction of the market due to the announcement.

Figure 5.1 Average Cumulative Abnormal Returns for All Models



Looking at the individual recalls, we can determine the impacts of each recall more specifically. Figure 5.2 shows each individual company's CARs for Model 1. The results from this model vary slightly from those of Models 2 and 3.

Figure 5.2 Individual Cumulative Abnormal Returns for Model 1

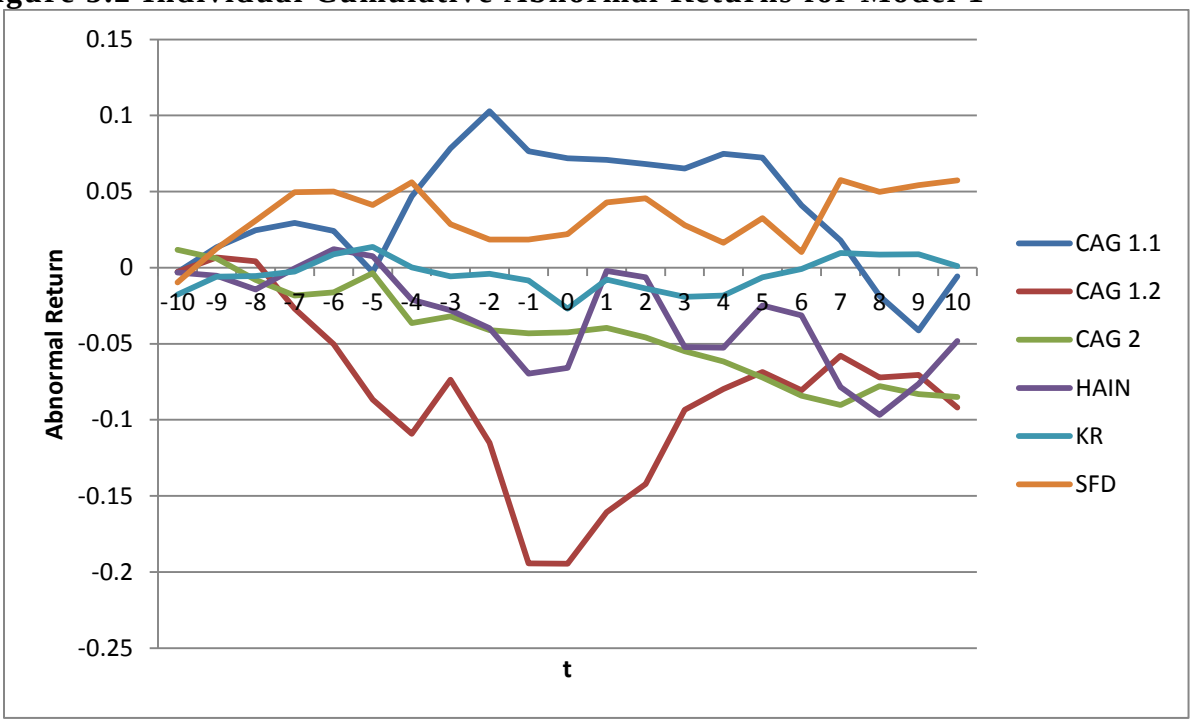


Figure 5.3 shows the CARs for each recall for Model 2. In this model, the results show that there was not a significant impact on stock process for the CAG 1.1, CAG 1.2 and SFD recalls. The increase in CAG 1.1's CAR could possibly indicate that that stock market reacted positively as a result of the recall. Because CAG 1.2 is representative of and expansion of CAG 1.1 and the CARs for this recall remain unchanged from day -5 to day 0, we can assume that once the news of the initial recall (CAG 1.1) was released and the initial shock was felt, the anticipated subsequent news of the expansion was not a major concern for shareholders. In fact, even after the expansion was issued, CAG 1.2's CAR showed an increase, which indicates a positive effect. The SFD recall remains relatively unchanged for the duration of the event window meaning the news of the recall did not have much of an impact on Smithfield's stock market prices for that time period. The CARs for CAG 2, HAIN, and KR recalls show a decreasing slope for the majority of the days prior to the event day. There could be a couple of

explanations for this. The primary one is that with social media and instantaneous news rapidly rising at the time of these recalls, information may have leaked into the markets and triggered the preemptive decline. According to these results, it seems, however, that once the event broke on day 0, the decline of the CARs became stagnant.

Figure 5.3 Individual Cumulative Abnormal Returns for Model 2

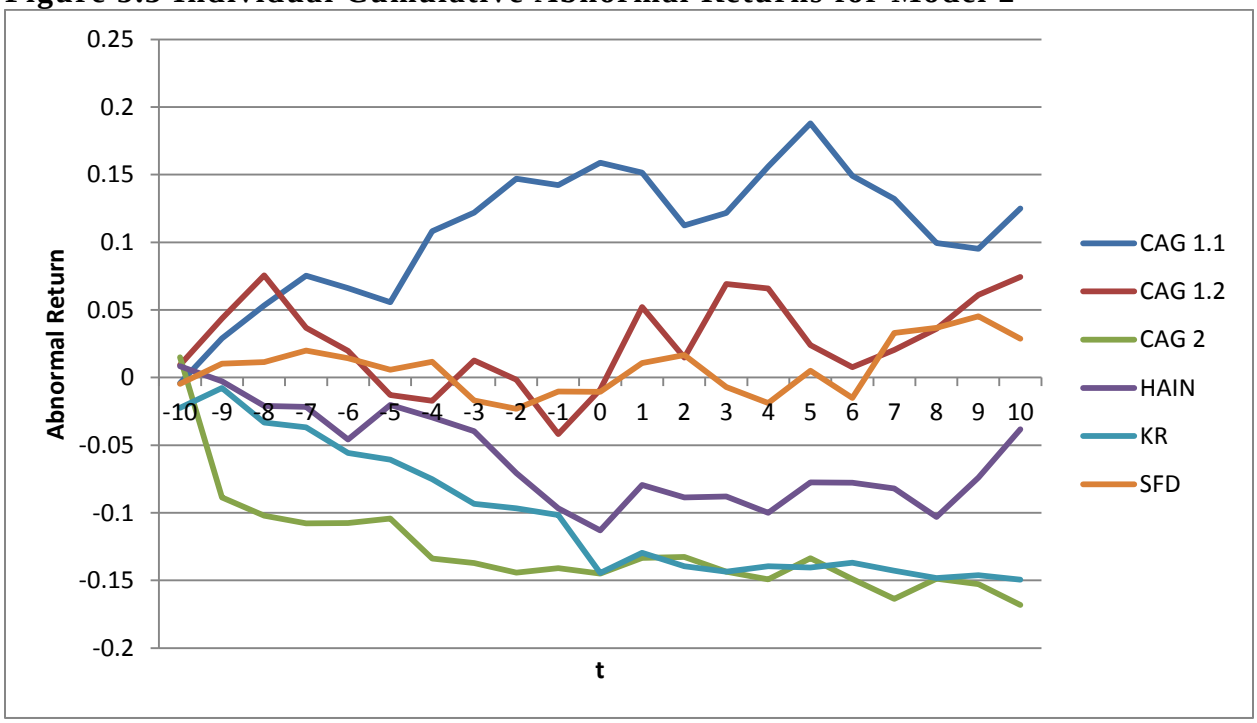
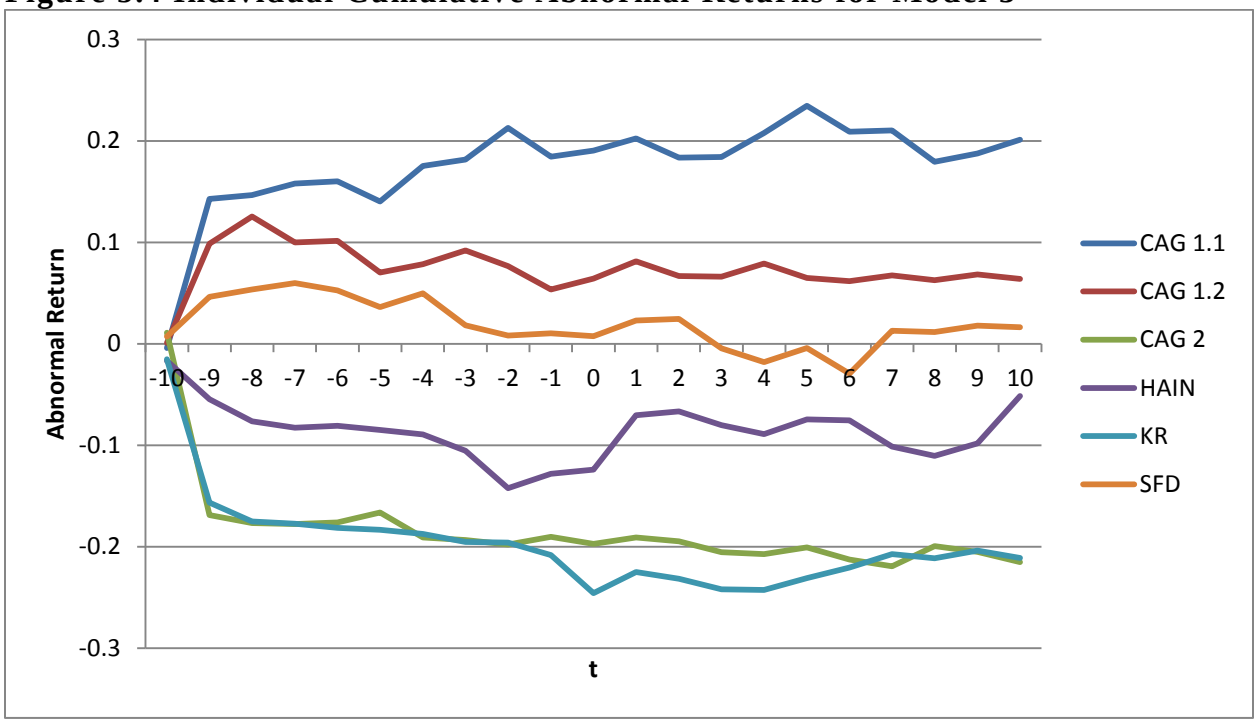


Figure 5.4 shows the individual CARs for each recall for Model 3. In this model, the results is similar to those of Models 1 and 2, but depicts a clearer image of how the market reacted to each of the recalls. Here again, CAG 1.1's CARs show a slight yet steady increase throughout the entire event window. CAG 1.2 and SFD's CARs remain relatively flat and indicate there was no impact resulting from the recalls. The results for CAG 2, HAIN, and KR are also similar to those from Model 2. In this model, the three recalls continue to exhibit decreasing CARs beginning from day -10 and lasting throughout the time frame.

Figure 5.4 Individual Cumulative Abnormal Returns for Model 3



The ARs and CARs for each of the recalls as well as the sums of the ARs for all recalls can be found in the appendix.

Tables 5.1 and 5.2 show the ARs and CARs, respectively, for Model 1 as percentages. Also included in both tables, are the sums of the ARs or CARs, the standard deviations and the t-statistic for each day ***t***. For Model 1, ARs for four out of the 21 days were statically significant from zero. This implies that looking across all of the recalls for each day ***t***, there is evidence that, for the most part, the recalls had a little impact on shareholder values. The day immediately before the recall announcement showed that the stock market reacted negatively. This can be attributed to anticipation of the recall in the market. Days 6 and 8 after the recall were also significantly negative. Day ***t-1*** and day ***t+1*** are both highly significant. In some of these recalls, leakage of media and/or anticipation of a recall may have contributed greatly to the large abnormal return. The t-test for each recall, located at the bottom of each recall's column, shows

that the CAG 2 and KR recalls are the two recalls in this model that had the most negative effect on shareholder values.

Table 5.1 Abnormal Returns for Model 1

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM AR	STDEV AR	T-STAT
-10	-0.3035	-0.2831	1.1727	-0.3242	-2.2492	-0.9652	-2.9525	1.1127	-1.0833
-9	1.6496	0.9522	-0.5579	-0.202	1.4705	2.2138	5.5263	1.0912	2.0675*
-8	1.1169	-0.2438	-1.4156	-0.9101	-2.5552	1.8467	-2.1611	1.6309	-0.5410
-7	0.4848	-3.1301	-1.0403	1.3915	-0.3455	1.8718	-0.7678	1.8208	-0.1722
-6	-0.5287	-2.3213	0.2155	1.2551	-1.9103	0.028	-3.2617	1.354	-0.9834
-5	-2.7174	-3.6372	1.2686	-0.4557	-0.4958	-0.8755	-6.9129	1.7594	-1.6041
-4	4.9937	-2.2581	-3.2958	-2.8645	-1.4283	1.4959	-3.3571	3.2094	-0.4270
-3	3.1406	3.5522	0.4595	-0.689	-1.8316	-2.7566	1.8751	2.5898	0.2956
-2	2.433	-4.1476	-0.9028	-1.1712	-0.3156	-1.0145	-5.1187	2.101	-0.9946
-1	-2.6214	-7.91	-0.2223	-2.9921	-0.5057	0.0114	-14.24	2.9967	-1.9400*
0	-0.4668	-0.0285	0.06	0.3679	-4.2844	0.3574	-3.9945	1.799	-0.9065
1	-0.0949	3.3799	0.3013	6.3893	1.4913	2.0752	13.5421	2.3796	2.3233*
2	-0.2822	1.852	-0.6254	-0.4232	-1.0025	0.26	-0.2212	1.0143	-0.0890
3	-0.2831	4.8755	-0.9143	-4.584	-0.4013	-1.7594	-3.0665	3.0786	-0.4066
4	0.9522	1.3688	-0.6757	-0.0503	0.4099	-1.1464	0.8585	0.959	0.3655
5	-0.2438	1.1096	-1.0527	2.7826	-0.0963	1.6121	4.1114	1.4094	1.1909
6	-3.1301	-1.1975	-1.1893	-0.6599	0.3479	-2.2192	-8.0481	1.2109	-2.7134*
7	-2.3213	2.2725	-0.6102	-4.718	-0.5915	4.7135	-1.2549	3.3313	-0.1538
8	-3.6372	-1.427	1.2382	-1.83	-0.5327	-0.7759	-6.9646	1.6093	-1.7668*
9	-2.2581	0.1786	-0.5224	2.0572	0.1988	0.4564	0.1106	1.4058	0.0321
10	-0.6125	-2.144	-0.1885	2.814	-0.3232	0.3079	-0.1463	1.62	-0.0369
Average	-0.2252	-0.4375	-0.4046	-0.2294	-0.7119	0.2732			
T-Test	-0.4768	-0.6721	-1.7908*	-0.4112	-2.4422*	0.7090			

*Indicates statistically different from zero at the .05 level.

Table 5.2 Cumulative Abnormal Returns for Model 1

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM CAR	STDEV CAR
-10	-0.3035	-0.2831	1.1727	-0.3242	-2.2492	-0.9652	-2.9525	1.1127
-9	1.3461	0.6691	0.6148	-0.5261	-0.7787	1.2486	2.5738	0.8917
-8	2.4630	0.4253	-0.8007	-1.4363	-3.3339	3.0953	0.4127	2.4339
-7	2.9478	-2.7048	-1.8411	-0.0447	-3.6794	4.9672	-0.3551	3.3937
-6	2.4191	-5.0260	-1.6256	1.2103	-5.5897	4.9952	-3.6167	4.2246
-5	-0.2983	-8.6632	-0.3570	0.7546	-6.0855	4.1197	-10.5296	4.7194
-4	4.6954	-10.9213	-3.6528	-2.1099	-7.5138	5.6156	-13.8868	6.5569
-3	7.8360	-7.3691	-3.1933	-2.7988	-9.3454	2.8590	-12.0117	6.4062
-2	10.2690	-11.5166	-4.0962	-3.9700	-9.6610	1.8445	-17.1303	7.9807
-1	7.6476	-19.4266	-4.3185	-6.9621	-10.1667	1.8559	-31.3704	9.4424
0	7.1808	-19.4551	-4.2585	-6.5942	-14.4511	2.2133	-35.3649	9.9697
1	7.0859	-16.0752	-3.9572	-0.2049	-12.9599	4.2885	-21.8227	9.2876
2	6.8038	-14.2232	-4.5826	-0.6281	-13.9623	4.5485	-22.0440	8.9959
3	6.5207	-9.3477	-5.4969	-5.2121	-14.3636	2.7891	-25.1105	7.6978
4	7.4729	-7.9789	-6.1726	-5.2624	-13.9537	1.6427	-24.2520	7.5456
5	7.2291	-6.8693	-7.2253	-2.4798	-14.0501	3.2548	-20.1406	7.7226
6	4.0990	-8.0668	-8.4146	-3.1397	-13.7022	1.0356	-28.1887	6.6171
7	1.7777	-5.7943	-9.0248	-7.8577	-14.2936	5.7492	-29.4435	7.3865
8	-1.8594	-7.2212	-7.7866	-9.6877	-14.8263	4.9732	-36.4081	6.8369
9	-4.1175	-7.0426	-8.3090	-7.6305	-14.6275	5.4297	-36.2975	6.5981
10	-4.7300	-9.1867	-8.4975	-4.8165	-14.9507	5.7375	-36.4438	6.8885

Tables 5.3 and 5.4 show the ARs and CARs, respectively, for Model 2 as percentages. Compared to Model 1, the results in this model are fairly similar. When using the S&P 500 index prices, there are four days that are significant across all recalls. In this model, the two days immediately after the recall showed signs of having the greatest impact on shareholder returns. However, day 1 after the recall shows a positive effect on prices. This could be because consumers did not think that the recall announcement was overly alarming or that news coverage of the recall was minimal and not widely distributed. Looking more closely at the data for the individual recalls, we can see that the changes in the S&P 500 were relatively proportionate to the changes in the daily stock prices for the individual companies during the event window. Again in this model, the t-test for the KR recall was significantly different from zero and was the only recall that showed any significant impact on shareholder values.

Because the S&P 500 spans across all markets, it is not surprising that this model does not produce any significant results. Furthermore, even though the size of the recalls included in this study can be considered large, the impact they possess in their respective markets does not seem to impact the S&P 500.

Table 5.3 Abnormal Returns for Model 2

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM AR	STDEV AR	T-STAT
-10	-0.4142	0.9257	1.4963	0.8358	-2.2492	-0.4783	0.116	1.3602	0.0348
-9	3.2999	3.4381	-1.8574	-1.1061	1.4705	1.4891	6.7341	2.2002	1.2495
-8	2.452	3.1943	-1.3683	-1.8318	-2.5552	0.1341	0.0251	2.366	0.0043
-7	2.1866	-3.894	-0.5634	-0.0629	-0.3455	0.8487	-1.8306	2.0272	-0.3687
-6	-0.9071	-1.6915	0.0253	-2.4135	-1.9103	-0.5705	-7.4674	0.9154	-3.3303*
-5	-1.0502	-3.2781	0.3378	2.5445	-0.4958	-0.8437	-2.7854	1.9027	-0.5976
-4	5.2443	-0.4069	-2.9529	-0.9271	-1.4283	0.5743	0.1033	2.8148	0.0150
-3	1.3812	2.9706	-0.3262	-1.0035	-1.8316	-2.864	-1.6735	2.1418	-0.3190
-2	2.4987	-1.4257	-0.7107	-3.11	-0.3156	-0.6031	-3.6663	1.8263	-0.8196
-1	-0.4765	-4.0164	0.3156	-2.6082	-0.5057	1.282	-6.0092	1.9566	-1.2538
0	1.6615	3.3008	-0.3936	-1.6233	-4.2844	-0.0351	-1.374	2.6264	-0.2136
1	-0.7324	6.1017	1.1637	3.3674	1.4913	2.1466	13.5383	2.3128	2.3897*
2	-3.9064	-3.7395	0.0548	-0.9394	-1.0025	0.5751	-8.958	1.9022	-1.9226*
3	0.9257	5.4232	-1.0696	0.085	-0.4013	-2.3682	2.5948	2.6857	0.3944
4	3.4381	-0.3226	-0.5796	-1.2105	0.4099	-1.1645	0.5707	1.7433	0.1336
5	3.1943	-4.1742	1.5629	2.241	-0.0963	2.3722	5.0999	2.6979	0.7717
6	-3.894	-1.6386	-1.5477	-0.023	0.3479	-2.0003	-8.7557	1.5225	-2.3478*
7	-1.6915	1.281	-1.4659	-0.4229	-0.5915	4.7975	1.9068	2.4327	0.3200
8	-3.2781	1.5579	1.5034	-2.1028	-0.5327	0.3833	-2.469	1.9631	-0.5135
9	-0.4069	2.4968	-0.404	2.899	0.1988	0.8406	5.6243	1.4451	1.5889
10	1.545	1.3286	-1.5371	3.594	-0.3232	-1.6404	2.9669	2.0377	0.5944
Average	0.5271	0.3539	-0.3960	-0.1818	-0.7119	0.1369			
T-Test	0.9602	0.5128	-1.5099	-0.4102	-2.4422*	0.3551			

*Indicates statistically different from zero at the .05 level.

Table 5.4 Cumulative Abnormal Returns for Model 2

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM CAR	STDEV CAR
-10	-0.4142	0.9257	1.4963	0.8358	-2.2492	-0.4783	0.1160	1.3602
-9	2.8857	4.3637	-8.8587	-0.2703	-0.7787	1.0109	-1.6474	4.6281
-8	5.3378	7.5580	-10.2270	-2.1021	-3.3339	1.1450	-1.6222	6.4283
-7	7.5244	3.6640	-10.7904	-2.1650	-3.6794	1.9936	-3.4528	6.4294
-6	6.6173	1.9725	-10.7650	-4.5785	-5.5897	1.4232	-10.9203	6.2916
-5	5.5671	-1.3055	-10.4272	-2.0340	-6.0855	0.5794	-13.7057	5.5068
-4	10.8114	-1.7125	-13.3801	-2.9610	-7.5138	1.1537	-13.6024	8.1800
-3	12.1926	1.2582	-13.7063	-3.9646	-9.3454	-1.7103	-15.2758	9.0021
-2	14.6913	-0.1675	-14.4170	-7.0746	-9.6610	-2.3134	-18.9421	10.1257
-1	14.2148	-4.1839	-14.1014	-9.6827	-10.1667	-1.0314	-24.9514	10.1276
0	15.8763	-0.8830	-14.4950	-11.3060	-14.4511	-1.0665	-26.3254	11.7067
1	15.1439	5.2187	-13.3313	-7.9387	-12.9599	1.0801	-12.7871	11.3066
2	11.2375	1.4791	-13.2765	-8.8781	-13.9623	1.6553	-21.7451	10.0243
3	12.1632	6.9023	-14.3461	-8.7931	-14.3636	-0.7129	-19.1502	11.1751
4	15.6012	6.5797	-14.9258	-10.0036	-13.9537	-1.8774	-18.5795	12.2494
5	18.7955	2.4055	-13.3628	-7.7626	-14.0501	0.4948	-13.4796	12.3713
6	14.9015	0.7669	-14.9106	-7.7855	-13.7022	-1.5055	-22.2354	11.0743
7	13.2100	2.0479	-16.3765	-8.2084	-14.2936	3.2920	-20.3286	11.4938
8	9.9320	3.6058	-14.8731	-10.3113	-14.8263	3.6753	-22.7976	10.8248
9	9.5251	6.1026	-15.2771	-7.4122	-14.6275	4.5159	-17.1733	10.9682
10	11.0700	7.4312	-16.8142	-3.8182	-14.9507	2.8755	-14.2064	11.6036

The results of Model 3 show that there are six days where the ARs are significantly different from zero. From day ***t+1*** through day ***t+6***, there are four days that are significantly different from zero across all recalls. Here again, the day immediately following the announcement showed a positive effect on prices.

Because this model uses the S&P 500 – Packaged Foods and Meats index, it would be expected to see that the recalls did have more of an impact on daily stock prices than the S&P 500 model. In this model, there are no t-tests for individual recalls that show signs of being significant.

Overall, the impacts of theses recalls show that there seems to be no consistency between the recalls and their impact on the stock prices. There were days for each model where the stocks were significantly different; however, there is no correlation between the three studies and the exact days on which the market prices were affected. Tables for each recall that includes the price and index data in this study can be found in the index.

Table 5.5 Abnormal Returns for Model 3

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM AR	STDEV AR	T-STAT
-10	-0.1313	0.0905	1.0993	-1.6883	-1.5340	0.6984	-1.4653	1.1460	-0.5982
-9	1.9245	2.3464	-1.1755	0.0259	0.8358	1.0400	4.9970	1.2814	2.0400*
-8	0.3764	2.6834	-0.7867	-2.1610	-1.8820	0.7356	-1.0345	1.8186	-0.4223
-7	1.1229	-2.5650	-0.1118	-0.6477	-0.2010	0.6365	-1.7663	1.2805	-0.7211
-6	0.2167	0.1495	0.1603	0.1953	-0.4250	-0.7330	-0.4366	0.4049	-0.1782
-5	-1.9957	-3.1120	0.9936	-0.3911	-0.1880	-1.6500	-6.3427	1.4737	-2.5894*
-4	3.5045	0.8179	-2.4693	-0.4460	-0.4170	1.3808	2.3705	2.0195	0.9678
-3	0.6554	1.3515	-0.2461	-1.6249	-0.7850	-3.1820	-3.8302	1.6279	-1.5637
-2	3.1026	-1.5380	-0.4569	-3.6857	-0.0700	-1.0030	-3.6506	2.2169	-1.4904
-1	-2.8392	-2.3070	0.7580	1.4252	-1.2020	0.2410	-3.9243	1.7278	-1.6021
0	0.6012	1.0732	-0.6809	0.4136	-3.7770	-0.2940	-2.6640	1.7504	-1.0876
1	1.2098	1.7063	0.6390	5.3408	2.0796	1.5512	12.5266	1.6665	5.1140*
2	-1.9103	-1.4590	-0.3827	0.3806	-0.6610	0.1373	-3.8945	0.8939	-1.5899
3	0.0905	-0.0630	-1.0659	-1.3375	-1.0170	-2.8800	-6.2734	1.0685	-2.5611*
4	2.3464	1.2991	-0.2101	-0.8881	-0.0690	-1.3560	1.1216	1.3901	0.4579
5	2.6834	-1.4380	0.6774	1.4475	1.1649	1.3715	5.9067	1.3598	2.4114*
6	-2.5650	-0.3140	-1.2194	-0.0800	1.0403	-2.5120	-5.6506	1.4312	-2.3068*
7	0.1495	0.5699	-0.6520	-2.5939	1.3234	4.2331	3.0301	2.2645	1.2370
8	-3.1115	-0.4590	2.0076	-0.9181	-0.4130	-0.1480	-3.0415	1.6381	-1.2417
9	0.8179	0.5625	-0.5843	1.2340	0.7705	0.6469	3.4475	0.6133	1.4074
10	1.3515	-0.4260	-0.9978	4.6459	-0.7270	-0.1710	3.6757	2.1398	1.5006
Average	0.3619	-0.0491	-0.2240	-0.0645	-0.2930	-0.0598			
T-Test	0.4616	-0.0759	-0.5479	-0.0741	-0.5602	-0.0861			

*Indicates statistically different from zero at the .05 level.

Table 5.6 Cumulative Abnormal Returns for Model 3

t	CAG 1.1 (%)	CAG 1.2 (%)	CAG 2 (%)	HAIN (%)	KR (%)	SFD (%)	SUM CAR	STDEV CAR
-10	-0.4142	0.0905	1.09926	-1.6883	-1.5338	0.6984	-1.7482	1.1462
-9	14.289	9.8681	-16.89	-5.4806	-15.649	4.6139	-9.2491	13.1817
-8	14.665	12.551	-17.677	-7.6417	-17.531	5.3495	-10.2835	14.5726
-7	15.788	9.9864	-17.789	-8.2894	-17.732	5.986	-12.0498	14.5616
-6	16.005	10.136	-17.629	-8.0941	-18.157	5.2529	-12.4865	14.6046
-5	14.009	7.0244	-16.635	-8.4852	-18.345	3.6026	-18.8291	13.3022
-4	17.514	7.8423	-19.104	-8.9312	-18.762	4.9834	-16.4586	15.1306
-3	18.169	9.1938	-19.35	-10.556	-19.547	1.8018	-20.2889	15.6028
-2	21.272	7.6563	-19.807	-14.242	-19.617	0.7989	-23.9395	16.7105
-1	18.432	5.349	-19.049	-12.817	-20.819	1.0399	-27.8638	15.4959
0	19.033	6.4223	-19.73	-12.403	-24.596	0.746	-30.5278	16.7143
1	20.243	8.1286	-19.091	-7.0622	-22.517	2.2971	-18.0011	16.4224
2	18.333	6.67	-19.474	-6.6816	-23.178	2.4344	-21.8956	15.9228
3	18.423	6.6068	-20.54	-8.0191	-24.194	-0.446	-28.1691	16.2640
4	20.77	7.9059	-20.75	-8.9072	-24.264	-1.802	-27.0475	17.1688
5	23.453	6.4679	-20.072	-7.4597	-23.099	-0.431	-21.1408	17.3764
6	20.888	6.1534	-21.292	-7.5398	-22.059	-2.943	-26.7915	16.4923
7	21.038	6.7233	-21.944	-10.134	-20.735	1.2902	-23.7614	16.7900
8	17.926	6.2646	-19.936	-11.052	-21.148	1.1424	-26.8028	15.5499
9	18.744	6.8271	-20.521	-9.8177	-20.377	1.7893	-23.3553	15.7668
10	20.096	6.4014	-21.518	-5.1719	-21.104	1.6181	-19.6795	16.2362

5.2 – Comparative Results

As mentioned in chapter 2, Salin and Hooker (2001) found that the large recall in the study had no effect on the firm's daily returns due to the fact that it is a large, highly diversified corporation. We see similar effects in this study, in that all of these recalls represent relatively large food processing companies and grocery stores, all of which operate in several areas under multiple names. However, we do see a negative reaction to most of these recalls in each of the three models. The reactions do not last for more than a few days in each of the cases, but this could be attributed to the increase in media technology and the fact that the coverage of these recalls had a greater reach than the coverage of the 1996 to 1998 recalls in Salin and Hooker's 2001 study.

We also learned from their study that two recalls by the same company in a short time span cannot be treated independently. In fact, in this study, we actually see a positive effect on ConAgra's daily returns once the initial recall, CAG 1.1, was expanded and the announcement of CAG 1.2 was made. Salin and Hooker suggested in their study that it was most likely attributed to the market learning that the company manages contamination recalls well and felt there were no long-term financial effects. Here we cannot assume that the market had fully learned the lesson in the matter of three weeks between the two recalls. It can be believed, however, that with the recall expansion, consumers saw this as an act of good faith by ConAgra which strengthened consumer confidence.

Thomsen and McKenzie (2001) found that markets tend to respond negatively before the recall announcement. There is often some leakage in the media which leads to anticipation of a recall in the market. There is evidence of this happening in this study, in particular in the HAIN

recall. This is not surprising because of the extremely large announcement of the peanut contamination that occurred in the weeks prior to Hain's recall.

The results of this study are comparable to results of previous studies. There is an overall effect of Class 1 recalls that is evident. However, the impact that a recall has on a firm's shareholder value is ultimately a factor of the size and severity of the recall, the company's existing reputation and financial position, and external events that may multiply or suppress the impact.

Chapter 6 – Conclusion

The amount of food that is being consumed and the number of consumers grows each year. At the same time, guidelines and regulations for food production in the U.S. is constantly improving. The U.S. food supply is considered among the safest in the world. With that being said, it is also important to remember that there is no way of achieving a 100 percent assurance that a food product will never come in contact with a microbiological pathogen or some other form of contamination without degradation of the product. Even though the volume of food being produced is increasing, the number of recall events involving meat products has remained relatively stable over the last decade.

This event study suggests that Class 1 food recall events do have an impact on the financial markets, even if the impact is small and temporary. The recalls for these larger firms were not associated to large or consistent reductions in returns. Like all studies, there were limitations. The recalls included in this study are not a representative sample of all recalls and thus the results from this study cannot be applied across all markets or recalls. The amount of recall data available limits the study.

Implications of this study may be used to further estimate firm-specific events on shareholder values. Future studies may include all Class 1 recalls. As the literature review shows, there are several ways in which stock price data and the event study methodology can be used to evaluate many different hypotheses regarding this topic. Stock prices and recall information are easily attainable and the methodology is fairly straightforward. Further research is encouraged using more recent and future data. It would be interesting if data over a longer

period of time could be examined to determine if there is an underlying trend is not apparent in a shorter event window.

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Appendix

Figure A-1 Daily Closing Stock Prices for ConAgra 2001-2003

Figure A-2 Daily Closing Stock Prices for ConAgra 2006-2008

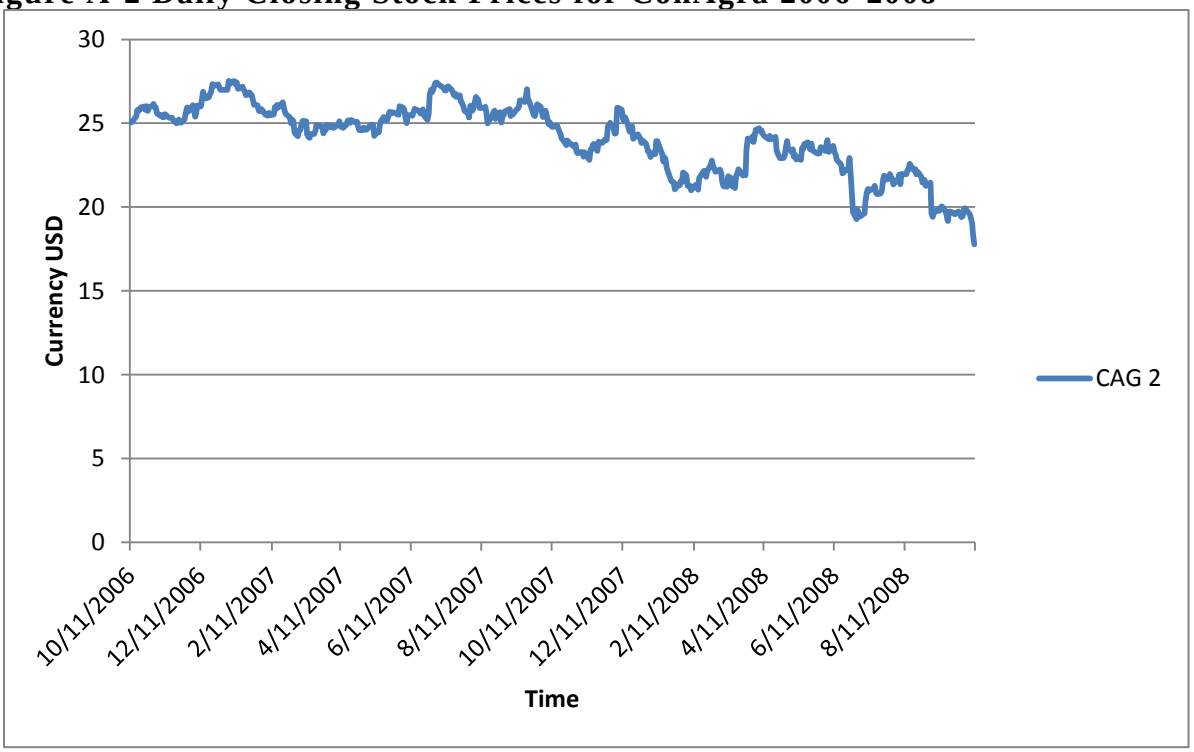


Figure A-3 Daily Closing Stock Prices for Hain 2008-2010

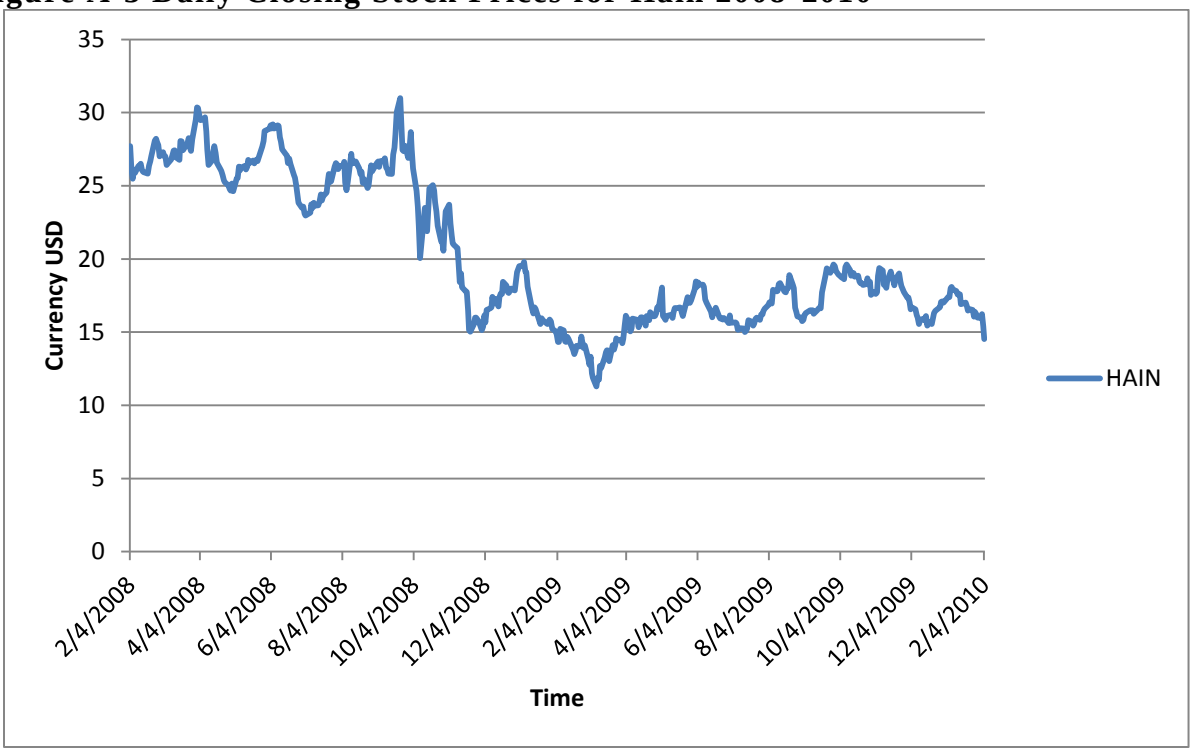


Figure A-4 Daily Closing Stock Prices for Kroger 2008-2010

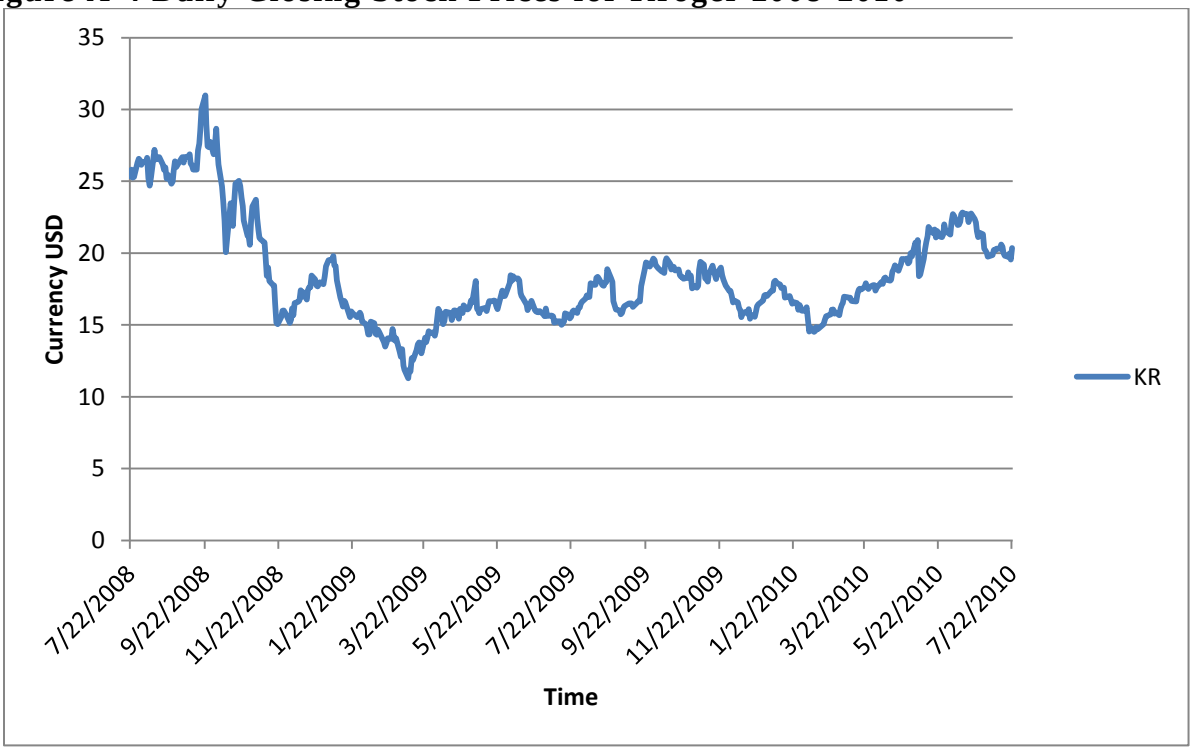


Figure A-5 Daily Closing Stock Prices for S&P 500 2001-2003 (CAG 1.1 & CAG 1.2)

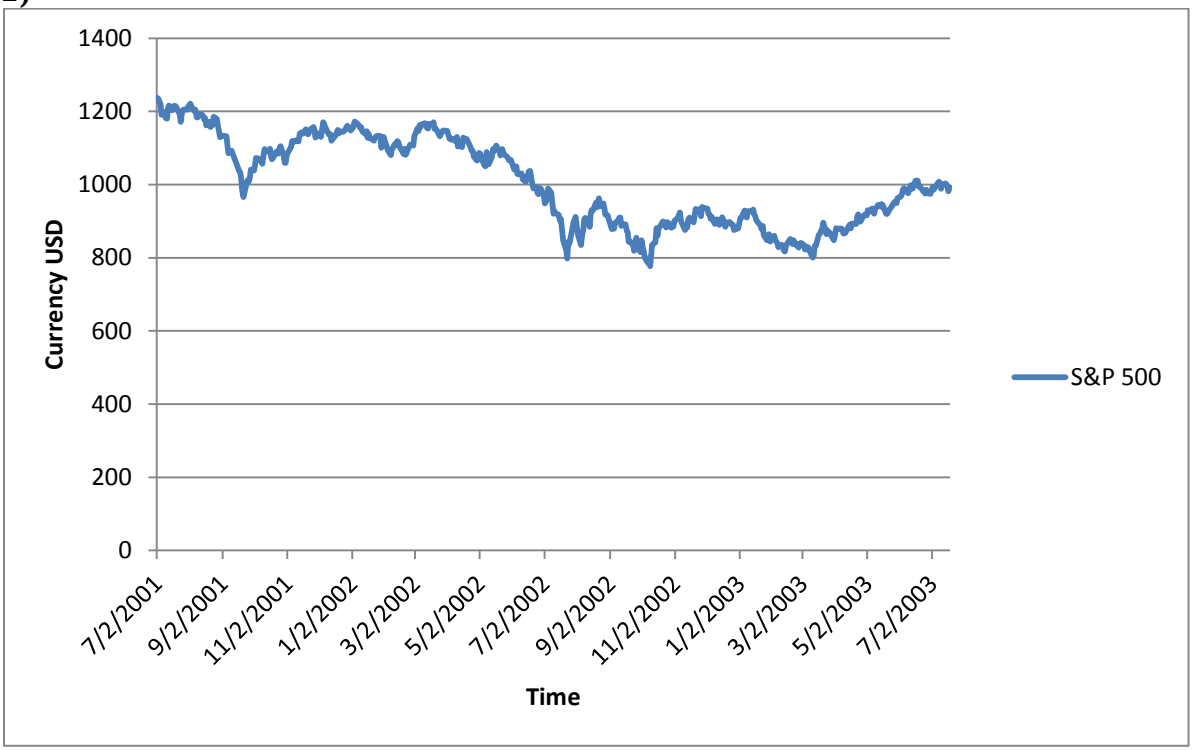


Figure A-6 Daily Closing Stock Prices for S&P 500 2006-2008 (CAG 2)

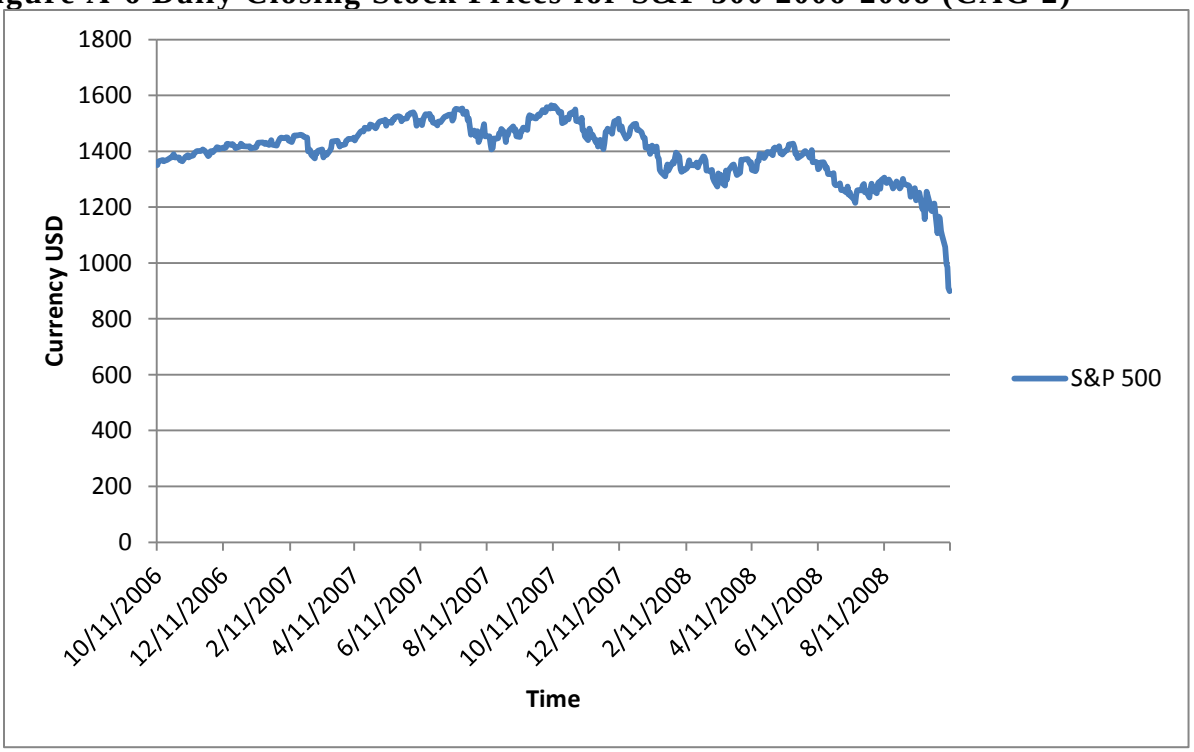


Figure A-7 Daily Closing Stock Prices for S&P 500 2008-2010 (HAIN)

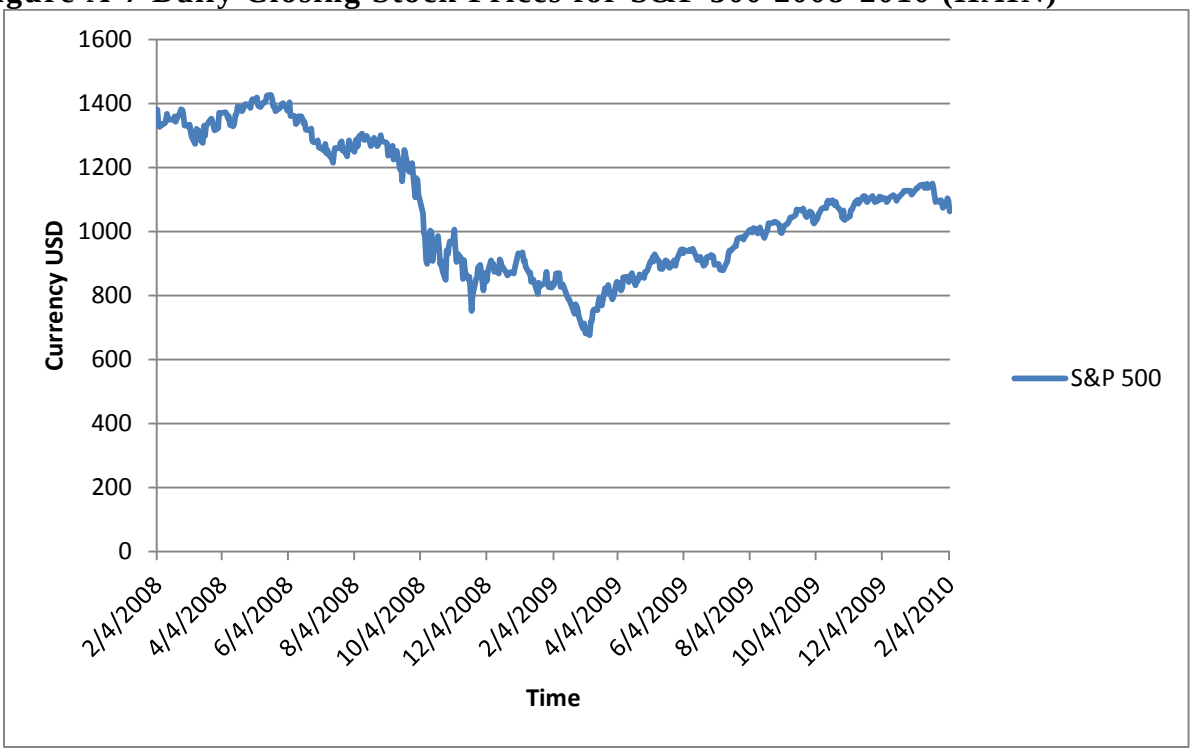


Figure A-8 Daily Closing Stock Prices for S&P 500 2008-2010 (KR)

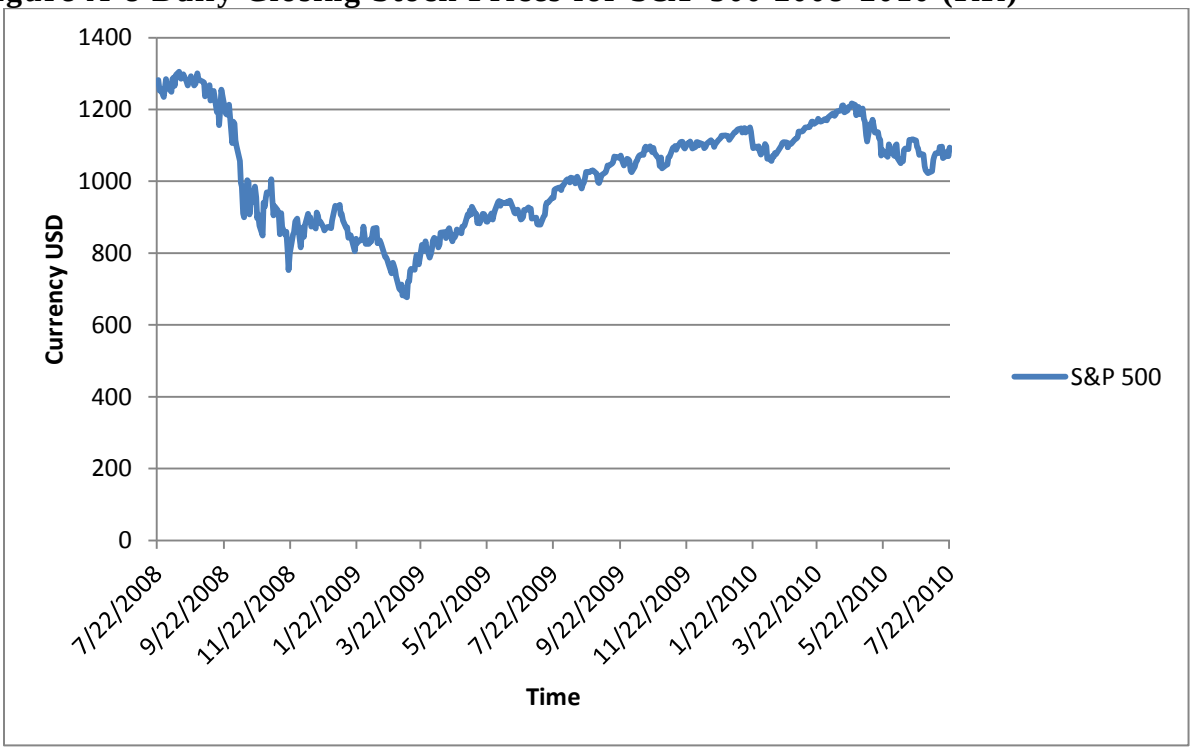
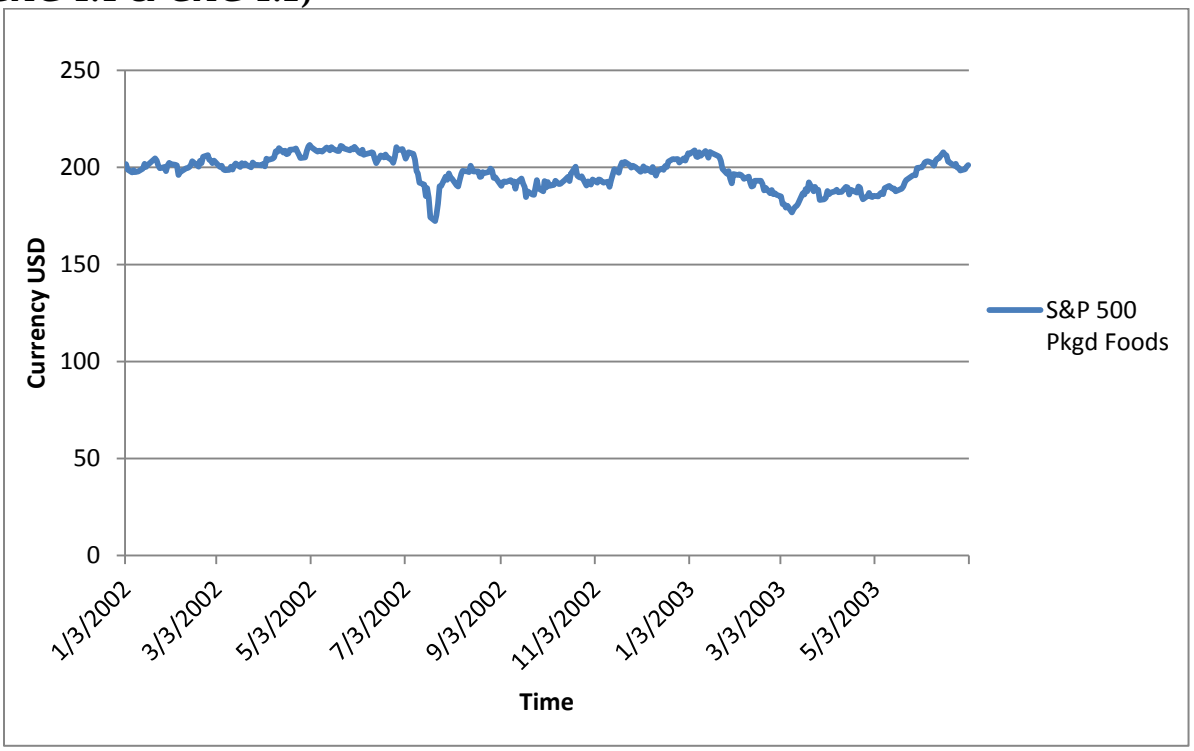


Figure A-9 Daily Closing Stock Prices for S&P 500 Packaged Foods 2001-2003 (CAG 1.1 & CAG 1.2)



*Two year data was not available at the time of submission.

Figure A10 Daily Closing Stock Prices for S&P 500 Packaged Foods 2006-2008 (CAG 2)

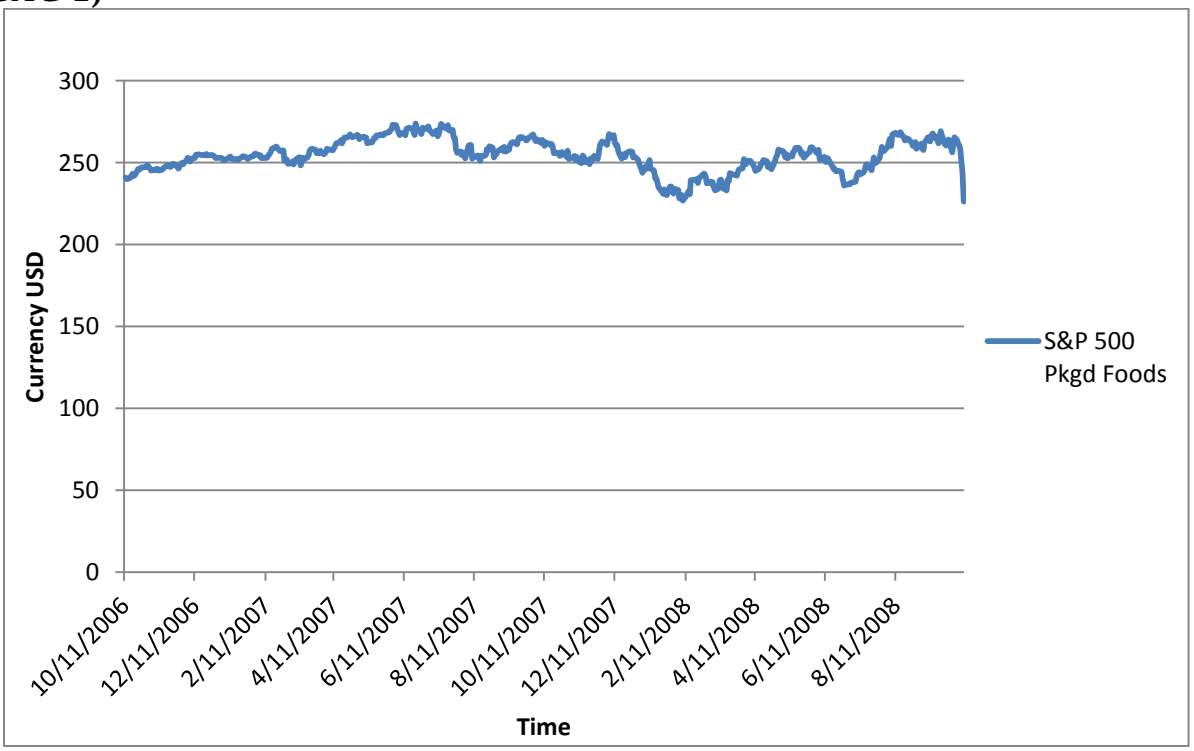


Figure A-11 Daily Closing Stock Prices for S&P 500 Packaged Foods 2008-2010 (HAIN)

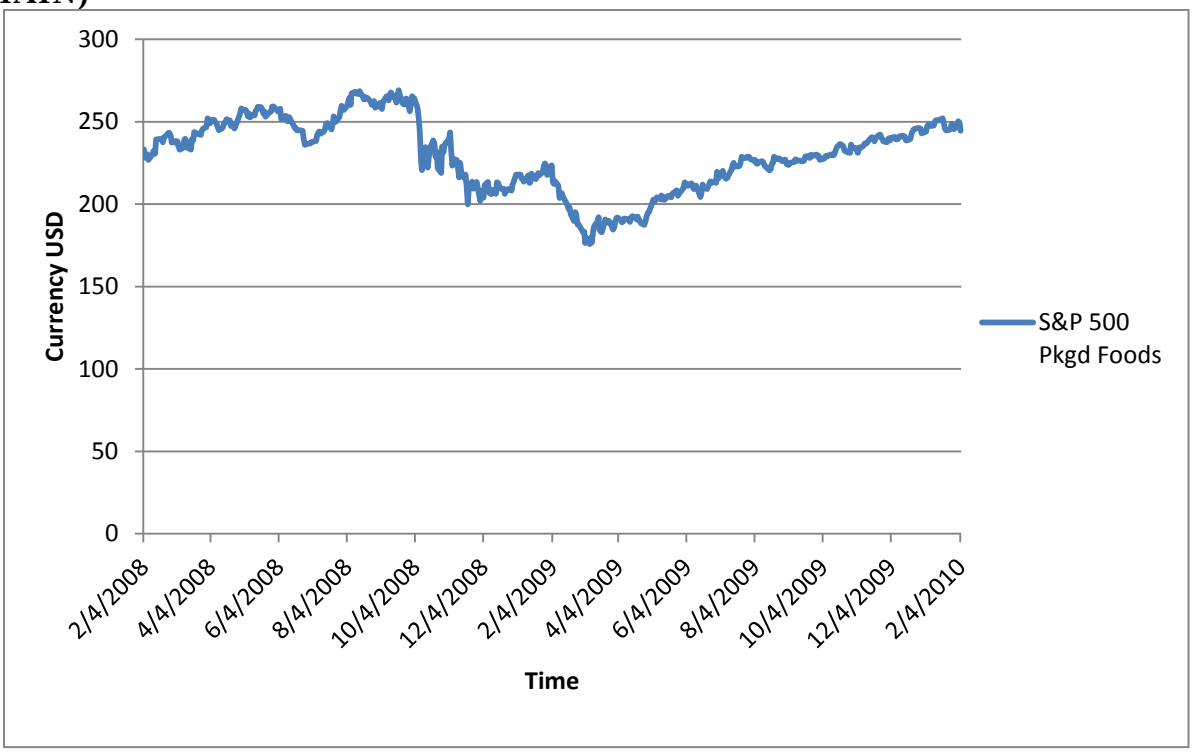


Figure A-12 Daily Closing Stock Prices for S&P 500 Packaged Foods 2008-2010 (KR)

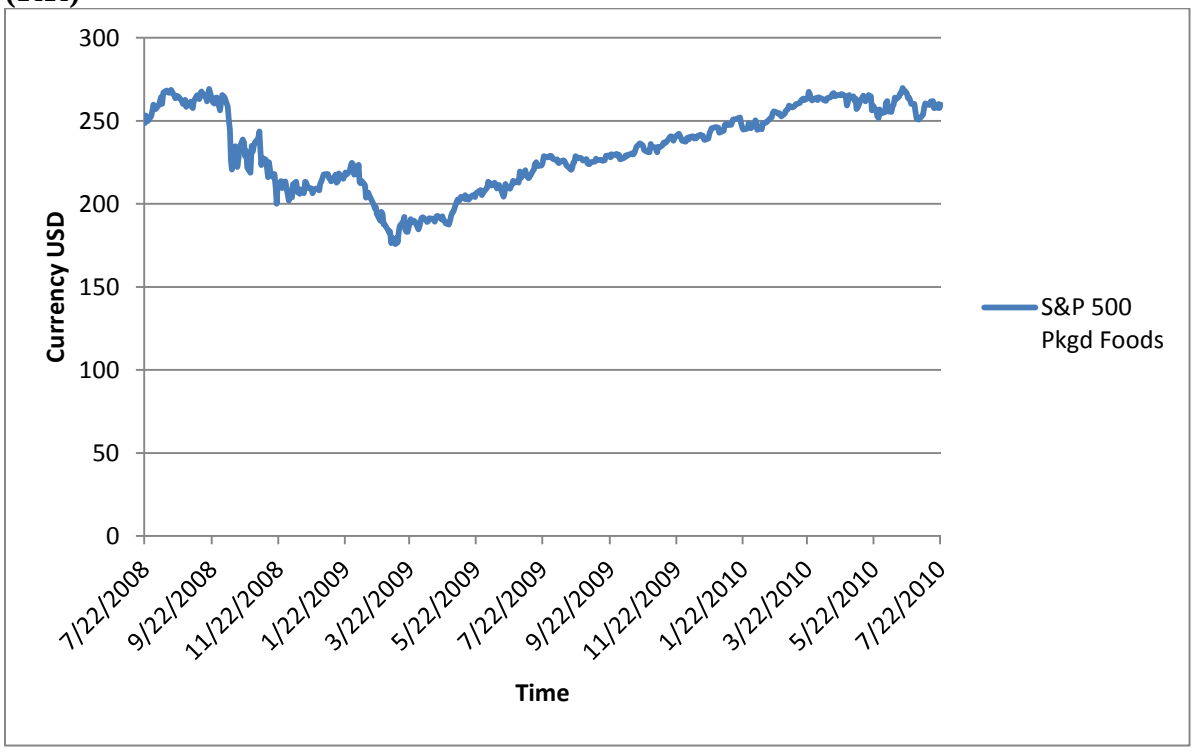


Figure A-13 CAG 1.1 Abnormal Returns

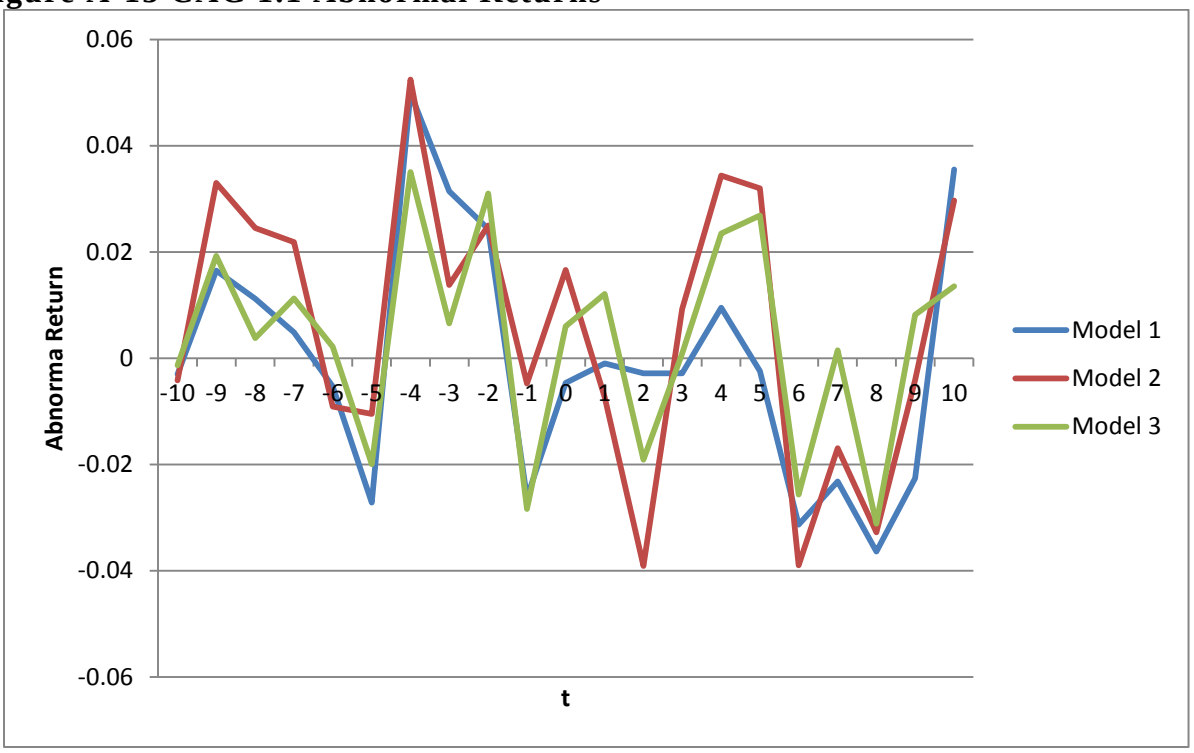


Figure A-14 CAG 1.1 Cumulative Abnormal Returns

Figure A-15 CAG 1.2 Abnormal Returns

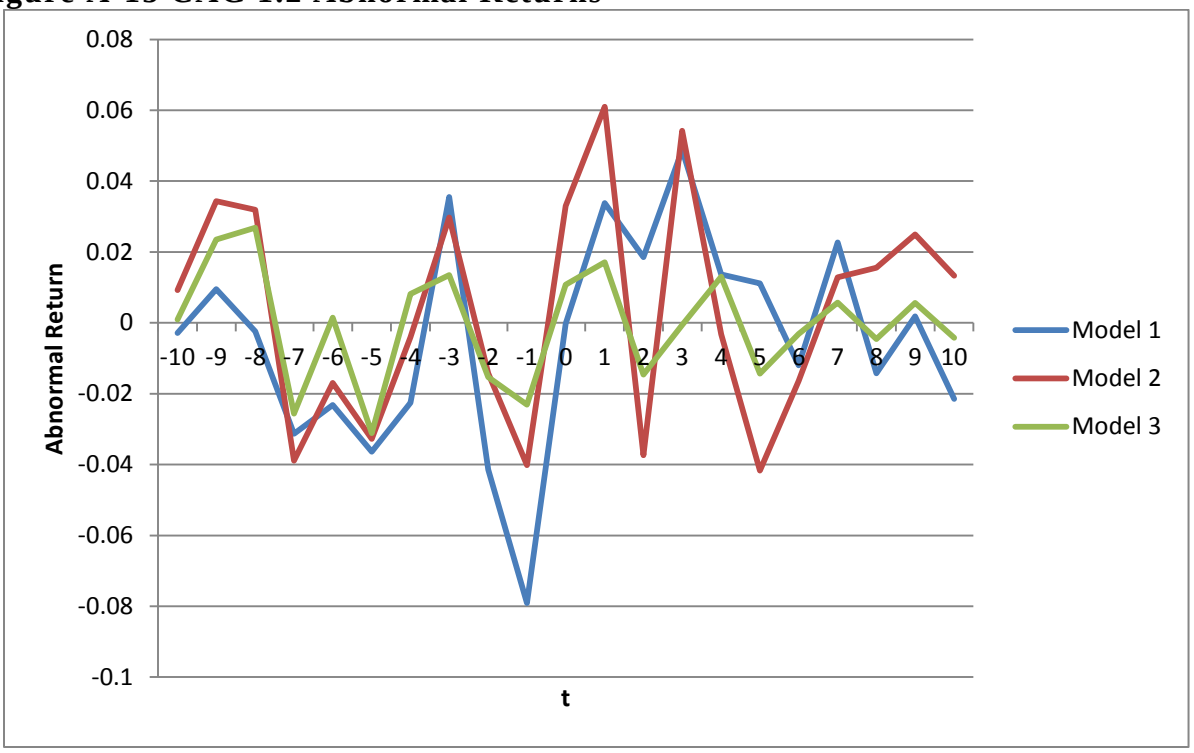


Figure A-16 CAG 1.2 Cumulative Abnormal Returns

Figure A-17 CAG 2 Abnormal Returns

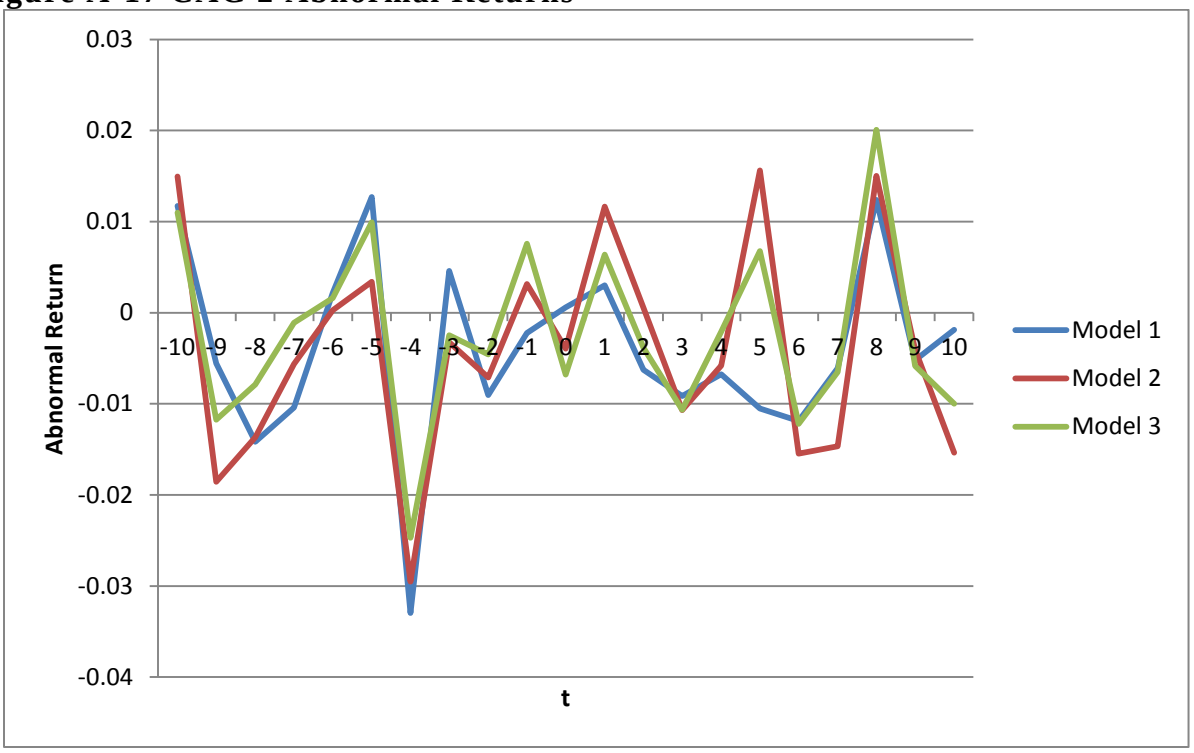


Figure A-18 CAG 2 Cumulative Abnormal Returns

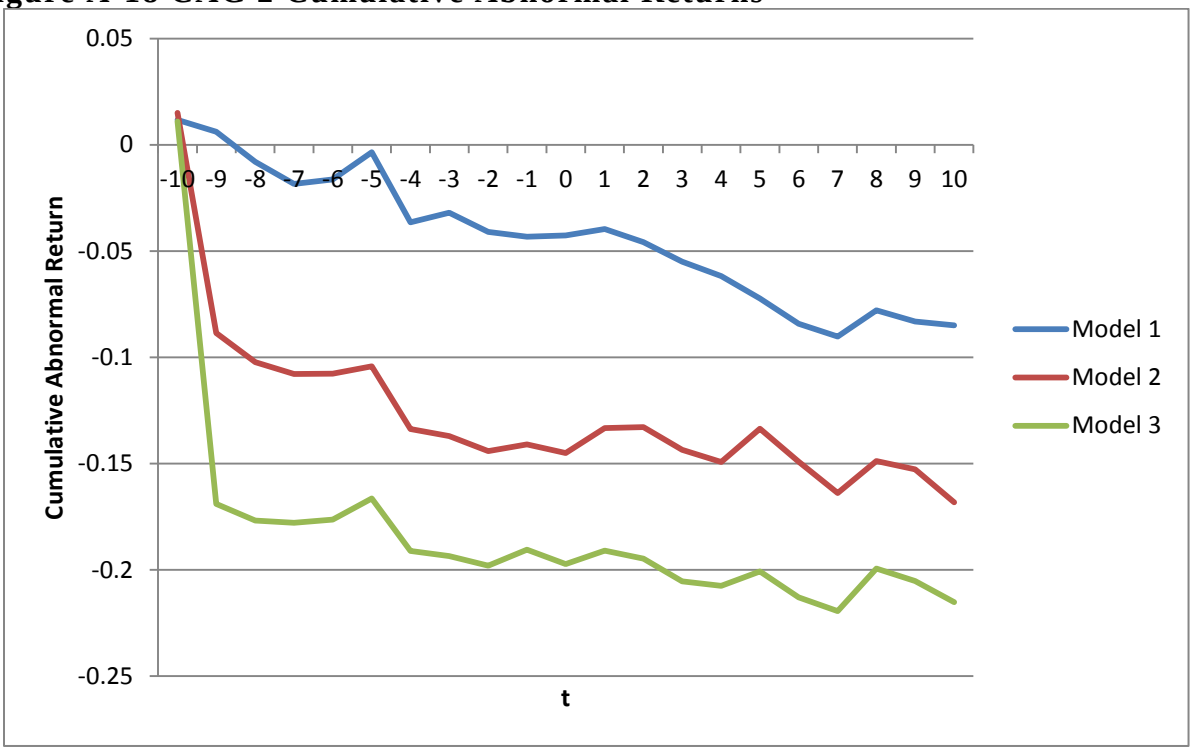


Figure A-19 HAIN Abnormal Returns

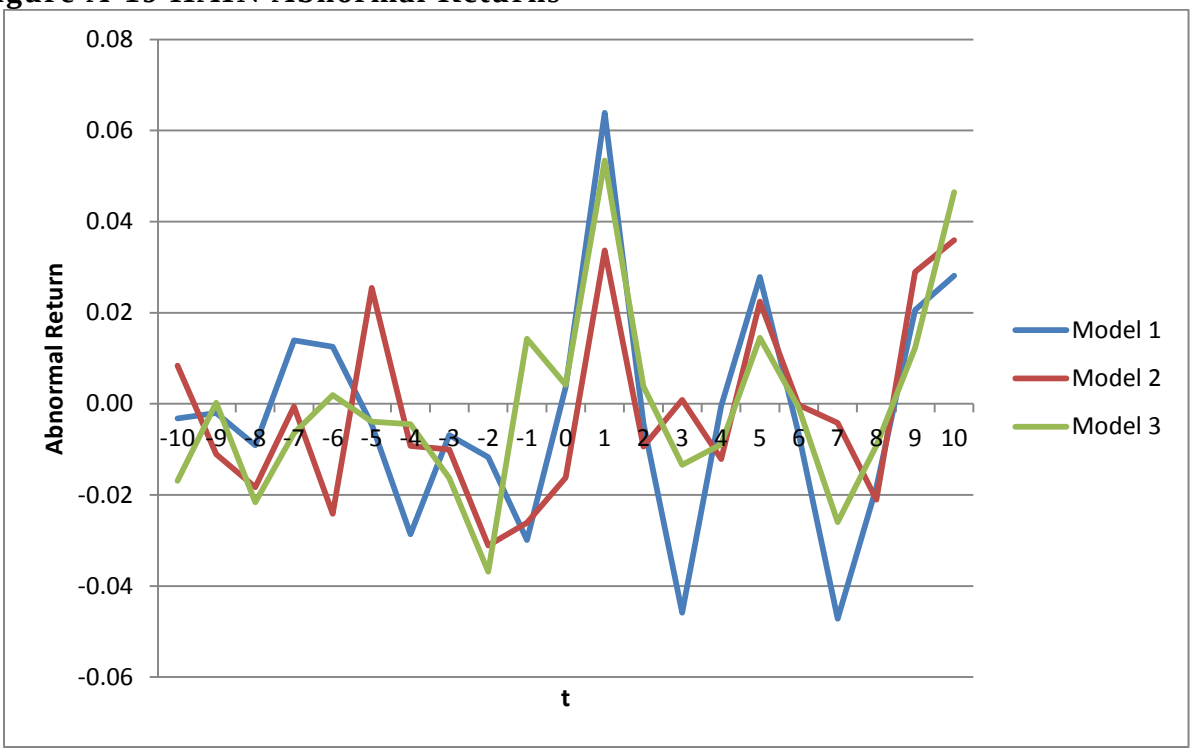


Figure A-20 HAIN Cumulative Abnormal Returns

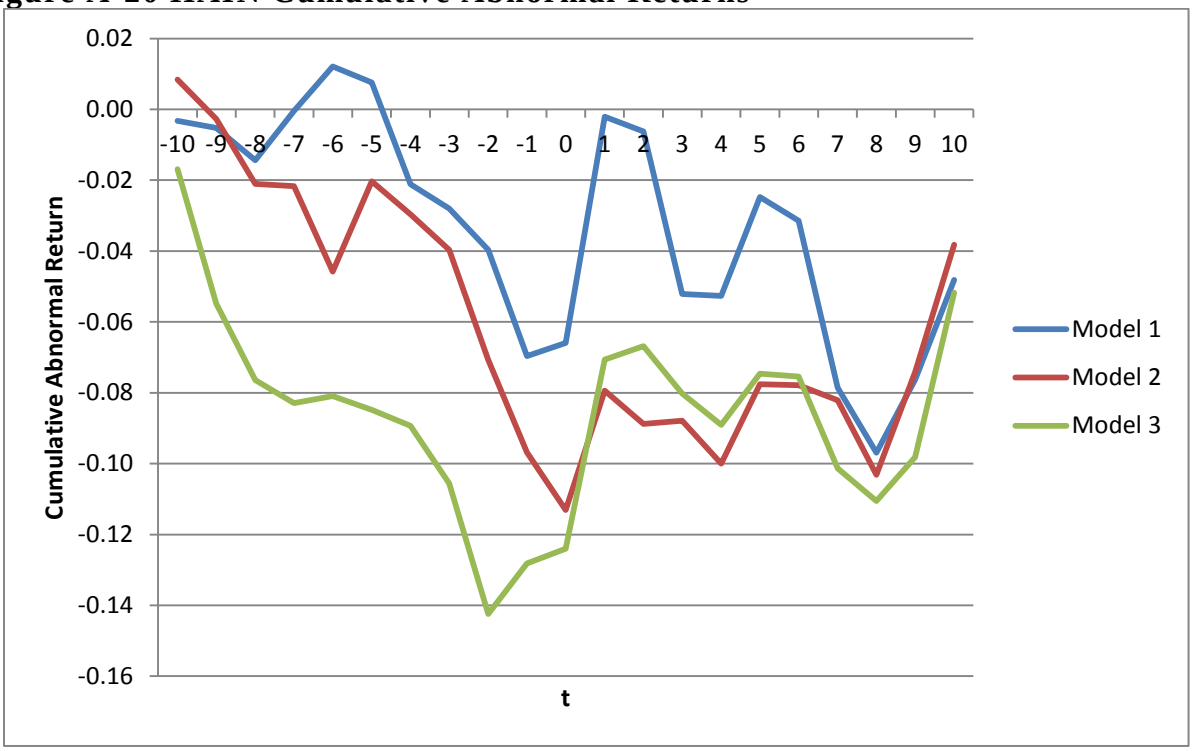


Figure A-21 KR Abnormal Returns

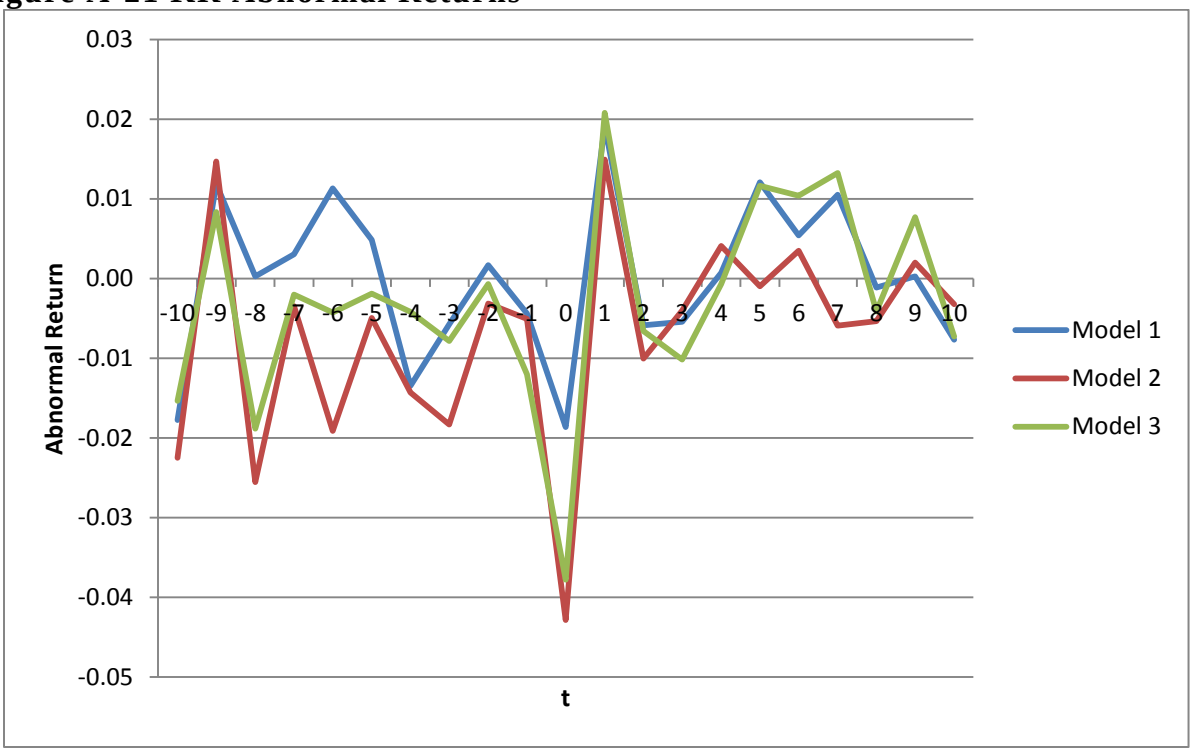


Figure A-22 KR Cumulative Abnormal Returns

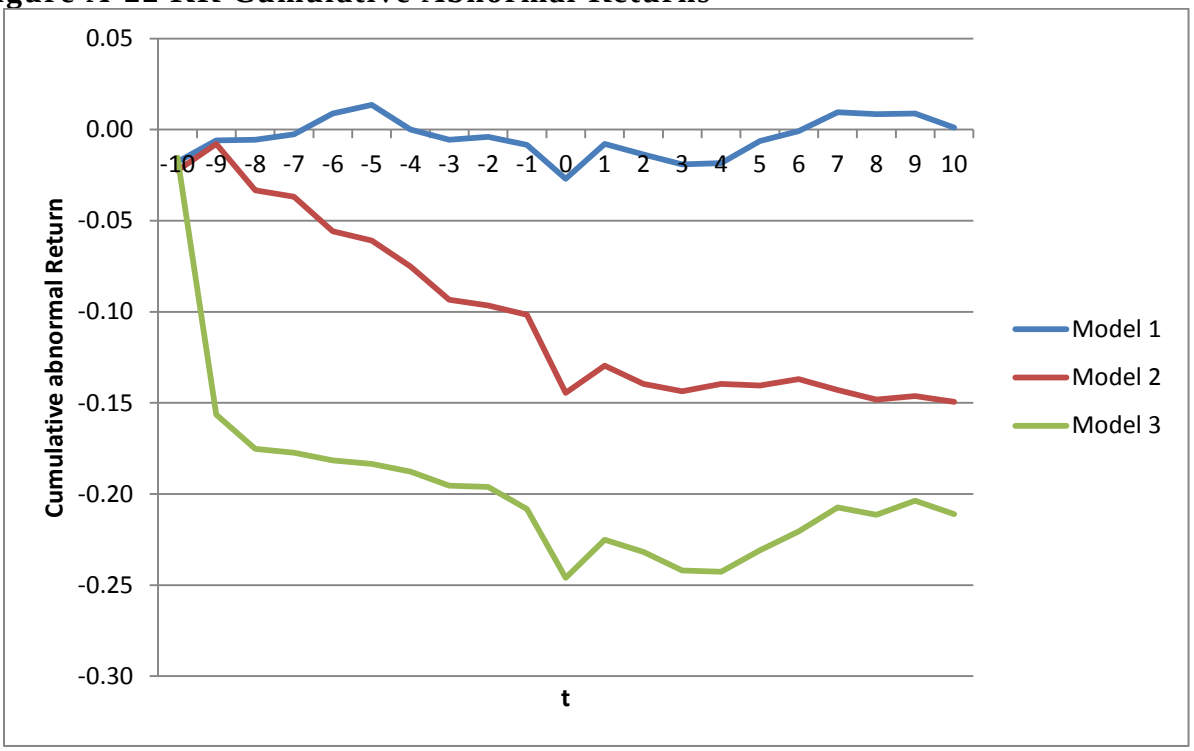


Figure A-23 SFD Abnormal Returns

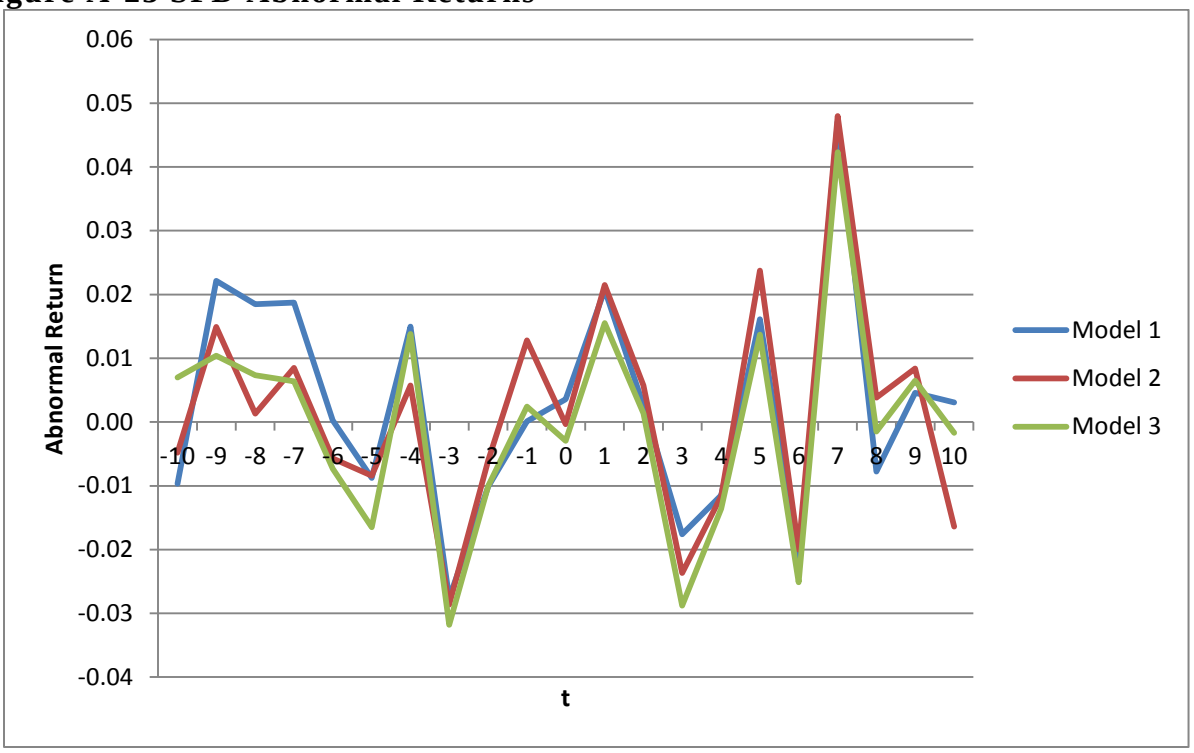


Figure A-24 SFD Cumulative Abnormal Returns

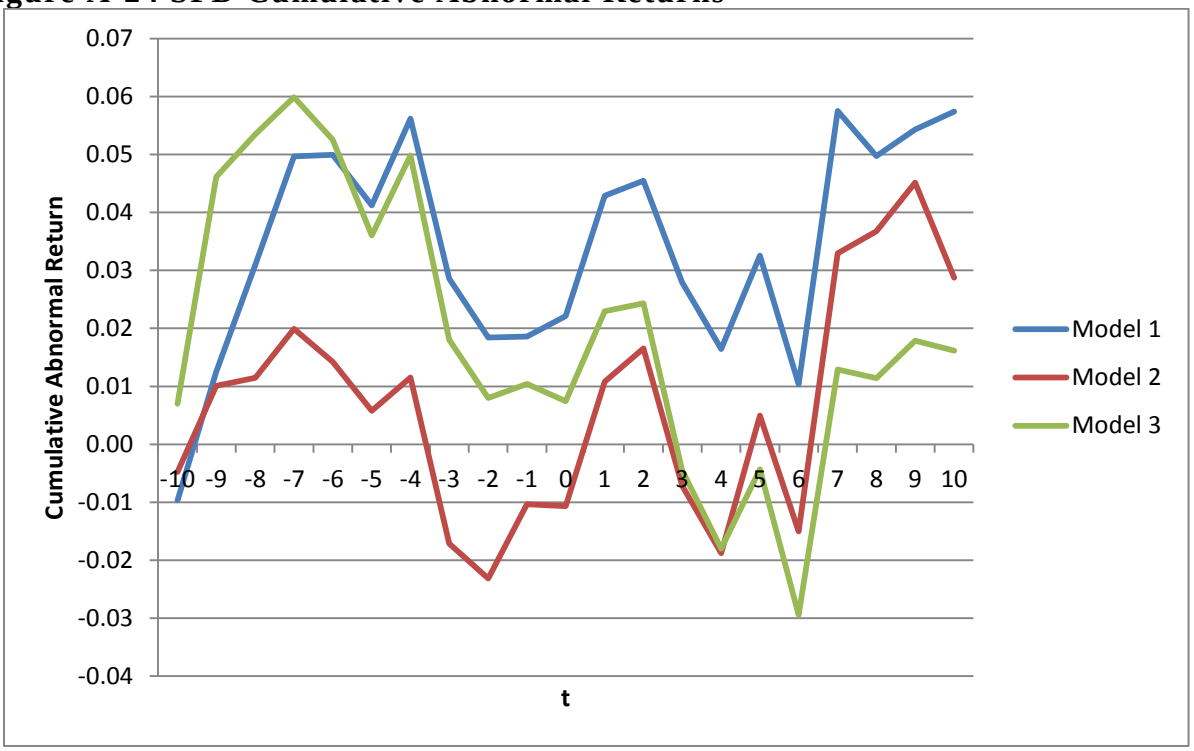


Figure A-25 Average Abnormal Returns for All Recalls

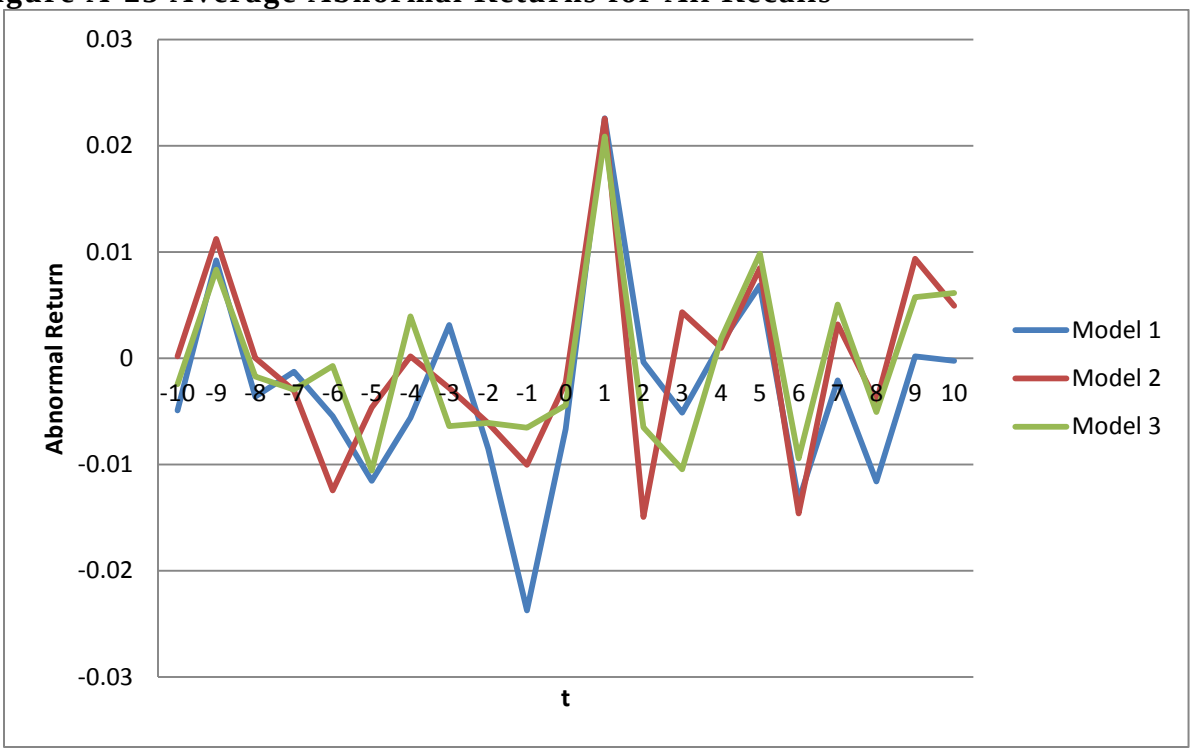


Table A-1 Data for CAG 1.1 Recall

					CAG 1.1					
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	6/17/2002	24.99	1036.17	206.21	-0.3035	-0.3035	-0.4142	-0.4142	-0.1313	-0.4142
-9	6/18/2002	24.91	1037.14	205.82	1.6496	1.3461	3.2999	2.8857	1.9245	14.2888
-8	6/19/2002	25.32	1019.99	205.22	1.1169	2.4630	2.4520	5.3378	0.3763	14.6652
-7	6/20/2002	25.6	1006.29	206.71	0.4848	2.9478	2.1866	7.5244	1.1229	15.7880
-6	6/21/2002	25.72	989.14	205.36	-0.5287	2.4191	-0.9071	6.6173	0.2167	16.0048
-5	6/24/2002	25.58	992.72	203.80	-2.7174	-0.2983	-1.0502	5.5671	-1.9957	14.0090
-4	6/25/2002	24.89	976.14	202.30	4.9937	4.6954	5.2443	10.8114	3.5045	17.5135
-3	6/26/2002	26.16	973.53	205.30	3.1406	7.8360	1.3812	12.1926	0.6554	18.1689
-2	6/27/2002	26.99	990.64	210.43	2.4330	10.2690	2.4987	14.6913	3.1026	21.2715
-1	6/28/2002	27.65	989.82	208.99	-2.6214	7.6476	-0.4765	14.2148	-2.8392	18.4323
0	7/1/2002	26.93	968.65	209.41	-0.4668	7.1808	1.6615	15.8763	0.6012	19.0335
1	7/2/2002	26.8	948.09	207.15	-0.0949	7.0859	-0.7324	15.1439	1.2098	20.2432
2	7/3/2002	26.77	953.99	204.43	-0.2822	6.8038	-3.9064	11.2375	-1.9103	18.3330
3	7/5/2002	26.69	989.03	207.75	-0.2831	6.5207	0.9257	12.1632	0.0905	18.4234
4	7/8/2002	26.61	976.98	206.94	0.9522	7.4729	3.4381	15.6012	2.3464	20.7698
5	7/9/2002	26.86	952.83	204.04	-0.2438	7.2291	3.1943	18.7955	2.6834	23.4532
6	7/10/2002	26.79	920.47	198.12	-3.1301	4.0990	-3.8940	14.9015	-2.5650	20.8882
7	7/11/2002	25.96	927.37	196.97	-2.3213	1.7777	-1.6915	13.2100	0.1495	21.0377
8	7/12/2002	25.36	921.39	192.13	-3.6372	-1.8594	-3.2781	9.9320	-3.1115	17.9262
9	7/15/2002	24.45	917.93	191.09	-2.2581	-4.1175	-0.4069	9.5251	0.8179	18.7440
10	7/16/2002	23.9	900.94	185.27	3.5522	-0.5653	2.9706	12.4957	1.3515	20.0956

Table A-2 Data for CAG 1.2 Recall

			CAG1.2							
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	7/5/2002	26.69	989.03	207.75	-0.2831	-0.2831	0.0905	0.0905	0.0905	0.0905
-9	7/8/2002	26.61	976.98	206.94	0.9522	0.6691	2.3464	9.8681	2.3464	9.8681
-8	7/9/2002	26.86	952.83	204.04	-0.2438	0.4253	2.6834	12.5514	2.6834	12.5514
-7	7/10/2002	26.79	920.47	198.12	-3.1301	-2.7048	-2.5650	9.9864	-2.5650	9.9864
-6	7/11/2002	25.96	927.37	196.97	-2.3213	-5.0260	0.1495	10.1359	0.1495	10.1359
-5	7/12/2002	25.36	921.39	192.13	-3.6372	-8.6632	-3.1115	7.0244	-3.1115	7.0244
-4	7/15/2002	24.45	917.93	191.09	-2.2581	-10.9213	0.8179	7.8423	0.8179	7.8423
-3	7/16/2002	23.9	900.94	185.27	3.5522	-7.3691	1.3515	9.1938	1.3515	9.1938
-2	7/17/2002	24.76	906.04	189.36	-4.1476	-11.5166	-1.5375	7.6563	-1.5375	7.6563
-1	7/18/2002	23.75	881.56	184.45	-7.9100	-19.4266	-2.3072	5.3490	-2.3072	5.3490
0	7/19/2002	21.94	847.75	174.37	-0.0285	-19.4551	1.0732	6.4223	1.0732	6.4223
1	7/22/2002	21.93	819.85	172.43	3.3799	-16.0752	1.7063	8.1286	1.7063	8.1286
2	7/23/2002	22.68	797.7	175.31	1.8520	-14.2232	-1.4586	6.6700	-1.4586	6.6700
3	7/24/2002	23.1	843.43	181.18	4.8755	-9.3477	-0.0632	6.6068	-0.0632	6.6068
4	7/25/2002	24.25	838.68	190.32	1.3688	-7.9789	1.2991	7.9059	1.2991	7.9059
5	7/26/2002	24.58	852.84	190.42	1.1096	-6.8693	-1.4380	6.4679	-1.4380	6.4679
6	7/29/2002	24.85	898.96	195.3	-1.1975	-8.0668	-0.3145	6.1534	-0.3145	6.1534
7	7/30/2002	24.55	902.78	193.55	2.2725	-5.7943	0.5699	6.7233	0.5699	6.7233
8	7/31/2002	25.11	911.62	196.84	-1.4270	-7.2212	-0.4587	6.2646	-0.4587	6.2646
9	8/1/2002	24.75	884.66	194.91	0.1786	-7.0426	0.5625	6.8271	0.5625	6.8271
10	8/2/2002	24.79	864.24	194.13	-2.1440	-9.1867	-0.4257	6.4014	-0.4257	6.4014

Table A-3 Data for CAG 2 Recall

					CAG 2					
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	9/27/2007	25.82	1531.38	265.25	1.1727	1.1727	1.4963	1.4963	1.0993	1.0993
-9	9/28/2007	26.13	1526.75	265.5	-0.5579	0.6148	-1.8574	-8.8587	-1.1755	-16.8905
-8	10/1/2007	25.99	1547.04	267.2	-1.4156	-0.8007	-1.3683	-10.2270	-0.7867	-17.6772
-7	10/2/2007	25.63	1546.63	265.58	-1.0403	-1.8411	-0.5634	-10.7904	-0.1118	-17.7890
-6	10/3/2007	25.37	1539.59	263.18	0.2155	-1.6256	0.0253	-10.7650	0.1603	-17.6287
-5	10/4/2007	25.43	1542.84	263.38	1.2686	-0.3570	0.3378	-10.4272	0.9936	-16.6351
-4	10/5/2007	25.76	1557.59	264.16	-3.2958	-3.6528	-2.9529	-13.3801	-2.4693	-19.1044
-3	10/8/2007	24.93	1552.58	262.04	0.4595	-3.1933	-0.3262	-13.7063	-0.2461	-19.3505
-2	10/9/2007	25.05	1565.15	263.95	-0.9028	-4.0962	-0.7107	-14.4170	-0.4569	-19.8074
-1	10/10/2007	24.83	1562.47	262.83	-0.2223	-4.3185	0.3156	-14.1014	0.7580	-19.0494
0	10/11/2007	24.78	1554.41	260.32	0.0600	-4.2585	-0.3936	-14.4950	-0.6809	-19.7302
1	10/12/2007	24.8	1561.8	262.31	0.3013	-3.9572	1.1637	-13.3313	0.6390	-19.0912
2	10/15/2007	24.88	1548.71	261.48	-0.6254	-4.5826	0.0548	-13.2765	-0.3827	-19.4739
3	10/16/2007	24.73	1538.53	260.9	-0.9143	-5.4969	-1.0696	-14.3461	-1.0659	-20.5398
4	10/17/2007	24.51	1541.24	261.35	-0.6757	-6.1726	-0.5796	-14.9258	-0.2101	-20.7499
5	10/18/2007	24.35	1540.08	260.19	-1.0527	-7.2253	1.5629	-13.3628	0.6774	-20.0725
6	10/19/2007	24.1	1500.63	255.78	-1.1893	-8.4146	-1.5477	-14.9106	-1.2194	-21.2919
7	10/22/2007	23.82	1506.33	255.91	-0.6102	-9.0248	-1.4659	-16.3765	-0.6520	-21.9439
8	10/23/2007	23.68	1519.59	256.07	1.2382	-7.7866	1.5034	-14.8731	2.0076	-19.9363
9	10/24/2007	23.98	1515.88	254.16	-0.5224	-8.3090	-0.4040	-15.2771	-0.5843	-20.5205
10	10/25/2007	23.86	1514.4	254.37	-0.1885	-8.4975	-1.5371	-16.8142	-0.9978	-21.5183

Table A-4 Data for HAIN Recall

					HAIN					
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	1/21/2009	15.95	840.24	216.73	-0.3242	-0.3242	0.8358	0.8358	-1.6883	-1.6883
-9	1/22/2009	15.84	827.5	218.9	-0.2020	-0.5261	-1.1061	-0.2703	0.0258	-5.4806
-8	1/23/2009	15.75	831.95	217.6	-0.9101	-1.4363	-1.8318	-2.1021	-2.1610	-7.6417
-7	1/26/2009	15.55	836.57	219.53	1.3915	-0.0447	-0.0629	-2.1650	-0.6477	-8.2894
-6	1/27/2009	15.71	845.71	223.23	1.2551	1.2103	-2.4135	-4.5785	0.1953	-8.0941
-5	1/28/2009	15.85	874.09	224.78	-0.4557	0.7546	2.5445	-2.0340	-0.3911	-8.4852
-4	1/29/2009	15.72	845.14	223.81	-2.8645	-2.1099	-0.9271	-2.9610	-0.4460	-8.9312
-3	1/30/2009	15.22	825.88	217.66	-0.6890	-2.7988	-1.0035	-3.9646	-1.6249	-10.5561
-2	2/2/2009	15.06	825.44	218.9	-1.1712	-3.9700	-3.1100	-7.0746	-3.6857	-14.2419
-1	2/3/2009	14.83	838.51	223.65	-2.9921	-6.9621	-2.6082	-9.6827	1.4252	-12.8166
0	2/4/2009	14.34	832.23	213.2	0.3679	-6.5942	-1.6233	-11.3060	0.4136	-12.4030
1	2/5/2009	14.34	845.85	212.32	6.3893	-0.2049	3.3674	-7.9387	5.3408	-7.0622
2	2/6/2009	15.23	868.6	213.77	-0.4232	-0.6281	-0.9394	-8.8781	0.3806	-6.6816
3	2/9/2009	15.11	869.89	211.28	-4.5840	-5.2121	0.0850	-8.7931	-1.3375	-8.0191
4	2/10/2009	14.38	827.16	203.78	-0.0503	-5.2624	-1.2105	-10.0036	-0.8881	-8.9072
5	2/11/2009	14.32	833.74	204.74	2.7826	-2.4798	2.2410	-7.7626	1.4475	-7.4597
6	2/12/2009	14.67	835.19	206.73	-0.6599	-3.1397	-0.0230	-7.7855	-0.0800	-7.5398
7	2/13/2009	14.52	826.84	204.78	-4.7180	-7.8577	-0.4229	-8.2084	-2.5939	-10.1336
8	2/17/2009	13.8	789.17	199.74	-1.8300	-9.6877	-2.1028	-10.3113	-0.9181	-11.0517
9	2/18/2009	13.5	788.42	197.2	2.0572	-7.6305	2.8990	-7.4122	1.2340	-9.8177
10	2/19/2009	13.73	778.94	198.1	2.8140	-4.8165	3.5940	-3.8182	4.6459	-5.1719

Table A-5 Data for KR Recall

					KR					
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	7/8/2009	21.84	879.56	216.25	-1.7752	-1.7752	-2.2492	-2.2492	-1.5338	-1.5338
-9	7/9/2009	21.43	882.68	215.47	1.1875	-0.5878	1.4705	-0.7787	0.8358	-15.6487
-8	7/10/2009	21.66	879.13	215.97	0.0275	-0.5602	-2.5552	-3.3339	-1.8821	-17.5308
-7	7/13/2009	21.64	901.05	219.87	0.3046	-0.2556	-0.3455	-3.6794	-0.2012	-17.7320
-6	7/14/2009	21.68	905.84	220.72	1.1296	0.8739	-1.9103	-5.5897	-0.4253	-18.1572
-5	7/15/2009	21.9	932.68	223.91	0.4845	1.3585	-0.4958	-6.0855	-0.1876	-18.3449
-4	7/16/2009	21.98	940.74	225.15	-1.3467	0.0118	-1.4283	-7.5138	-0.4173	-18.7622
-3	7/17/2009	21.66	940.38	222.8	-0.5750	-0.5632	-1.8316	-9.3454	-0.7847	-19.5469
-2	7/20/2009	21.51	951.13	223	0.1664	-0.3968	-0.3156	-9.6610	-0.0700	-19.6169
-1	7/21/2009	21.52	954.58	223.26	-0.4393	-0.8361	-0.5057	-10.1667	-1.2021	-20.8190
0	7/22/2009	21.4	954.07	224.7	-1.8622	-2.6983	-4.2844	-14.4511	-3.7772	-24.5962
1	7/23/2009	20.98	976.29	228.77	1.9150	-0.7833	1.4913	-12.9599	2.0796	-22.5167
2	7/24/2009	21.36	979.26	228.12	-0.5848	-1.3681	-1.0025	-13.9623	-0.6609	-23.1775
3	7/27/2009	21.21	982.18	228.02	-0.5423	-1.9105	-0.4013	-14.3636	-1.0169	-24.1944
4	7/28/2009	21.07	979.62	228.83	0.0724	-1.8380	0.4099	-13.9537	-0.0693	-24.2637
5	7/29/2009	21.06	975.15	228.88	1.2061	-0.6319	-0.0963	-14.0501	1.1649	-23.0988
6	7/30/2009	21.29	986.75	228.7	0.5418	-0.0901	0.3479	-13.7022	1.0403	-22.0586
7	7/31/2009	21.38	987.48	227.29	1.0510	0.9609	-0.5915	-14.2936	1.3234	-20.7351
8	8/3/2009	21.58	1002.63	226.4	-0.1120	0.8488	-0.5327	-14.8263	-0.4129	-21.1480
9	8/4/2009	21.53	1005.65	226.81	0.0270	0.8758	0.1988	-14.6275	0.7705	-20.3775
10	8/5/2009	21.51	1002.72	224.86	-0.7673	0.1085	-0.3232	-14.9507	-0.7270	-21.1045

Table A-6 Data for SFD Recall

			SFD							
			Indices		Model 1		Model 2		Model 3	
t	Date	Daily Closing Price	S&P 500	S&P 500-Pkgd Foods	AR (%)	CAR (%)	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	4/20/2012	20.55	1378.53	322.39	-0.9652	-0.9652	-0.4783	-0.4783	0.6984	0.6984
-9	4/23/2012	20.28	1366.94	315.94	2.2138	1.2486	1.4891	1.0109	1.0400	4.6139
-8	4/24/2012	20.66	1371.97	318.53	1.8467	3.0953	0.1341	1.1450	0.7356	5.3495
-7	4/25/2012	20.97	1390.69	320.94	1.8718	4.9672	0.8487	1.9936	0.6365	5.9860
-6	4/26/2012	21.29	1399.98	323.77	0.0280	4.9952	-0.5705	1.4232	-0.7331	5.2529
-5	4/27/2012	21.22	1403.36	325.08	-0.8755	4.1197	-0.8437	0.5794	-1.6503	3.6026
-4	4/30/2012	20.96	1397.91	326.44	1.4959	5.6156	0.5743	1.1537	1.3808	4.9834
-3	5/1/2012	21.2	1405.82	325.65	-2.7566	2.8590	-2.8640	-1.7103	-3.1816	1.8018
-2	5/2/2012	20.55	1402.31	325.87	-1.0145	1.8445	-0.6031	-2.3134	-1.0030	0.7989
-1	5/3/2012	20.27	1391.57	324.67	0.0114	1.8559	1.2820	-1.0314	0.2410	1.0399
0	5/4/2012	20.2	1369.1	322.77	0.3574	2.2133	-0.0351	-1.0665	-0.2939	0.7460
1	5/7/2012	20.2	1369.58	323.72	2.0752	4.2885	2.1466	1.0801	1.5512	2.2971
2	5/8/2012	20.55	1363.72	324.26	0.2600	4.5485	0.5751	1.6553	0.1373	2.4344
3	5/9/2012	20.53	1354.58	323.5	-1.7594	2.7891	-2.3682	-0.7129	-2.8804	-0.4460
4	5/10/2012	20.1	1357.99	325.98	-1.1464	1.6427	-1.1645	-1.8774	-1.3564	-1.8025
5	5/11/2012	19.8	1353.39	325.5	1.6121	3.2548	2.3722	0.4948	1.3715	-0.4309
6	5/14/2012	20.05	1338.35	325.12	-2.2192	1.0356	-2.0003	-1.5055	-2.5119	-2.9429
7	5/15/2012	19.54	1330.66	324.91	4.7135	5.7492	4.7975	3.2920	4.2331	1.2902
8	5/16/2012	20.41	1324.8	325.31	-0.7759	4.9732	0.3833	3.6753	-0.1479	1.1424
9	5/17/2012	20.18	1304.86	322.12	0.4564	5.4297	0.8406	4.5159	0.6469	1.7893
10	5/18/2012	20.2	1295.22	320.36	0.3079	5.7375	-1.6404	2.8755	-0.1712	1.6181