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AN ANALYSIS OF THE IMPACT OF PUBLISHED NEWS ON STOCK PRICE AND STOCK TRADING VOLUME

by

PATRICK GAUGHAN

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1986

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Abstract

AN ANALYSIS OF THE IMPACT OF PUBLISHED NEWS ON STOCK PRICES AND STOCK TRADING VOLUME

by

Patrick Gaughan

Advisor: Professor Michael Grossman

This study analyzes the impact of firm specific news developments on stock prices and stock trading volume. A methodology is formulated to quantitatively measure the market value of news stories in dollars. The effects are also measured for certain sub-samples of news which vary in the form neutral to extreme news. The role of financial risk, as measured by a firm's beta, is also explored. In addition, the impact of the January anomaly is also considered.

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INTRODUCTION

INTRODUCTION

It is generally accepted that stock prices and stock trading volume respond to alterations in the information set of investors. While there are many sources of information available to investors, this study focuses on that information which is made public through publication in The Wall Street Journal. At issue is whether or not the most prestigious financial publication has the ability to move financial markets. Academic theorists have continually expounded on the implications of the efficient markets hypothesis which implies that such published materials are of dubious value. However, the recent attention that apparent anomalies such as the "small firm effect" or the "January anomaly" have received has lead to a search for other "inefficiencies". If information published after the financial markets have had time to internalize it moved the markets then such markets would be most inefficient. However, many proponents of the power of the press steadfastly assert that the media influences financial markets. This study will attempt to quantify any relationship that might exist between published news, stock prices and trading volume.

The key to being able to conduct a study such as this is to be able to quantify the news. To accomplish this a market derived measure of the dollar value of the news is utilized. Thus monetary movements in news values can be compared to fluctuations in stocks prices as well as variations in trading volume levels.

This study is organized in the following manner. A review of some of the literature relating the reaction of financial markets to the release of information is provided in Part I. No attempt is made to provide an exhaustive review of this literature. Rather only a subset of these studies which are most relevant to this topic are considered. Following the literature review the efficient markets hypothesis is related to the topic at hand.

In Part II the development of the study's methodology is reviewed. This includes a description of the data and the data collection methods. Also included in this section is a discussion of some of the data problems associated with this particular study as well as other research of this kind. Econometric issues related to this study are discussed in Chapter 5.

Part III is devoted to empirical issues. Firstly, the price and volume specifications are developed. The results for the original definition of the news in both models are reviewed. Following this the definition of the news is varied to see if there is a differential impact with alternative definitions of the news. These definitions covered sub-samples that alternatively eliminating neutral news as well as a sample that only included extreme news. The impact of good vs bad news is also explored.

Part IV focuses on factors which might influence the impact of the news on either price or volume. Of prime interest is the role of risk as reflected by the financial risk measure beta. Also considered is whether certain phenomena such as the January anomaly affect the impact of news on the study's dependent variables.

PART I

CONCEPTUAL DEVELOPMENT OF THE METHODOLOGY

CHAPTER ONE

INTRODUCTION OF THE COMPONENTS OF THE MODELS

Evaluation of the Monetary Value of the News Methodology

In the interests of expediency I sought to find one source of news developments which could encapsulate the main source of firm specific news which investors are exposed to on a daily basis. While investors may read a wide range of publications such as Business Week, Forbes, Institutional Investors, Fortune, etc., these sources being weekly or monthly are not timely enough to coincide with daily market fluctuations. Other media sources such as The New York Times, television, and radio are timely enough but have other drawbacks. The Wall Street Journal is a more comprehensive source of firm specific news than any of the aforementioned and is easier to quantify than either radio or television. Moreover, The Wall Street Journal enjoys a generally accepted reputation for being the most well read daily source of business and financial news among investors.

News stories will be measured by the markets valuation of the space in The Wall Street Journal that this story commands. My reasoning is that a story concerning a particular firm is analogous to a corporate advertisement but one which may reveal either positive, neutral, or negative news about the firm. For example, recent stories in The Wall Street Journal concerning the second Tylenol poisoning were, in a sense, a negative ad for Johnson & Johnson Co.[1] However, instead of touting the strength of the firm and its products, it implied to investors that perhaps

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[1]See The Wall Street Journal, February 18, 1986.

management do not properly foresee the possibility of a second tampering with its encapsulated products. In addition, it also reports the obvious concerns to consumers regarding the safety of the Tylenol product line.

The belief that such news can affect stock prices received much attention recently when a former stockbroker trainee was arrested for putting rat poison in certain products of the Smith Kline Corporation. The individual put an anticoagulant used to kill rats in Contac Cold Capsules and Dietoc Appetite Suppressant. He then contacted radio and television stations to publicize his deeds in an effort to influence the firms stock. To capitalize on the expected market movements he purchased "put" options on 36,000 shares of Smith Kline stock. However, the market did not react very much to this bad news and the perpetrator failed to enjoy a return for his efforts although he did manage to get incarcerated.

There have been some studies which show that corporate advertising tends to have a positive and significant impact upon stock prices.[2] By corporate advertising I am referring to advertising which is not designed to sell a specific product or service. Jaye Neifeld showed a positive relationship between corporate advertising and stock prices.[3] Neifeld believed that this relationship is causal rather than

----

[2]Eugene Schoenfeld and John Boyd, "Financial Payoff in Corporate Advertising," Journal of Advertising Research, vol. 22, #1 February/March 1982, pp. 45-55.

[3]Jaye Niefeld, "Corporate Advertising," Industrial Marketing, July 1980, pp. 64-74.

specious. In particular his study indicated that corporate advertising accounted for 4% of the variance in stock prices. It would be most interesting to see to what extent corporate advertising is successful in ameliorating the price depressing effects of negative news. However, this question is beyond the scope of this analysis and will be left for future study.

The fact that corporate advertising has a positive and significant impact upon stock prices seems to conflict with the efficient markets hypothesis. It would seem that the market prices would have already internalized this information. Neifeld believes that corporate advertising with information on labor productivity and new product announcements as well as the belief that firms who can afford expensive corporate advertising campaigns must be financially sound all serve to uplift stock prices.

Space in a commercial publication commands a market value just like other commodities. This value usually varies in direct proportion to the size of the circulation and readership of the publication. Circulation refers to the number of individuals who initially receive the publication while readership takes into account the additional readers who acquire the publication through pass-along. Consequently, when a story appears in a publication its value can be measured by the advertising cost of the space that story commands.

This technique of measuring the monetary value of editorial space through advertising costs is often used by public relations firms in an attempt to evaluate their placement efforts. While it is a most useful guide, this method is not an exact science since editorial space and purchased space are not equivalent.

There are two factors that differentiate the value of editorial space from advertising space from the point of view of the company which is the object of the particular story. Firstly, since the company does not determine directly the content of the story, the phraseology probably is not as favorable as it would have been had the company wrote the copy itself.

Moreover, any illustrations or pictures used in the story may not be the best from the firm's point of view. The fact that companies incur significant product costs to develop the most desirable image is evidence of the importance of this factor.

The second major difference between editorial and advertising space lies in the belief that editorial space is more credible than an advertisement. The comments and opinions cited in editorial copy are supposed to originate from an unbiased source. Many writers go to great lengths to avoid the appearance of providing one particular subject preferential treatment. Nonetheless, this does not imply that these writers are not influenced by the firm. Public relations departments and public relations firms, on behalf of their clients, go to great length to indirectly influence the content of these articles. These activities range from preparation of press kits filled with facts, photos, and ready-made quotes which writers often utilize to staging elaborate press conferences and receptions. The success of these activities is evidenced by the robust growth and development of the public relations industry.

These two factors outlined above serve to oppose each other. The inability to directly control the content of the space serves to make this exposure less valuable than advertising. The enhanced credibility of the copy can make the article more valuable than an advertisement. A method is not currently available to quantitatively evaluate the relative influences of these two factors. Consequently, this study will then rely on advertising space costs to serve as the proxy for the value of the space an article commands.

The markets valuation of a story on a firm is arrived at by determining what was the markets valuation of the space that story commanded in The Wall Street Journal. For example, if a firm has a one-third page story on some aspect of its operations in The Journal, its advertising cost is the cost of a one-third page ad. Usually advertising costs vary with placement in the publication. However all pages in The Wall Street Journal cost the same unless the advertiser specifies a particular page for ad placement. This significantly simplifies the valuation process.

It is possible to purchase advertising space in regional editions of The Wall Street Journal as opposed to the complete national edition. The regional editions of The Journal are: Eastern, Midwest, Southwest, and the Western. However, since all of the companies in this study are large, national companies, it is assumed that all of the stories appeared in the national as well as the regional edition. Consequently, I used the national advertising rate when calculating the market value of the stories.

Wall Street Journal Advertising Rates[4]

For 1 column

Depth in Inches	Lines	National Edition
1	14	$ 594
1 1/2	21	891
2	28	1,188
2 1/2	35	1,485
3	42	1,782
3 1/2	49	2,079
4	56	2,376
4 1/2	63	2,673
5	70	2,970
5 1/2	77	3,267
6	84	3,564
6 1/2	91	3,861
7	98	4,158
7 1/2	105	4,455
8	112	4,752
8 1/2	119	5,049
9	126	5,346
9 1/2	133	5,643
10	140	5,940

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[4]Wall St. Journal Advertising Rate Card No. 51.

Each article on every firm in the sample group that appeared in The Wall Street Journal during 1984 was included in the news data set. A photocopy of each article was presented to two panelists for evaluation. The panelists were chosen to serve as a proxy for the mindset of the investment public. Their backgrounds included a good knowledge of financial markets and investments. The panelists were told to look at the headline of each story although the complete story was presented to them in each case. The availability of the complete story is important to add to the subjective impression the panelist forms when evaluating the article. By being able to see the complete article as well as its placement on the page, the panelist can make a better evaluation.

The rationale for focusing only on the headline rather than the full article finds its motivation in the fact that it would be prohibitively expensive to require panelists to read the entire article. However, various market research studies have showed that 80 - 90% of readers only read the headline and do not read the copy.[5] It is believed that the panelist can make an accurate assessment of the nature of the story through reading the headline as well as a topical examination of the article. The panelists' evaluation of each story provides a determination as to whether the article

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[5]David Olgilvy, Olgilvy on Advertising, (Crown Publishers Inc., New York), p. 71.

see also
John Caples, Tested Advertising Methods, (Prentice Hall, New Jersey).

is good, neutral, or bad news. A scale is utilized to provide gradations of each of the two extremes. This procedure is similar to that used by Osgood in his well known Osgood's Semantic Differential.[6] The scale is as follows:

very good news	7
good news	6
moderately good news	5
neutral news	4
moderately bad news	3
bad news	2
very bad news	1

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[6]Charles E. Osgood et al., The Measurement of Meaning, (University of Illinois Press, Urbana, Illinois, 1957).

<u>News Variable with Qualitative Variations in the News</u>

The original news sample includes a wide range of articles on the ten sample firms. These stories include large articles spanning two pages to mere mentions of personnel changes which might only occupy a couple of lines in an obscure part of the paper. The latter group of stories tended to draw neutral values (4). While any mention of a firm's name helps keep the company in the investors mind there does not seem to be much reason to believe that these mentions should affect investment decisions.

In an effort to qualitatively differentiate between different types of news stories the original news sample was broken down in the following way:

All News	--	Scale Values 1 - 7
Non Neutral News	--	Scale Values 1 - 3 and 5 - 7
Extreme News	--	Scale Values 1 - 2 and 6 - 7

In this manner one can test to see if stock prices and trading volume are influenced to a greater extent by more extreme news. If news is to have an impact on these dependent variables the effect should be more pronounced with the more extreme values.

The Appropriate Definition of the News Variable

There are two possible ways to examine the interaction of the monetary value of the news and its scale counterpart with stock prices and trading volume. One way would be to treat the monetary value of the news and the corresponding scale as two separate variables. Therefore, the news variable would measure market value of the space each story commanded in The Wall Street Journal. The scale, in turn, would measure the intensity of the news on a semantic differential scale.

A problem with defining the variables in this manner is that this method separated the two measures of the importance of a story to the trading community. Presumably there is a positive, although not necessarily proportional, relationship between the size of the space and the importance of a story. The scale is purposely chosen to reflect whether a story was good or bad as well as the intensity of these two extremes. It would seem that use of the news variable by itself or in conjunction with a separate scale variable could be inconclusive. Examination of the news variable alone tells us nothing about whether the news was good or bad.

A potential solution to this problem would be the creation of another variable -- The News Scale -- which is simply the product of the two. In this way we are applying subjective weights (which represents a proxy for the investment community's mindset) to the objective market measures of the news. Through the use of such a variable, articles that are considered more important to the investment community are given more weight than other features.

The latter definition of the news variable seems to make greater sense from a conceptual point of view. However both methods are initially used in the econometric analysis to see which better explains the movements in stock prices and trading volume.

Other Data Sources

Stock Prices - The closing stock prices are drawn from the Daily Stock Price Record.[7]

Volume Data - The number of shares traded are also gathered from the Daily Stock Price Record. They are entered as hundreds of shares.

Dow Jones Industrial Averages - The closing value of the Daily Dow Jones Industrial Average are gathered from The Wall Street Journal Index.[8]

Dow Jones Industrials Volume - The Daily Volume of trading for the stocks included in the Dow Jones Industrials Group are gathered from Daily Stock Price Record.

Betas - The betas for each of the study's firms are provided by O'Neills Service. An explanation of this measure, its method of calculation, and a rationale for including it is provided in Chapter 10.

Earnings Per Share - The average earnings per share for the 1984 period are drawn from Moody's Industrial Surveys.[9]

Shares Outstanding - The number of total shares of common stock outstanding is taken from the Daily Stock Price Record. It is numbered in the thousands of shares.

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[7]Daily Stock Price Record, 1984, vol. 1, 2, 3, and 4, Dow Jones, Irwin, New York.

[8]Wall Street Journal Index, 1984, vol. 1, 2, 3, and 4, Dow Jones, Irwin, New York.

[9]Moody's Industrial Survey.

<u>Components of the Dow Jones Industrial Average*</u>

	PERCENT OF DJIA
Allied-Signal	2.81%
Alcoa	2.39
American Can	3.93
American Express	3.25
AT&T	1.35
Bethlehem Steel	1.06
Chevron	2.17
DuPont	3.70
Eastman Kodak	2.82
Exxon	3.06
General Electric	4.12
General Motors	4.22
Goodyear	1.90
Inco	0.85
IBM	8.99
Intl. Harvester	0.53
Intl. Paper	2.96
McDonald's	4.48
Merck	8.10
Minnesota Mining	5.18
Owens-Illinois	3.35
Philip Morris	5.49
Procter & Gamble	3.94
Sears, Roebuck	2.22
Texaco	1.72
Union Carbide	4.95
United Technologies	2.73
U.S. Steel	1.40
Westinghouse	2.69
Woolworth	3.61

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* Source: <u>The Wall Street Journal</u>, January 27, 1986, p. 10.

Companies Chosen

There are two potential sources of bias when utilizing this method of measuring the news. Firstly, large firms would seem to receive more attention in The Journal than smaller firms. This makes sense since a large firm with a greater dollar value of shares outstanding affects more shareholders than smaller firms. However, from an investor's point of view aggregate capital gains opportunities can be as great for small as well as large companies. The simplest way to alleviate this problem is to choose firms which are about the same size. I have chosen firms ranked #81 - #100 by total sales.[10]* By controlling for the size of each firm one potential source of bias is eliminated. This selection method will help prevent some sample firms from receiving more editorial play simply because they are larger than other firms.

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[10] Fortune Magazine, 1985.

* After having chosen this sample of 20 firms it became necessary to limit it to 10 firms to accommodate computer cost restraints. The ten firms with the most news stories were chosen from this group. However some of the remaining firms are used later in the study to formulate the low beta sample.

The targeted companies are:[11]

International Paper $4.357 billion sales

International Paper Company is a land resources management company. IP is principally engaged in the manufacture and sale of pulp, paper, paperboard, and packaging products. IP also manufactures non-woven products and is involved in the development of mineral properties, oil and gas drilling, and agricultural operations. IP is the largest industrial landowner in the U.S., owns 6.8 million acres of timber. For 1983, sales (and operating profits) by products were: Pulp and Paper, 35% (44%); Packaging and Packaging materials, 47% (24%); Wood Products and Resources, 15% (23%); Other Products, 3% (9%).

Motorola $4.33 billion sales

Motorola is engaged in the design, manufacture, and sale, principally under the MOTOROLA brand, of a diversified line of products. These products include two-way radios and other forms of electronic communications systems; semiconductors, discrete semiconductors and microprocessor units; electronic equipment for military and aerospace use; automobile radios, stereo tape players, citizens band radios and other automotive electronic equipment; and data communications products such as high speed modems, multiplexers and network processors. In 1984, sales (and profits) were derived as follows: communications products, 36% (24%); semiconductor products, 39% (64%); information systems products, 11% (0%); other, 14% (12%).

Burroughs $4.3 billion sales

Burroughs, a leading producer of business equipment, has a broad product line which covers most major sectors of the data processing market. Products range from very small to giant systems. In addition, the Company offers a full range of peripherals, terminals, and data entry equipment. Computer products are supported by an extensive library of application programs which are sold primarily to small users who do not have their own programming capability. Products are designed so that customers can easily move to larger equipment as their needs expand.

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[11]Moodys Industrial Surveys, 1984.

Archer Daniels Midland $4.29 billion sales

Aided by acquisitions, Archer Daniels Midland has diversified its line to include over 1,000 products. It processes grain, soybeans, flaxseed, and other farm products. Principal end-products include linseed and soybean oils. Company is also one of the largest domestic flour millers. It sells primarily to industrial consumers in the food, chemicals, paper, protective coating, and animal feed industries. ADM's grain operations are concentrated in the central states grain belt. American River Transportation Co. is a carrier of various dry-bulk and liquid commodities on inland waterways such as the Mississippi and Ohio Rivers. Gooch Foods offers various grocery items such as noodles, pet foods, and packages prepared dinners.

Digital Equipment $4.27 billion sales

Digital Equipment is a leading manufacturer of mini-computers. The Company produces a broad line of small, general purpose digital computers. Models range from a suit-case size table-top model to larger ones used in time-sharing functions. Applications are broad. Digital has developed a variety of peripheral equipment including magnetic tape systems, disc and drum storage readers, printers, plotters, and cathode-ray-tube display and data communication interfacing terminals. Software is designed for both broad and specific market applications. Most of its computers are sold rather than leased, although service and other revenue constitutes approximately 31% of total revenues.

Borden $4.26 billion sales

Borden is primarily engaged in the purchase, manufacture, processing, and distribution of a broad range of products, both domestically and in foreign countries. The company is organized into two operating segments. The food segment, 70% of 1983 sales and (63% of operating profit), includes cheese and cheese products, milk and milk products, snack foods and cakes, fruit drinks and carbonated beverages. Brand names include BORDEN MILK, LADY BORDEN ICE CREAM, CRACKER JACK, and WYLER'S drink mixes.

Champion International $4.26 billion sales

Champion International is an integrated forest products company engaged in the manufacture, conversion, and distribution of wood-based building products, paper, and packaging. CHA owns or controls approximately 3.3 million acres of timberland in the U.S. In addition, its Brazilian and Canadian subsidiaries own or control significant timber resources supporting their operations. Contributions to sales (operating income) in 1983 were derived as follows: building products, 41% (34%); paper, 41% (68%); and packaging 18% (-2%).

Armco $4.16 billion sales

Armco is a diversified company with a large commitment to steel. In 1983 sales were derived as follows: oilfield equipment and production, 17%; carbon steel, 39%; specialty steel, 13%; fabricated products and services, 19%; aerospace and strategic materials, 12%. Armco also provides financial and leasing services through the Armco Financial Corp. During 1981, Armco reclassified certain business within its line of business. The new aerospace and strategic materials business includes HITCO, Oremet and Ladish Co. results. Ladish Co., acquired October 16, 1981, manufactures high technology metal components.

Esmark $4.04 billion sales

Diamond Shamrock $4.03 billion sales

Diamond Shamrock is a domesticated oil and gas company with interests in coal and chemicals. Diamond produces crude oil, natural gas, and coal; refines and markets petroleum products; and manufactures chemicals for broad industrial and commercial use. In 1983, sales (and operating profit) were derived: exploration and production, 11.8% (0%); refining and marketing, 55.9% (32.2%); coal, 6.9% (6.0%; geothermal, 0.8% (0%); chemicals, 23.4% (61.8%); and corporate, 1.2% (0%). The Company has manufacturing, administrative, and marketing facilities in more than 30 countries. On 8/31/83, Natomas Co. merged with DIA.

CPC $4.01 billion sales

CPC is a multinational corporation involved in the food and related businesses serving home and industry. Approximately 84% of sales are derived from the United States, Canada, and Western Europe. Branded grocery products accounted for 58% of 1983 sales. In the United States, the Company's major brand names are HELLMAN'S, BEST FOODS, MAZOLA, SKIPPY, THOMAS', KARO, GOLDEN GRIDDLE, ARGO and RIT. Worldwide, the best selling brand is KNORR, the world's leading brand in dry soup mixes and bouillons. Corn wet milling accounted for 38% of sales. The company supplies corn syrup, dextrose, and starches for producers of food and beverages. Other businesses include specialty chemicals, packaging, and restaurants.

Time Incorporated $3.99 billion sales

Time Inc. is the largest magazine publisher in the U.S. (42% of 1983 sales) and accounts for approximately 15% of all magazine advertising. The Company's various publications are TIME, SPORTS ILLUSTRATED, FORTUNE, MONEY, PEOPLE, LIFE, AND DISCOVER. Book publishing operations (15% of 1983 sales) include Time-Life Books, Book-of-the-Month-Club and Little, Brown and Company. Video operations (40% of 1983 shares) include Home Box Office's two pay television networks, HBO and Cinemax; and American Television and Communications. The remaining operations (3% of 1983 share) consist of selling Area-Marketing, Inc. which markets computer-generated information on the sales flow of food stores products.

John Deere $3.97 billion sales

Deere and Company manufactures, distributes, and finances the sale of mobile power machinery for the farm equipment and industrial equipment business sector. The farm equipment segment (79.9% of 1984 sales) produces a full range of farm equipment. These products are market primarily via an independent retail dealer network and include: tractors, tillage, soil improvement, seeding and harvesting machinery, and crop handling equipment. The industrial equipment segment (20.4% of sales) produces a broad range of equipment used in earthmoving and forestry. Overseas sales account for 19.6% of total revenue.

Bristol Myers $3.97 billion sales

Bristol-Myers Company operates in four different segments. Pharmaceutical and medical products, which account for 38% of sales (43% of profit) includes prescription medicines, mainly antibiotics, anti-cancer and cardiovascular drugs, orthopedic implants, surgical instruments, and orthodontic materials products. Non-prescription and health products, 27% (30%), includes infant formulas analgesics, cough-cold remedies and skin care products. Toiletries and beauty aids, 25% (20%), includes hair coloring and hair care preparations, deodorants, and antiperspirants, and beauty appliances. Household products, 10% (7%), includes household cleansing, specialty and laundry products. Major brand names include BUFFERIN, EXCEDRIN, COMTREX, BAN, DRANO, PLATINOL, AMEKIN, ENFAMIL, and WESTCORT.

Martin Marietta $3.90 billion sales

Martin Marietta was formed in 1961 by the consolidation of American-Marietta and Martin Company. Sales contributions in 1983 were: aerospace, 65%; aluminum, 13%; cement, 6%: chemicals, 6%; aggregates, 10%; other, 4%. Chemicals are primarily dyestuffs for the textile industry, admixtures for concrete, and refractory products for steel and other industries. Other lines are bank and financial systems and computer software systems. Important government defense and aerospace systems include TITAN III launch vehicles, Space shuttle (external tanks) PERSHING II, COPPERHEAD (laser-guided artillery shell) and the PATRIOT missile, MX missile, TADS/PNVS fire control and sensor system.

Firestone $3.87 billion sales

Firestone is engaged in the development, production, distribution, and sale of tires for all types of vehicles. FIR also manufactures and markets approximately 40,000 other products, including rims and wheels for trucks, tractors, and off-highway equipment; synthetic and natural rubber; polyurethane foam; vinyl resin and sheeting; metal and industrial rubber products; synthetic fibers, textiles, and chemicals. Sales (and operating profit) breakdown in 1984 was: tires and related products 89.2% (76.5% and diversified products 10.8% (23.5%). Firestone products are distributed through both independent dealers and Company-owned retail stores.

IC Industries $3.86 billion sales

IC Industries operates under several operating groups. Pepsi-Cola General Bottlers operates under the consumer products group, serves major markets in seven midwestern states with several brands and flavors. Pet, Inc. operates within the food industry. Its highly diversified line of food products are directed at a broad range of consumers. The commercial products group manufactures automotive products hydraulics, railroad product and castings. The Illinois Central Gulf Railroad is the transportation group's primary operating subsidiary. In 1983 sales (and operating profits) were derived as follows: consumers, 59% (84%); commercial, 17% (1%); and railroad activities 24% (15%).

North American Phillips $3.80 billion sales

North American Phillips concentrates its efforts in the fields of consumer products, electrical and electronic components, and professional equipment. The U.S. Phillips Trust controls 58% of the Company. The shareholders of Phillips Lamp Works (N.V. Phillips) are beneficiaries of the trust, NACP and Phillips Lamp Works share technology and patents and NAPC sells Phillips Lamp Works products in the U.S. Tradenames include MAGNAVOX and NORELCO. The breakdown of sales (and operating income) in 1983 was as follows: electrical and electronic products, 20.7% (46.4%); professional equipment, 23.9% (10.9%); consumer products and services, 55.4% (42.7%).

Pfizer $3.75 billion sales

Pfizer, Inc. is a worldwide company with primary interests in pharmaceutical and hospital products. Other major product lines include organic fine chemicals, agricultural products, consumer products, and materials science products. The Company maintains principal pharmaceutical research facilities at Groton, Conn.; Sandwich, England; Amboise, France; and Nagoya, Japan. There are 142 Pfizer production facilities in 41 countries. For 1983 the percent of sales (and operating profit) by product group were as follows: Health Care, 62% (89%); Agricultural, 12% (5%); and materials Science, 7% (0%). International operations accounted for 45% of sales and 52% of operating profit.

Heinz **$3.74 billion sales**

Heinz packs and sells an extensive line of canned foods, including soups, baby and junior foods, beans, canned prepared meals, pickles, vinegar, sauces and other specialties, under the Heinz label and trademark '57 Varieties. Under the STAR-KIST label it produces tuna products, cat food under the 9-LIVES label, and frozen potato and onion products under ORE-IDA. Outside the U.S. and Canada Heinz operates factories in England, Holland, Belgium, Italy, Australia, Venezuela, Ireland, Denmark, Portugal, and Japan. Foreign operations produced 35% of revenues and 36% of profits in the year ended 5/1/84. Weight Watchers prepares a line of diet foods and publishes a line of related books.

Further Potential Bias in News Reporting

Another potential source of bias is the belief among certain members of the investment community that writers for publications like The Wall Street Journal have a tendency to write more about certain favorite industries such as defense, airlines, etc. as opposed to providing valuable information for investment decisions. For example, in a recent conversation with Dean La Baron, President of Battery March Investment Associates, Mr. La Baron expressed his firm belief that this type of bias exists in The Wall Street Journal's reporting.

Most newspapers provide two products to their readers--entertainment and entertainment and informative news. Newspapers tend to vary their relative proportions of these two products. However, when writers are focusing on favorite or more glamorous industries rather than pure economic or investment news, they are producing something that more closely resembles entertainment. The Wall Street Journal was selected because it seemed to maintain the highest percentage of news.

While some bias of this type still may exist to some extent, economic theory implies that it cannot be that pervasive. If The Journal's content were significantly skewed towards individual writer's preferences, then economic theory implies that another publication would seek to supplant The Journal's preeminent position. There is a great abundance of firms with sufficient capital to accomplish this task. If The Journal was such an inefficient source of financial news we might see publications like The New York Times significantly expand their business section. However, the fact that there has not been an influx of new entrants or an expansion by current competitors seems to support the view that The Journal is an efficient source of investor information.

This is not to imply that there has not been entrant activity in this industry. The Financial Times has made an attempt to enter certain markets. In addition their are other local business publications such as Crain's New York Business. The latter type are more entertainment than investment news and the former has not yet attained a significant foothold in the market. The Wall Street Journal very much maintains the dominant position.

CHAPTER TWO

THE WALL STREET JOURNAL AND THE IMPACT OF THE NEWS

Wall Street Journal and the Timeliness of News

The Wall Street Journal and other business oriented publications frequently taut the usefulness of their articles to investors in their advertising. Such advertising often describes a scenario in which investors who regularly read their publication out perform their less well-read counterparts. However, the finance literature authored by the efficient market theorists seems to imply that the facts contained in the newspaper stories are not truly news. If this conclusion is accurate for a daily publication such as The Wall Street Journal, it must hold at least as strongly for weekly business publications such as Business Week, Forbes, as well as monthlies like Fortune.

There are many reasons why it might be plausible to question whether daily reading of The Journal can be a source of invaluable and timely news. To consider why, one must bear in mind that investors who rely on business publications for much of their investment information are competing against more sophisticated, professional investors who may be more adept at the information acquisitions business. The sophisticated investor may even be more skillful at gaining access to important financial details which could cause movements in security prices than the writers of business articles. It would seem that if one would compare the large disparity in pecuniary income between skillful security traders and financial writers such a comparison might provide a basis for believing that traders must have at least as much incentive to acquire important financial information as writers.

In addition to the incentive issue, the sophisticated investor can act on his or her information before the less sophisticated investor who relies on an intermediary in the information acquisition process -- the business publications.

This lag can be separated into three components:

> Lag 1. This lag refers to the time span between when the event first takes place and when the writer gets his story. Let us, for the moment, exclude insiders from consideration even though adherents to the extra-strong efficient markets hypothesis might not feel it would make a difference. Admittedly, sophisticated investors incur a similar lag, however, the agreement in the previous section implies that it may be shorter for sophisticated investors than less sophisticated investors.
>
> Lag 2. This time period refers to the time between when the writer refers to his story and when it finally is printed in The Journal. The lag includes the editorial process.
>
> Lag 3. This is the lag between when an article actually gets printed and when a potential investor reads it. This lag includes the physical newspaper delivery process.

It is clear from a review of this total lag process that less sophisticated investors who rely on secondary sources for their investment information may be off to a late start.

An advocate of the investment benefits of business publications might concede that much of the information in such stories is not totally new, however, this advocate might state that this is not true for exclusive stories. An exclusive refers to when a writer first gains access to a story. However, this first access and exclusivity usually is relative to other publications. Since The Wall Street Journal is the preeminent publication in its field, one would expect that it should include more exclusives than its competitors. However, there does not seem to be any compelling argument for believing that a particular publication's writers have more "exclusives" than sophisticated investor's. In fact arguments previously cited seem to imply that the opposite may be the case.

Other More Timely Sources of Information

The Wall Street Journal is not the most timely source of information. Radio and other live media rapidly carry information. The most often used information source by traders probably is The Dow Jones News Service or The Broad Tape. The Broad Tape monitors are placed at each station in the stock exchange floor. Through this process information is rapidly disseminated to traders. Information that appears on The Board Tape, such as earnings and dividend announcements, typically appear in The Wall Street Journal the following day.

Three Factors that Determine the Impact of News

Norman Fosback outlined three factors that determine what impact a news event may have on stock prices.[12] The first is the event's financial significance. For example, news of the recent Union Carbide Bhopal disaster could have clear financial repercussions in the near and distant future of the Union Carbide Corporation. The leak of methyl isocyanate gas from Union Carbide India Ltd's pesticide plant on December 3, 1984, gave rise to a host of damage claims which have a direct impact on earnings. News of a second leak at the Institute, West Virginia Union Carbide Plant, nine months after the first leak underscored initial fears that there might be overall mismanagement at the firm. The market consistently reflected these concerns. Carbide stock, which traded as high as $59 per share in the days before the Bhopal accident, fell to a low of $33 in January 1985. On the other hand this sustained decline in the value of the stock led to the feeling, on the part of other market participants, that the firm was inherently sound in the long run and thus might be undervalued and a potential takeover candidate. The GAF takeover bid which helped to reverse the stock's decline substantiated this.

It is clear that the more serious the news impact on the financial condition of the firm the greater the stock price reaction. The second factor determining the news impact is

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[12]Norman Fosback, "Stock Market Logic," (Institute for Econometric Research, Fort Lauderdale, Florida, 1983), p. 173.

the extent to which the event deviated from current market expectations. If a particular event has been fully anticipated, it should not have any impact upon market prices and trading volume. This issue will be discussed at length in the following pages as it will be a fundamental issue determining the form of the functional relationship relating price and volume to their respective independent variables.

Fosback's third factor determining the impact of news on stock prices is the speed of market adjustment. The more efficient the market the more rapidly prices should adjust to the news information. This factor will be addressed in Chapter 3.

The Rebound Effect

Market literature and stock folklore is replete with references regarding the purported tendency of market participants to overreact to new developments. For example, upon learning of bad news pertaining to a specific firm, investors might seek to unload a particular stock in anticipation of future price declines. However, it sometimes seems to be the case that the market reverses itself in the following days to the extent that it might offset the previous decline.

Victor Niederhoffer, in his Doctoral Thesis, The Analysis of World Events and Stock Prices, made an early attempt to quantify this effect:

> It is impossible in our opinion to provide a scientific explanation for the tendency for rises on days 2-5 following extremely bad events. A detailed examination of the numbers, however, does reveal a tendency for the market to overreact to bad news. This emerges clearly if we focus attention on the price movements on the days following large declines (changes in the first or second tenth.)
>
> There were fourteen large declines on day 1 following extremely bad events. On nine of these fourteen occasions, the change on day 2 was a large rise, on three occasions the change on day 2 was a moderate change, and on two occasions the change was a large decline. Thus, on day 2 following a large decline on day 1 of extremely bad events, a large rise is 4.5 times as likely as a large decline. This tendency for reversal stands in sharp contrast to the tendency for large changes in the same direction to follow each other for other world events (Table 13) and for randomly selected days.[13]

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[13] V. Niederhoffer, "The Analysis of World Events and Stock Prince," Journal of Business, p. 193-219.

This study will attempt a preliminary test of the market reversal process. The manner in which this will be accomplished will be through a comparison of the coefficients of the lagged news variables in the model with rice as the dependent variable.

$$Pt = B_o + B_1Pt-1 + B_2\ Nt + B_3\ Nt-1 + B_4\ Nt-2 + B_5\ Nt-3 + B_6\ St + B_7\ St-1 + B_8\ St-2 + B_9\ St-3 + B_{10}\ Vt + B_{11}\ Yt-1 + B_{12}\ DJIA + B_{13}\ DJIAt-1 + B_{14}\ EPS + B_{15}\ EPSTRD + B_{16}\ Beta + B_{17}\ Shareout$$

A longer lag is included in the model to see the price response over several trading days. This would allow the market some time to possibly arrive at a different conclusion after it has had more time to access the information as well as to consider additional sources.

The test for the presence of a rebound effect would be to compare the signs of the coefficients of the lagged news variables. For example, if a negative piece of information was made public on day t-1 a value of $B_3 < 0$ might indicate a price depressing impact of this news story. However, if $B_2 > 0$ this might indicate the potential presence of a rebound effect. The process might work similarly for positive news with the relative signs being reversed.

However, a relationship between news and stock prices must first be established in order to set up a further investigation to search for a rebound effect. This will be attempted in the empirical section of this study.

Presidential Illnesses and the Rebound Effect

A classic study showing the presence of the rebound effect is demonstrated in Niederhoffer's study on presidential illnesses and stock prices. In following the relationship between New York Times headlines concerning presidential illnesses and movements of the Dow Jones Industrial Average, Niederhoffer noticed a pronounced rebound effect.

> The average decline on day 1 was 2.80%. The date of the headline noting the sickness, a description of the event, and Dow Jones Industrial averages for day 0, 1, 2, 3, 4, and 5 are listed in Table 18. A summary of price movements on these days appears in Table 19.
>
> There is a strong and consistent tendency for rises to occur on days 2-5 following the presidential sickness. On twelve out of the fourteen occasions, there was a rise from the close of day 1 to the close of day 5. The average change from day 1 to the close of day 5 was 25%. The percentage of rises on day 2 was 100.0%, and on day 2 it was 78.6%.
>
> We conclude, therefore, that there is a strong tendency for a rise to occur on days 2-5 following a large decline on day 1 of a serious presidential illness or death. This confirms our previous conclusion concerning the market's strong tendencies to overreact on certain occasions following extremely bad events.[14]

The Niederhoffer study also revealed a most interesting relationship between what overtly appeared to be an overreaction, however, when utilizing hindsight, turned out to be the appropriate response. This was pointed out in the case of certain presidential illnesses which were initially

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[14] V. Neiderhoffer, S. Gibbs and J. Bullock, "Presidential Elections and the Financial Analysts Journal," vol. 26, March 1970, pp. 111-113.

reported to be only minor medical problems but which proved far more serious in the following days. A headline on July 23, 1923, noted that President Harding had suffered a case of ptomaine poisoning. The Dow Jones Industrial Average dropped 1.2 points the next day in what appeared to be a reaction to the illness. On the surface this seemed to be an overreaction to a relatively minor event. However, when President Harding died on August 2 the market, in retrospect, appeared to possess a degree of prescience. The tendency for the market to react correctly in cases where the illness was first reported to be minor was also apparent in the Roosevelt, Wilson, and Eisenhower administrations, according to Neiderhoffer.

The market can respond quite quickly to this type of news.

> The stock market is relatively efficient in responding rapidly to obviously significant news events and in adjusting prices to reflect updated knowledge. In fact, it usually responds so quickly as to effectively prohibit investors from profiting on news induced price moves. To cite an admittedly extreme example, when John F. Kennedy was assassinated on November 22, 1963, the Dow Jones Industrial Average sank 21 points. Yet prices collapsed so quickly that precious few investors were able to liquidate positions between the time of the assassination news and the end of the price decline (which culminated in a closing of the Exchange). When the market subsequently reopened its doors four days later, stocks retraced their previous declines (the Dow jumped 27 points), but again did so instantaneously, thereby prohibiting the realization of trading profits.[15]

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[15]Norman G. Fosback, "Stock Market Logic" The Institute for Econometric Research, Fort Lauderdale, Florida, 1983, p. 173.

Presidential Elections and the Market

Another classic relationship between news and the stock market is the role that presidential elections play in the market. There is much market folklore associated with the purported relationship between politics and the stock market.[16] It does seem clear that political actions can have a significant impact on business profits. However, many of the expected relationships such as a Republican victory being bullish have not held true.

Prestbo & Klein, in their book News and the Market, highlighted certain political motives for market activity.

> Postelection years long have been singled out as difficult ones for the market, no matter which party wins. Three of the worst declines in this century--in 1929, 1937, and 1969--all followed presidential balloting. Less severe slumps also occurred in the postelection years of 1941, 1949, 1953, and 1957, to name a few.
>
> The common explanation for this good-year-bad-year syndrome is that the party in power goes all out to keep the economy expanding (or, at least, make it appear to be expanding) in years that it must face the voters, but after the results are in, whoever takes charge often must do the painful things that were neglected while the electorate was being wooed.[17]

While there have been many relationships like these attributed to the market, such theorizing cannot be considered substantive. What is necessary is a sound statistical relationship to be demonstrated coupled with a

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[16]See Elliot Janeway, "Politics and the Stock Market," The Anatomy of Wall Street, ed. Charles J. Rolo and George J. Nelson, (Lippincott 1968), pp. 204-205.

[17]Prestbo and Klein, News and the Market, p. 133-134.

high degree of statistical confidence. Even if such a relationship could be demonstrated to have held for a particular time in the past this does not imply that, equipped with this knowledge, one can more successfully forecast future activity. Simply because the relationship seemed to hold in the past does not mean it will maintain in the future. Moreover, it might need to be established that political activity is a leading indicator. Following that an investor would be in the political forecasting business rather the market forecasting business. Should a useful political forecasting rule be established then one would need to contend with the efficient markets hypothesis.

CHAPTER THREE

A THEORETICAL DISCUSSION OF STOCK PRICES

The Efficient Markets Hypothesis

The efficient markets hypothesis makes certain claims regarding the ability of prices to adjust to new information. It also involves certain implications regarding the ability of investors to profit from publicly available information. In a sense, this study will provide still another test of the efficient markets hypothesis since if it could be established that a relationship does exist between information published in The Wall Street Journal and stock prices then the efficient markets view might be questioned. Consequently, it would be useful to clearly delineate the claims and implications attributed to the efficient markets hypothesis.

The first organized synthesis of the theory which included an organized collection of the ideas of the efficient markets empirical research was presented in Eugene Fama's seminal article in The Journal of Finance.[17] Fama's representation of the efficient markets view can be described as follows:

$$E[P^{1}_{jt} \mid \phi_{t-1}] = [1 + E(r^{1}_{jt} \mid \phi_{t-1}] P$$

where P_{jt-1} = price of security j at time t-1

P_{jt} = price of security j at time t

r_{jt} = the one period percent rate of return for security j during period t

ϕ_{t-1} = the information set that is fully reflected in the security's price at time t-1

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[17] E. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," Journal of Finance, vol. 25, no. 2, May 1970, pp. 383-417.

The information set referred to above includes all the relevant variables that might have an impact on the future return of that security. These include a complete range of any relevant economic variables such as interest rates, money supply growth, and GNP as well as firm specific variables such as earnings, the debt to equity ratio etc. Stated differently this means the following:

$$\phi^{M}_{t-1} = \phi_{t-1}$$

This means that the information that the market uses O_M includes all the relevant information O_{t-1}.[18]

Fama points out that the efficient markets view implies that the markets uses this information correctly. There have been numerous studies which attempts to test whether the market actually correctly uses the available information.

> Tests of market efficiency are concerned with whether or not the market does correctly use available information in setting security prices. Most common are tests that try to determine whether prices fully reflect specific subsets of information. For example, one possible source of information about future prices is the history of past prices and returns on securities. A nontrivial segment of the empirical literature on efficient markets is concerned with current security prices fully reflect any information in past prices and returns. Other sources of publicly available information are also fertile ground for tests of market efficiency. For example, there are studies of the adjustment of stock prices to the information in a stock split, a merger, an earnings announcement, the announcement of a new issue of securities by a firm, and so forth. In these tests the goal is to test whether prices adjust fully and instantaneously to the public announcement of the event of interest.

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[18]E. Fama, Foundations of Finance, (Basic Books 1976), p. 136.

> Finally, another sort of test of market efficiency is concerned with whether there individuals or groups -- for example, managers of mutual funds -- who are adept at investment selection in the sense that their choices reliably provide higher returns than comparable choices by other investors. If prices always fully reflect available information, this sort of investment adeptness is valued out. For if such adeptness exists, it implies that some investors either have access to information that is not utilized by the market in setting prices or that they are better able to evaluate available information than the market. In either case, the market is not efficient.[19]

Random Walks and Efficient Markets

The efficient markets hypothesis assumes that the time series pattern of stock prices is a random walk process.[20] By a random walk it is meant that each successive change in Pt is drawn independently from a probability distribution with a mean of zero. Therefore Pt is determined by

$$Pt = Pt-1 + E_t$$

$$\text{with} \quad E[Et] = 0 \text{ and}$$

$$E[Et\ Es] = 0 \text{ for } t = s$$

If stock prices are a random walk process and we wish to construct a forecast of P t + 1 given the past history (Pt...P1) we would want to generate the following:

$$\hat{P}\ t+1 = E[Pt+1 \quad (Pt...P1)]$$

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[19]Fama, op cit., p. 136.

[20]E. Fama, "Random Walks in Stock Market Prices," Financial Analysts Journal, Sept.-Oct. 1965.

However, since we assume stock prices are a random walk process then:

$$\hat{P}t+1 = Pt + Et+1$$

and E t+1 is independent of (Pt...P1).

Thus the forecast of $\hat{P}$ t+1 is simply:

$$\hat{P}\ t+1 = Pt + E[Et+1] = Pt$$

In other words, the best forecast of next periods stock prices is this periods stock price. This has most important implications for the construction of the specification of the price model. It implies that if our specification is the form of levels (as opposed to first differences) then the model must include a lagged dependent variable. However, the inclusion of a lagged dependent variable presents certain econometric difficulties. These econometric issues will be discussed later in this study.

Three Versions of the Efficient Markets Hypothesis

There are three versions of the efficient markets hypothesis. They are:

1. The Weak Form Efficient Markets Hypothesis
2. The Semi-Strong Form Efficient Markets Hypothesis
3. The Strong Form Efficient Markets Hypothesis

The weak form of the efficient markets hypothesis assumes that current prices reflect all stock market information. By stock market information I mean information such as the past history of stock prices, odd lot trading activity, trading volume levels, etc. That is all of the variables which technicians use in their trading rules will be useless in aiding them to predict future stock price movements. The rules include the multitudes of different charting schemes as well as all of the different filter rules that exist.* The weak form allows these filter rules to earn more than a simple buy and hold strategy. However, after accounting for commissions the weak version implies that it should not be able to out preform a naive strategy. Empirical research has not been kind to filter rules.[21] As Burton Malkiel stated it, "The history of stock-price movements contains no useful information that will enable an investor consistently to out perform a buy-and-hold strategy in managing a portfolio."[22]

The Semi-strong Form of the Efficient Markets Hypothesis states that stock prices adjust rapidly to the release of all new public information.

> Obviously the semi-strong hypothesis encompasses the weak form hypothesis because all public information includes all market information (stock prices, trading volume, etc.), plus all non market information, such as earnings, stock splits, economic news,

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[21]E. Fama and M. Blume, "Filter Rules and Stock Market Trading," Journal of Business, January 1966, pp. 226-241.

[22]B. Malkiel, A Random Walk Down Wall Street, (Norton & Co. 1973), p. 133.

*Filter rules refers to a market strategy in which an investor should buy and hold a security if its price rises at least X% and continue to hold until its price drops Y% from a subsequent high. If the price drops Z% then the rule would require liquidating that position and assuming a short position until the price rises a given percentage. See Jack Clark Francis, Investments: Analysis and Management, McGraw Hill, 1986, p. 529.

> political news. A direct implication of this hypothesis is that investors who act on important new information after it is public cannot derive above average profits from the transaction, considering the cost of trading, because the security price already reflects the effect of the new public information.[23]

It is the semi-strong version that would rule out any impact of Wall Street Journal news articles on stock prices. Since this is publicly available information the semi-strong version implies that it is rapidly internalized in the stock price. Therefore, it is already to late to act on information when one reads it in The Journal. There have been numerous studies which test the semi-strong version of the efficient markets hypothesis. Many of these studies have looked at stock price movements relative to some particular announcement date. The semi-strong version implies that prices would adjust before or during the announcement. In an effort to take this view into account it is necessary to test to see if prices lead the news as it appears in The Journal. Therefore a specification with this lead-lag relationship will be run.

The Strong Form Efficient Markets Hypothesis states that stock prices fully reflect all information -- public or otherwise. This means that there is no value to insider information. While the SEC has recently become most concerned about violations a laws when enjoin trading on undisclosed insider information the strong form hypothesis questions its value. In the classic study of insider trading

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[23]F. Rielly, (Investment Analysis and Portfolio Management), Dryden Press, 1985, p. 166.

at Portland State University, Professors Shannon Pratt and Charles DeVerre studied 52,000 insider transactions on 800 New York Stock Exchange stocks between 1960 to 1966.[24] The study seemed to indicate that those trades which were included in this insider group were shown to experience above average returns without incurring additional risk. The results from this study have been generally supported by other research on insider trading.[25]

The issue of the ability of insider trades to experience extra-normal returns is an important issue for this study to consider. If the research on insider trades did not reveal any extra-normal returns then this would cast strong doubt on the value of other more publicly available information. If so-called "higher quality" sources did not prove valuable then it would be more difficult to believe that such a widely distributed source such as The Wall Street Journal could have any market value. It is interesting to note that investment advisory services such as The Insiders have been established to make public information on and an analysis of insider trading activity that had been publicly released by the

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[24] S. Pratt and C. DeVeere, "Relationship between Insider Trading and Rates of Return for New York Stock Exchange Common Stocks 1960-1966," included in James Lorie and Richard Brealey, eds., Modern Development in Investment Management, (Praeger Publishers, 1972), pp. 268-279.

[25] See James Lorie and Victor Niederhoffer, "Predictive and Statistical Properties of Insider Trading," Journal of Law and Economics, vol. II, April 1968, pp. 35-53, and James Jaffe, "Special Information and Insider Trading," Journal of Business, vol. 47, no. 3, July 1974, pp. 410-428 and Joseph Finnerty, "Insiders and Market Efficiency," Journal of Finance, vol. 31, no. 4, September 1976, pp. 1141-1148.

Securities and Exchange Commission.[26] There does not seem to be established evidence that this type of information is of value.

Since it seems that insider information does have value it then seems reasonable to investigate other sources which do not provide information on as timely a basis as insider information.

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[26]N. Fosback, ed., The Insiders, Institute for Econometric Research, Fort Lauderdale, Florida.

<u>Tests of the Random Walk Process for Stock Prices</u>

For a stock price time series to follow a random walk process it must be the case that successive stock price changes are not correlated. That is there must be statistical independence between stock price changes. There have been several studies which have examined these price movements. Most notably Sidney Alexander found that the degree of correlation between stock prices over time and found the correlation to be small and not statistically significant.[27] The correlation coefficients typically ranged between +.10 and -.10.

Other tests of the autocorrelation of stock prices changes involve an examination of the frequency and duration of runs. A run is defined as two or more stock price changes which have the same direction (positive or negative). An example of this is shown below:

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- + - - - + - + - + + + + - + -
      Run             Run
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Simply by chance one would expect there to be a certain number of runs in a series of randomly selected numbers. Statisticians have shown that the expected number of runs from a random series is 1/3 (2n-1). If the actual number of runs from a given series deviates significantly from this number it would imply that the series is not random. A confirmation that there is not a certain periodicity to the

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[27]S. Alexander, "Price Movement and Speculative Markets: Trends or Random Walks," Industrial Management Review, May 1961, pp. 7-26.

appearance of runs would help support the weak version of the efficient markets sypothesis which will be discussed later.

Unfortunately, as in much of empirical research, all of the studies do not appear to be in agreement on this issue. Perhaps the most prominent source of disagreement finds its origin in a well known study by Niederhoffer and Osborne.[28] They found that price changes from individual transactions on The New York Stock Exchange exhibited significant serial correlation. Niederhoffer and Osborne attributed this autocorrelated pattern to the market making activities of stock market specialists.[29] Interestingly, the Niederhoffer and Osborne study showed that specialists use their access to information regarding unfulfilled limit orders to generate excess profits.

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[28]V. Niederhoffer and M. Osborne, "Market Making and Reversal on the Stock Exchange," Journal of the American Statistical Association, vol. 61, no. 316, December 1966, pp. 897-916.

[29]Specialists are monopoly market makers in one or more stock. There are approximately 400 specialists on The New York Stock Exchange. They buy or sell a security in response to supply and demand conditions for that security at a given moment in time in an effort to facilitate a smooth and continuous market.

<u>Random Walks and Gaussian Distributions</u>

For a given time series to fulfill the random walk criteria the individual members of the series must be independent and come from the same distribution. If one is studying security prices there are certain advantages to assuming that rates of return conform to a normal or Gaussian or normal distribution. Normal distributions are completed described by two statistics -- the mean and the variance. This second statistic is important in the analysis of security returns since normal distributions imply a finite variance. An assumption of a normal distribution would support the random walk description of the security price process in that E (Et) = 0 and E (Et Es) = 0. However, recent empirical research have called in question the assumption of a Gaussian distribution.

A recent study by B. Mandelbrat and E. Fama has suggested that the distributions of rates of return might be Leptokurtic with an infinite variance. Illustration A provides a comparison between a Gaussian and Leptokurtic distribution. The consideration of a Leptokurtic distribution was called for because of the need to explain the presence of outliers which fell beyond the bounds of the fails of the normal distributions. The presence of this outliers present statistical problems with the use of commonly used techniques for parameter estimation.

The solution of Mandelbrat and Fama was to utilize the more general Four Parameter Paretian Distribution to explain security returns.[30] The normal distribution is a special case of the Paretian Distribution and the normal distribution then is used as an approximation of the Paretian distribution.

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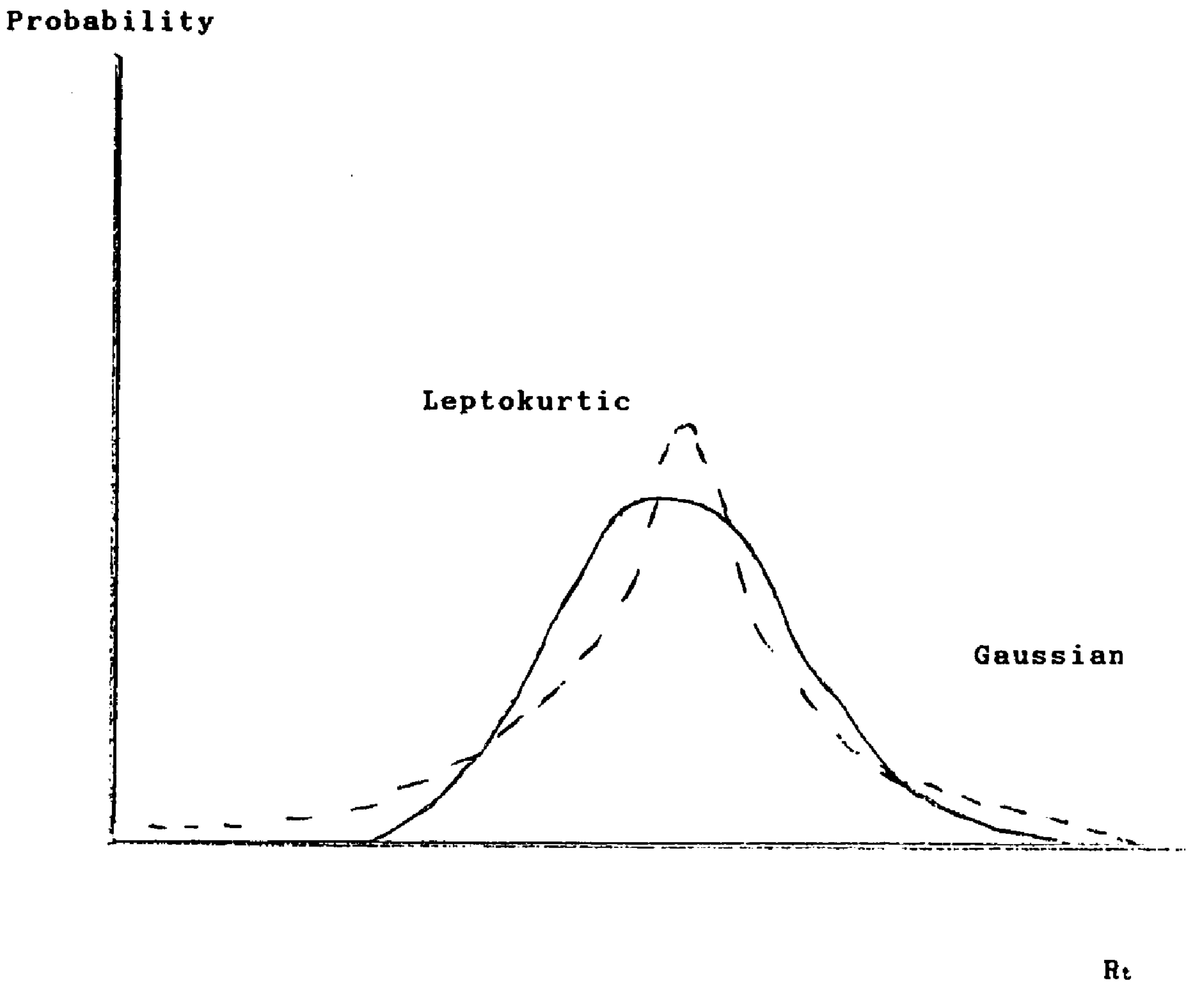
[30]J. Francis, Investments: Analysis and Management, (McGraw Hill, 1986), pp. 594-595.

ILLUSTRATION A



Other research has suggested that short term stock prices are normally distributed if the time period is defined differently.[31] If the time period is changed to conform to the time necessary to execute transactions instead of days then the distribution more closely follow the normal distribution. One study in particular theorized that this effect was most apparent when applies to trading volume. In Westerfield's study he related the arrival of each piece of new information to a change in a security's value and a change on trading activity.[32] This discussion is introduced to point out that while a Gaussian distribution is assumed in this study this assumption may not conform to reality. However, it seems reasonable to assume that a Gaussian distribution approximates the true distribution.

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[31]E. Fama, "Behavior of Stock Prices," Journal of Business, January 1965, pp. 39-105.

[32]R. Westerfield, "The Distribution of Common Stock Price Changes: An Application of Transactions Time and Subordinated Stockastic Models," Journal of Financial and Quantitative Analysis, December 1977.

Random Walks and Clustering of Stock Prices

A study by Victor Niederhoffer has put forward some compelling evidence demonstrating that stock prices may not be a random walk process.[33] He showed that stock prices have a tendency to cluster around integer values.

Osborne was the first to notice that the distribution of stock prices across the fractional prices (0/8, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8) was not random.[34]

The clustering results from the use of limit orders. There are two kinds of limit orders. Buy limit orders ask the broker to acquire the stock at the limit or below a specified price. A stop limit order is an order to sell a security when it falls to a certain price. Since investors tend to place these limit orders at prices they are familiar with -- integers or the more common fractions such as 1/4, 1/2, 3/4 -- one would expect prices to cluster around these values. Thus we do not see an even distribution across the other fractional prices. However, this cannot be considered a significant flaw in the random walk interpretation of stock prices time series.

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[33] V. Niederhoffer, "Clustering of Stock Prices," Operations Research pp. 258-265.

[34] M. Osborne, "Periodic Structure in the Brownian Motion of Stock Prices," Operations Research, vol. 10, 1960. pp. 345-379.

Speed of Stock Price Adjustment

The previous discussion implies that an efficient securities market adjusts "quickly" to new information. Hillmer and Yu looked at the markets adjustment to five different events.[35] They noticed that the variance of returns increased significantly and lasted for three to six hours. Their results most interestingly pointed out that the effects sometimes began prior to disclosure. Victor Niederhoffer believes that markets have an almost uncanny ability to anticipate seemingly unpredictable events.[36] He noticed certain movements in some investment prices prior to events such as the destruction of the Korean airlines jet as well as the bombing of Libya. While these events may seem unpredictable, Niederhoffer feels that the market has an ability to forecast the likelihood of their occurrence and to make the appropriate adjustments. For example, there was a great deal of military activity prior to the actual Libyan bombing. In some views the actual event was almost a foregone conclusion. Niederhoffer also maintains similar thoughts on other "unpredictable" events such as airline crashes.

James Patell and Mark Wolfsin conducted an important study which attempted to ascertain how quickly markets

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[35] S. Hillmer and P. Yu, "The Market Speed of Adjustment to New Information," Journal of Financial Economics, vol. 7, 1979, pp. 321-345.

[36] These comments are taken from a recent conversation with Victor Niederhoffer.

respond to the introduction of additional information.[37] They studied the intraday price reactions to earnings announcements on The Broad Tape. Their results demonstrated that the largest portion of the price response occurs five to fifteen minutes after disclosure. Interestingly, their research provided indications of unusual trading activity two hours prior to the actual announcements.

This research seems to provide evidence that it may be unlikely that we should expect a significant price reaction to information listed in The Wall Street Journal. The fact that traders would most often have ample opportunity to react prior to The Journal hitting the streets make such a reaction seem improbable.

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[37] J. Patell and M. Wolfsin, "Intraday Speed of Stock Price Adjustment," Journal of Financial Economics, 1984, pp. 223-252.

CHAPTER FOUR

A THEORETICAL DISCUSSION OF TRADING VOLUME

Volume of Trading and News

The incidence of news should lead to an adjustment process in the firm's stock price. The greater the trading volume the more rapidly prices should adjust. Consequently, it would be useful to investigate the impact of firm specific news developments and the trading volume of the particular firm's stock.

Another rationale for wanting to look at the relationship between trading volume and firm specific news is a potential theoretical basis for a differential reaction between sophisticated and unsophisticated investors in the market for this firms stock. It could be assumed that sophisticated investors whose full time livelihood is dependent on acquiring information on securities would have more rapid access to information and a better capacity to react to news than unsophisticated investors. In one possible scenario the sophisticated investors might have already capitalized on news of the event and are seeking to sell to a late arriving unsophisticated investor. This pattern of behavior might be reflected in an increase in trading volume for the firm's stock.

On the other hand, the absence of a reaction in trading volume and firm specific news may come from two possible causes. Firstly, it could be that investors did not feel that the content of the news was such that it provided them with sufficient incentive to trade the security. Another possible reason for a lack of a response in trading volume could be that while the content of the story was important to security holders they might have already acted on the information. That is by the time the story was read in The Wall Street Journal investors had already acted.

A Theoretical Model of the Relationship Between Price and Trading Volume

This study traces the relationship between news and both stock prices and trading volume. At first it seems reasonable to intuitively believe that there should be a consistent relationship between price and volume. If this is true then each variable should be included as a dependent variable in the variable's model. Moreover there should be a way to show the relationship between the two variables in terms of supply and demand analysis. The following section attempts to put forward a supply and demand framework to demonstrate this relationship. The analysis draws heavily on the work of Robert Crouch.[38]

Let us assume that there are two consumers in the market for a given security -- Investor A and Investor B. Therefore the market demand curve for this security is the horizontal summation of the two individual investor demand curves. That is:

$$D_M = D_A + D_B$$

Since the total supply for this security is fixed at a given moment in time, we would have an inelastic market supply which equals the horizontal summation of the individual supply curves.

$$S_M = S_A + S_B$$

Illustrations B and C show that a market price of P1 is determined given these supply and demand functions.

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[38]R. Crouch, "The Volume of Transactions and Price Changes on The New York Stock Exchange," Financial Analysts Journal, July-August 1970, pp. 104-109.

ILLUSTRATION B

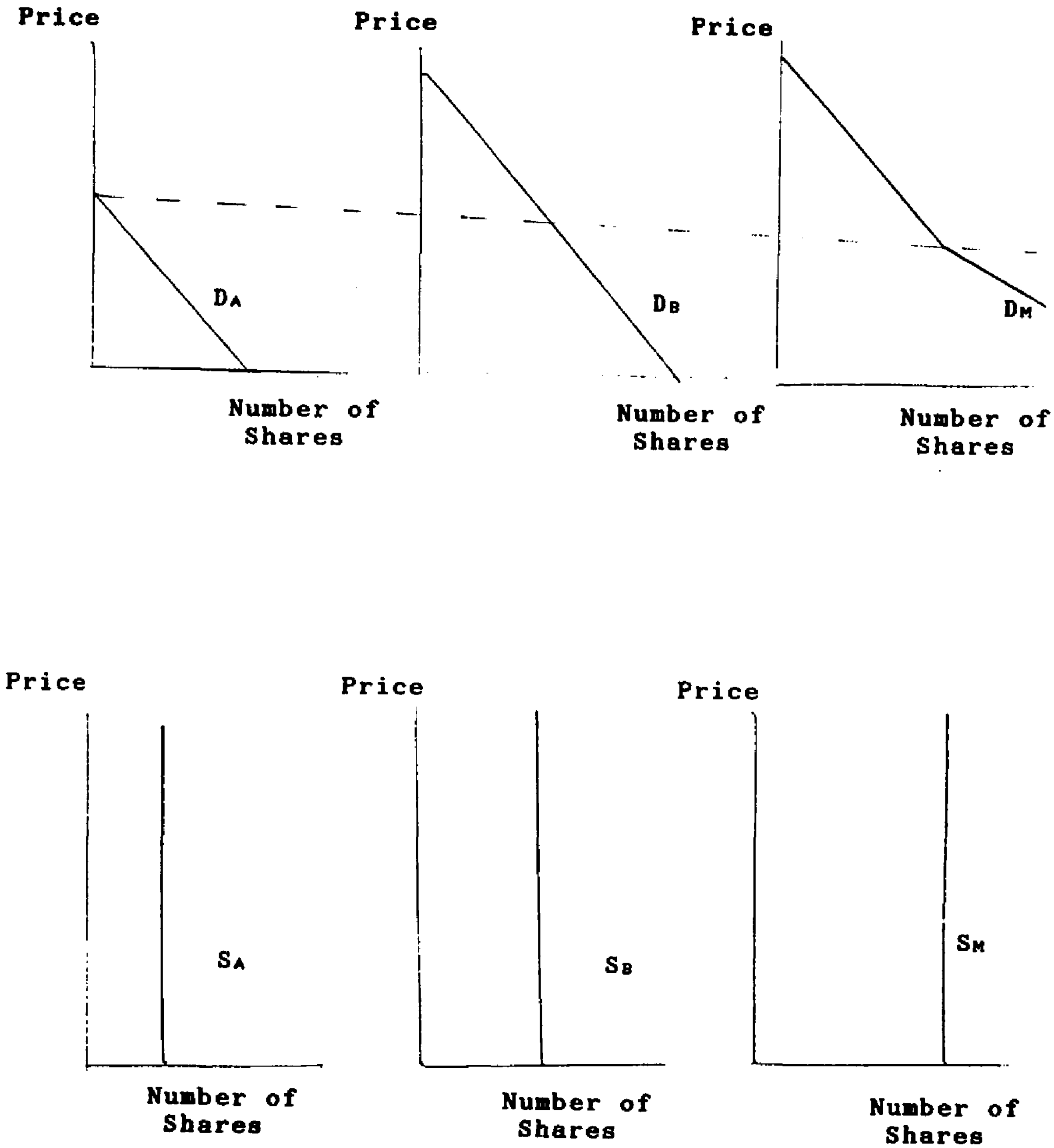
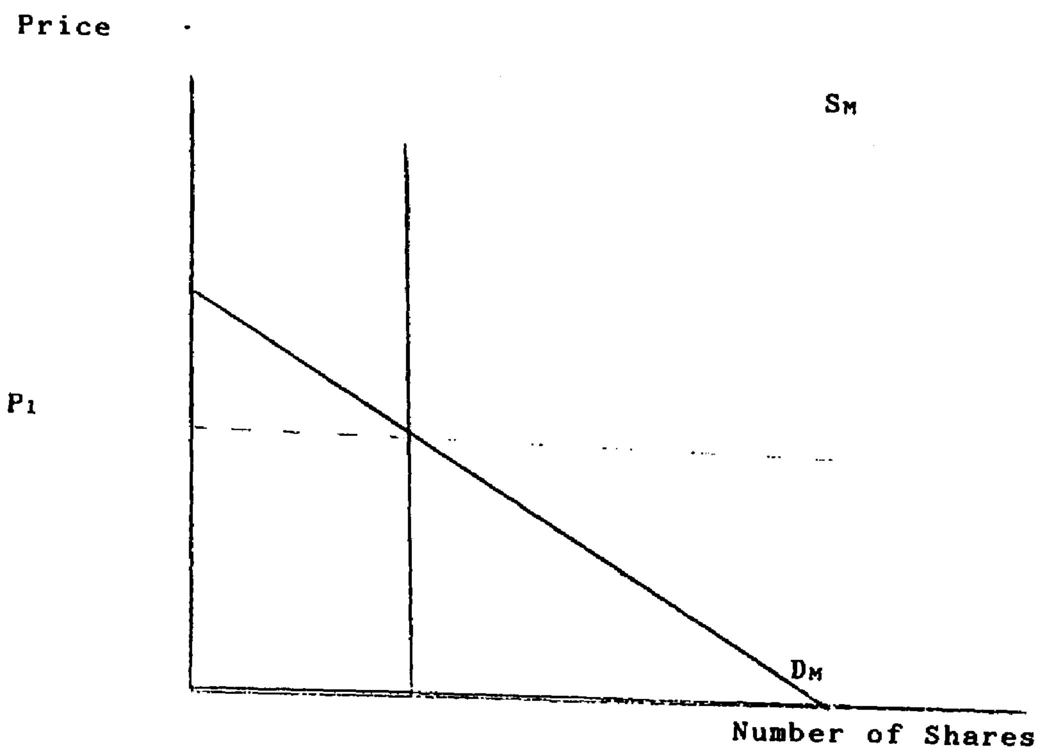


ILLUSTRATION C



Case I Offsetting Changes in Preferences

Let us assume that A experiences an enhanced preference for this security while B desires to reduce his holdings. This implies a shift in A's demand curve to the right while B's demand curve shifts to the left to the extent that each shift offsets the other. This is demonstrated in Illustration H. It can be seen that Sa' - Sa = Sb - Sb'. Since it is assumed that the shifts are offsetting, then price stays the same at P1.

The result is that trading volume has increased while price has remained constant. Therefore there is no correlation between trading volume and price. Moreover, net quantity demanded is constant.

Conclusion of Case I: No correlation between trading volume and price.

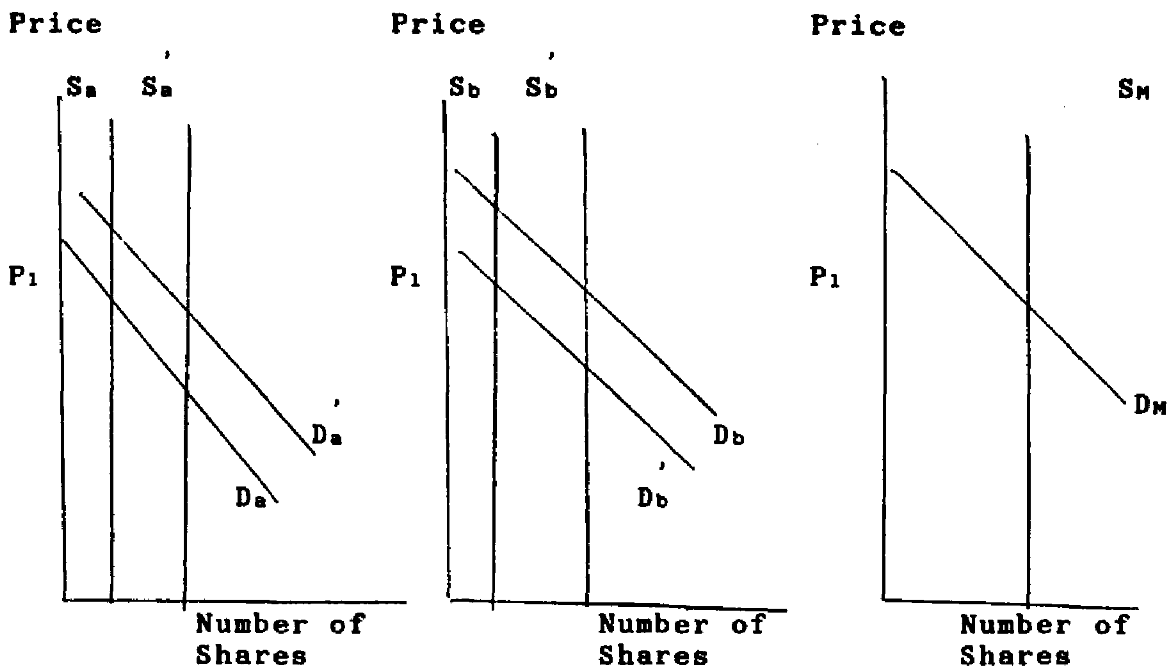
Case II Supporting Changes In Preferences In The Positive Direction -- Instantaneous Adjustment

Let us now assume that both Investor A and B experience an enhanced preference for this security. As Illustration E demonstrates this implies that their individual demand curves shift to the right causing the market demand to shift by the horizontal sum of the individual shift. In a perfectly competitive market with complete information the price should very rapidly adjust to P2 reflecting a market demand of D_m = da + db.

The stock market specialist plays a key role in facilitating the adjustment process. If he is omniscient he would instantly adjust the price to P2 having acquired the information of the net increase in demand. In this extreme case with these extreme assumptions we would not expect any increase in trading volume while showing an increase in price.

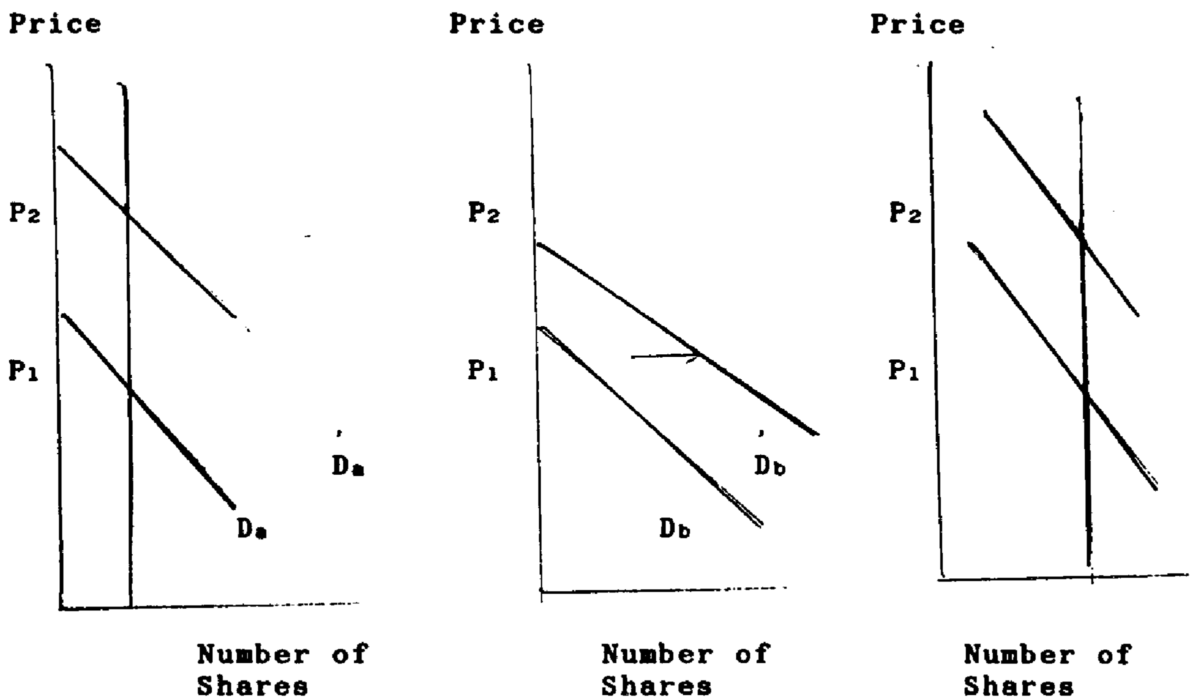
Conclusion of Case II: No correlation between trading volume and price.

ILLUSTRATION D



Case I: Offsetting Changes in Preferences

ILLUSTRATION E



Case II: Supporting Changes in Preferences in the Positive Direction -- Instantaneous Adjustment

Case III Supporting Changes in Preferences -- Non-Instantaneous Adjustment

There are obvious practical limitations associated with the assumptions of Case II. Firstly the specialist is not omniscient and initially accepts orders at P1. While acquiring information about the magnitude of the new increase in demand, he starts to raise price based upon his judgement of the current level of demand as well as his expectation of the future level of demand. Therefore there is a lag in this adjustment process. During this adjustment period between P1 and P2 trading volume is rising while price rises.

Conclusion of Case III: There exists a correlation between prices and trading volume.

Case IV Supporting Changes in Preferences in the Positive Direction Multi-Investor Case

There are other practical limitations associated with the two person model. Given the net increase in demand we do not have any sellers of the stock. Practically the specialist might have to temporarily raise the price above P2 so as to create some excess supply to meet the demand. However, the real solution to the limitations of the two person model is to make it a little more realistic by expanding it to be a multi-investor model.

We now assume that we have a group of sellers at prices between P1 and P2. Trading volume goes up as prices rise.

Conclusion Of Case IV: There exists a correlation between trading volume and prices.

Case V Supporting Changes in Preferences in the Negative Direction -- Multi-Investor Case

If instead of there being a net increase in demand there is a net decrease in demand, we see that we get some conflicting results. When A and B's demand for this security falls, both demand curves shift to the left causing the market demand curve to shift to the left. Illustration F demonstrates that price should fall in the two investor case. When we expand the model to include the multi-investor case given the arguments of Case IV, we see that we have an adjustment process with the market clearing at P3. In this case prices fall and the volume of trading rises.

Conclusion of Case IV and V: Rising trading volume can be associated with rising or falling prices. There does not seem to be a good correlation between trading volume and prices.

Robert Crouch points out there should be a correlation between the absolute value of the price change and trading volume.[39] This is important because a conventional attempt to derive a correlation between these two variable may not prove fruitful. Early empirical work seemed to come to the conclusion that there was not a relationship between these two variables.

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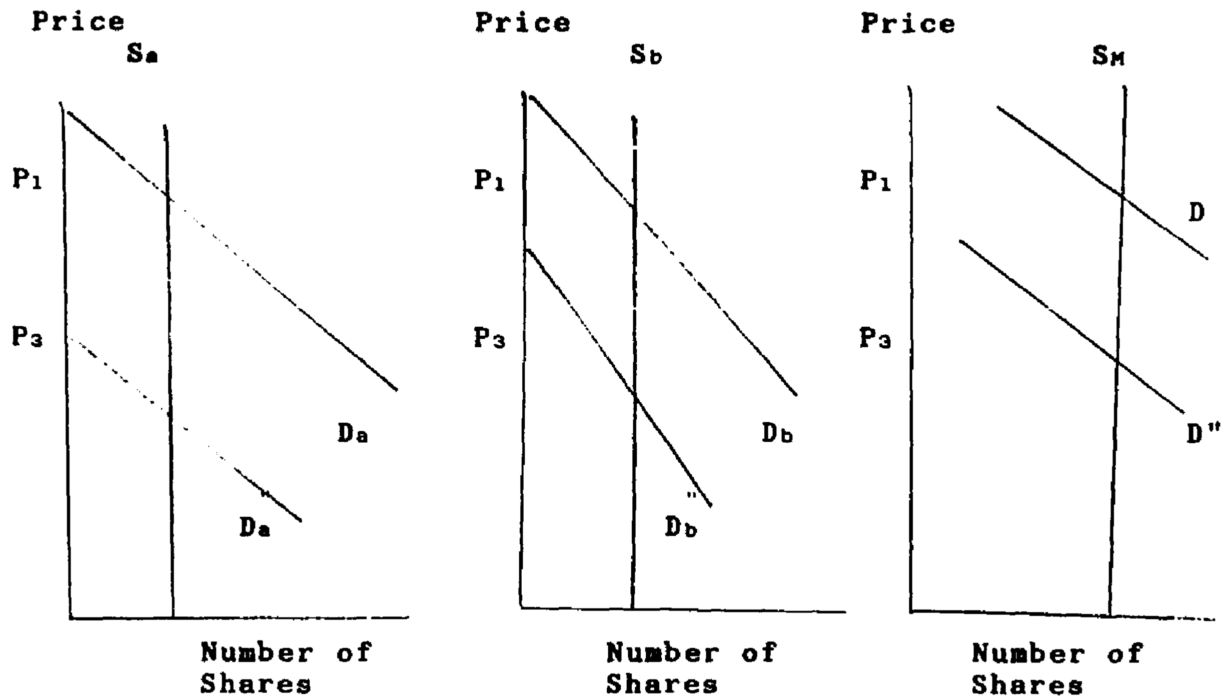
[39] R. Crouch op. cit., p. 106.

ILLUSTRATION F



Case V: Supporting Changes in Preferences in the Negative Direction -- Multi-Investor Case

CHAPTER FIVE

CHARACTERISTICS OF THE DATA

Problems with the Data

The Case of Esmark Corp.

In individual regressions for both stock price and trading volume Esmark Corporation demonstrated a statistically significant impact, at the 95% level of confidence, of the market value of the news. The intensity of the news, as represented by the panel scale variable, was not statistically significant.

The regressed results for both price and Esmark trading volume are listed below.

SMPL 1901 --1949
149 Observations
LS // Dependent Variable is ESMP1

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.6265291	2.9808743	0.8811271	0.378
ESMP1 (-1)	0.9861727	0.0118653	83.114173	0.000
ESMNEW	-0.0002082	6.519D-05	-3.1946720	0.001
ESMNEW(-1)	0.0001710	6.273D-05	2.7262760	0.006
ESMSCL	0.0592239	0.0769390	0.7697511	0.441
ESMSCL(-1)	-0.1361235	0.0765242	-1.7788298	0.075
DJIA	0.0284168	0.0075630	3.7573599	0.000
DJIA(-1)	-0.0300941	0.0073737	-4.0812825	0.000
ESMVL1	0.0002482	2.148D-05	11.556150	0.000
ESMVL1(-1)	-0.0001558	2.815D-05	-5.5323388	0.000
ESMJAN	0.2371069	0.4812340	0.4927061	0.662

R-squared	0.988547	Mean of dependent var	49.00809
Adjusted R-squared	0.987717	S.D. of dependent var	8.160894
S.E. of regression	0.904463	Sum of squared resid	112.8915
Durbin-Watson stat	2.443298	F-statistic	1191.111
Log likelihood	-190.7467		

The problem with Esmark Corp. lies in the fact that a full time series of 252 trading days for the 1984 sample period does not exist. Esmark was purchased on August 7, 1986, by Beatrice. The firm was purchased for $2.8 billion which resulted in a final payout price of $60 a common share and $42.50 a preferred share.

There were several reports in 1984 which one would expect to have a meaningful impact on both the price of Esmark stock as well as the amount of shares traded. One of the most notable was a report of a possible leveraged buyout bid by Kohlberg, Kravis and Roberts & Co., a New York investment banking firm that specializes in leveraged buyouts.* A major story on this proposed buyout appeared in May 4, 1986, on page 3 in <u>The Wall Street Journal</u>. It is interesting to note that following the release of this offer the company's stock opened at $55 per share of common which was $9.75 higher than the previous day's close of $45.25.

The impact of this leveraged buyout was also keenly felt in the quantity of shares traded as well as the coffers of the traders who accumulated the commissions on these trades. The volume of trading in Esmark common stock in early May went as follows:

Date	Shares Traded
May 1	105,800
May 2	92,700
May 3	3,004,000
May 4	3,925,500
May 5	1,374,700
May 6	474,000

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*In a leveraged buyout a small group of investors acquire a company in a transaction that is financed largely by debt.

In spite of the most apparent news impacts on stock price and trading volume the observations on Esmark are not included in the overall sample. To include Esmark without a full year's values might introduce a statistical bias into the overall results. Consequently, International Paper -- the 79th largest firm was included in its place.

Potential Problems Using Daily Data

Much of the literature in financial economics focuses on stock returns and excess returns as the principal dependent variable.

A return for period t (ie a month) is defined as:[40]

$$R_{it} = \frac{d_{it} + (P_{it} - P_{it-1})}{P_{it-1}} = \frac{d_{it}}{P_{it-1}} + \frac{P'_{it} - P_{it-1}}{P_{it-1}}$$

where: d_{it} = dividend per share of the common stock of firm: from the end of month t-1 to the end of month t;

P_{it-1} = price per share of the common stock of firm; at the end of month t-1;

P_{it} = market value at the end of month t of of one share of firm i purchased at the end of month t-1

Finance studies often utilize mean adjusted returns and market adjusted returns.[41] If we let Rit equal the return for security i for day t then R*it can be the excess mean adjusted return.

$$R^*_{it} = R_{it} - \bar{R}_i \; ; \; \bar{R}_i = \frac{1}{n} \sum_{i=1}^{n} R_{it}$$

where n = the number of days in the period which is used to calculate the mean. (ie one year).

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[40]Eugene Fama, Foundations of Finance, Basic Books, New York 1976, p. 12.

[41]S. Brown and J. Warner, "Measuring Security Price Performance," Journal of Financial Economics, 1980, pp. 205-258.

Market adjusted returns R'_{it} calculated in the following manner:

$$R'_{it} = R_{it} - R_{Mt}$$

where R_{Mt} is the return on the appropriately defined market such as The Standard and Poors 500 or a more broadly based measure such as The Wilshire 5000.

The most often used source of these data are the CRSP Daily Returns File and The CRSP Daily Excess Returns File. These files contain returns for stocks on The New York Stock Exchange and The American Stock Exchange going back to July 1962. In calculating excess returns the market is divided into ten risk classified portfolios which are ranked by their betas.[42]

It would be convenient to use stock returns or excess returns as the appropriate dependent variable. However, this data source is not available for this study. Consequently, stock prices are used as one of the dependent variables. The object of this study is to see the variability of prices and volume which might be generated by the variability in news. Therefore prices are as useful as returns.

There are certain advantages to using stock price levels as opposed to excess returns. Firstly the difficulties generated by non-synchronous trading are avoided. Non-synchronous trading refers to the fact that in calculating excess returns the return on a security and the return on the market index tends to be measured over different trading

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[42]Center for Research in Security Prices, Graduate School of Business, University of Chicago, Chicago, Illinois.

intervals. This can create biased parameter estimates.[43] Another problem generated by non-synchronous trading is that daily excess returns can exhibit serial dependence.[44] Since this study does not use excess returns the problems generated by non-synchronous trading are not encountered. A more important issue that the use of stock price levels as opposed to returns is the issue of daily data versus less timely data. Recent research has raised serious questions as to the general applicability of conclusions reached through the use of monthly data to work involving daily data. Fama has asserted that daily returns depart more from normality than monthly returns. In examining the frequency distributions for continuously compounded daily returns for each of the 30 stocks included in The Dow Jones Industrial Average Fama made the following observations:

> The obvious finding in Table 1.2 is that the frequency distributions of the daily returns more observations both in their central portions and in their extreme tails than are expected from normal distributions. For every stock the actual number of daily returns within .5 sample standard deviations from the sample mean return is greater than the expected number. Every stock also has more observations beyond three standard deviations from its mean return that would be expected with normal distributions; all but one have more beyond four standard deviations; and all but three have more beyond two standard deviations.

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[43]These returns were calculated using methods developed in Scholes and Williams. See Myron Scholes and Joseph Williams, "Estimated Betas From Non-Synchronous Data," Journal of Financial Economics, 1977, pp. 309-327.

[44]Scholes and Williams, op cit.

In more vivid terms, if daily returns are drawn from normal distributions, for any stock a daily return greater than four standard deviations from the mean is expected about once every 50 years. Daily returns this extreme are observed about four times every five years. Similarly, under the hypothesis of normality, for any given stock a daily return more than five standard deviations from the mean daily return should be observed about once every 7,000 years. Such observations seem to occur about every three to four years.[45]

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[45]Eugene Fama, op cit., p. 21.

CHAPTER SIX

ECONOMETRIC ISSUES

Use of the Pooled Regression Technique

Most of the data used in econometric estimation is either time series or cross sectional data. With time series data we look at a particular variable over successive time periods. For cross sectional data we are considering a particular variable at a given moment in time but over different entities or cross sections (ie firms or geographic areas). In this analysis it is necessary to use a pooled model as we need to look at the effects of news on prices and volume through time but over several different firms. The expansion of the data set to consider different cross sections or firms is necessary in order to attempt to develop a relationship that may be applicable to companies in general as opposed to a certain firm.

The pooled model is then:

Price as the Dependent Variable

Pit = B0 + B1 Pit-1 + B2 Nit + B3 Nit-1 + B4 Sit + B5 Sit-1
+ B6 Vt + B7 Vt-1 + B8 DJIA + B9 DJIAt-1 + B10 EPS
+ B11 EPSTRD + B12 Beta + B13 Shareout + eit*

where i = (1...10) = number of cross sections

i = 1 = Armco Inc
i = 2 = Burroughs Corp
i = 3 = Champion Int's Inc
i = 4 = Digital Equipment Corp
i = 5 = Diamond Shamrock Corp
i = 6 = Firestone Inc
i = 7 = International Paper Inc
i = 8 = Martin Marietta Corp
i = 9 = Motorola Corp
i = 10 = Time Inc

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*The news definition included here separated the monetary value of the news and its scale counterpart. The alternative version of the news is the product of the two in each case.

where Pit = closing price for firm's stock on day t

Nit = dollar value of news for firms with a print date of t

Sit = scale evaluator for news for firms with a print date of t

Vit = volume of trading in firm i stock on day t

DJIA = Dow Jones Industrial Average on day t

EPS = earnings per share of firm i for 1984

EPSTRD = dummy variable -- equals 1 if earnings per share did not decline in past three years and equals 0 otherwise

Beta = Beta risk measure

Shareout = total shares outstanding for firm

<u>Trading Volume as the Dependent Variable</u>

Vit = B0 + B1 Nit + B2 Nit-1 + B3 Sit + B4 Sit-1 + B5 Pit + B6 Pit-1 + B7 DJIVOLit + B8 DJIVOLit-1 + B9 EPSi + B10 EPSTRDi + B11 Beta + B12 Shareout + E

where: DJIVOL = Dow Jones Industrials Volume on day t

The pooled models covers 252 trading days starting with January 1, 1984, to December 31, 1984. This time series is then traced over ten cross sections. Each model contains (252) 10 = 2520 observations. Without taking lags into account this allows for [(10)(252)] - 12 = 2508 degrees of freedom for the price model since parameters must be estimated. The volume model then has [(10)(252)] - 11 = 2509 degrees of freedom.

Serial Correlation

Economic time series tends to suffer from serial correlation. Positive serial correlation occurs when there is a positive relationship between successive errors.

> Positive serial correlation frequently occurs in time series studies, either because of correlation in the measurement error component of the error term or more likely because of high degrees of correlation over time present in the cumulative effects of the omitted variables in the regression model.[46]

Negative serial correlation is when positive errors in one time period are associated with negative errors in the ensuing time period. Illustration G demonstrates this in the case of a two variable linear regression model.

The Durban-Watson statistic provides a test for the presence of serial correlation. It is calculated in the following manner:[47]

$$DW = \frac{\sum_{t=1}^{T} (E_t - E_{t-1})^2}{\sum_{t=1}^{T} E_t^2}$$

The Durban-Watson statistic can range between 0 and 4. Low Durban-Watson values imply positive serial correlation. A value of 2 usually implies no first order serial correlation. This is not the case, though, when the

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[46]Robert Pindyck and Daniel Rubinfeld, Econometric models and Economic Forecasts, (McGraw Hill, 1976), p. 107.

[47]J. Durban and G. S. Watson, "Testing for Serial Correlation in Least Squares Regression," Brometrika, vol. 38, pp. 159-177, 1951.

regression equation contains lagged dependent variables. However the detection of serial correlation in the presence of lagged dependent variables will be discussed separately.

An often used method of correcting for serial correlation is The Cochrane-Orcutt procedure.[48] This method uses ordinary least squares to calculate a model of the type:

$$Y = B_o + B_1 X_{1t} + B_2 X_{2t} + \ldots + B_n X_{nt} + E_t$$

Given that the time series is characterized by autocorrelation an autoregressive error process, such as that listed below, must exist.[49]

$$E_t = P E_{t-1} + V_t \quad 0 \underline{<} P \underline{>} 1$$

The Cochrane-Orcutt procedure uses a generalized differencing transformation process. This method would yield a transformed equation such as:[50]

$$Y_t{*} = B_o (1-\hat{p}) + B_1 X^{*}_{1t} + \ldots + B_n X^{*}_{nt} + V_t$$

$$\text{where } Y^{*}_t = Y - \hat{p}\, Y_{t-1}$$

$$X^{*}_{1t} = X_{1t} - \hat{p}\, X_{1t-1}$$

$$X^{*}_{nt} = X_{nt} - \hat{p}\, X_{nt-1}$$

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[48]D. Cochrane and G. H. Orcutt, "Application of Least Squares Regressions to Relationships Containing Autocorrelated Error Terms," Journal of the American Statistical Association, vol. 44, 1949, pp. 32-61.

[49]This autoregressive error process represents first order serial correlation. This is not to imply that higher order serial correlation does not exist. Econometricians often make the simplifying assumption of first order serial correlation in an effort to avoid the often intractable problem of estimating a very large number of off-diagnol elements of the variance-covariance matrix of the disturbance vector.

[50]Pindyck and Rubinfeld, op cit., p. 111.

This transformed equation is then estimated and new parameter values substituted into the original equation thus yielding new regression residuals.

This iterative process is continued with the newly estimated residuals through which a new p is derived. The interations are generally stopped when the new p estimates differ from the old ones by less than .01.6[51]

The Cochrane-Orcutt procedure is used extensively in this study. It is used in the Volume Models since these specifications do not contain lagged dependent variables.

A test does exist to detect higher order serial correlation. Higher order serial correlation exists when an error term is correlated with a more distantly lagged error term. It is the Box-Pierce Q Statistic.[52] It can be calculated in the following manner:

$$Q = N \left[\sum_{K=1}^{M} r_K^2 \right]$$ [53]

where: r_K^2 = Kth lag autocorrelation of the residuals

M = number of autocorrelations used

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[51]The Cochrane-Orcutt is sufficient to deal with the autocorrelation of this time series. However the Hildreth-Lu Procedure on the Durban Procedure could also be used to correct for serial correlation. See. G. Hildreth and J. Lu, "Demand Relations with Autocorrelated Disturbances," Michigan State University, Agricultural Experimental Station, Technical Bulletin 276, November 1960, and J. Durban, "Estimation of Parameters in Times Series Models," Journal of the Royal Statistical Society, ser B, vol. 22, pp. 139-153, 1963.

[52]G. Box and D. Pierce, "Distribution of Residual Autocorrelations in Autoregressive-Integrated Moving Average Models," Journal of the American Statistical Association, vol. 65, 1970, pp. 1509-1526.

[53]R. Litterman, Rats Manual, p. 1-18.

While the Q statistic might shed some light on the presence of higher order serial correlations, it will not be explicitly used in this study. The simplifying assumption of no higher order serial correlation is often made in time series analysis for cost saving reasons. It is also assumed in this study to economize in computational costs.

Lagged Dependent Variables

If we believe that stock prices are a random walk then it is necessary to include a lagged dependent variable in the price specification. However, there are certain econometric problems associated with multiple regression analysis with a lagged dependent variable as an explanatory term. These issues are be discussed below.

R^2's and Lagged Dependent Variables

When running multiple regressions using a lagged dependent variable as an explanatory term one tends to notice high R^2 values.* This can lead to the misleading conclusion that the model one is using is very good. However, in time series data, very high R^2's are not unusual.[54] Ames and Reiter showed that the average R^2 for a randomly chosen variable and its own lagged value is about 0.7.[55] Therefore, one cannot look at the R^2's and conclude that the model is appropriate. There needs to be sound theoretical reasons to include each variable and ideally each variable showed to be statistically significant.

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[54] P. Kennedy, A Guide to Econometrics, (MIT Press, Cambridge, Mass.)

[55] E. Ames and S. Reiter, "Distributions of Correlation Coefficients in Economic Time Series," Journal of the American Statistical Association, vol. 56, 1961, pp. 637-656.

*The meaning of the R^2 statistic is discussed in Chapter 8.

Lagged Dependent Variables and the Detection of Serial Correlation

One can usually rely on the Durban-Watson statistic to detect serial correlation. However, the usual Durban-Watson statistic cannot be used in models with lagged dependent variables. In such models the Durban-Watson values tends towards 2 which is the value one would expect to occur when the errors terms were randomly occurring. Therefore there is a built in bias against detecting serial correlation.[56]

In situations such as this one can use the Durban h test.[57] The Durban h statistic can be calculated as follows:

$$h = \hat{p}\sqrt{\frac{N}{1- N\,[\text{var}\,(\hat{\alpha}_2)]}}$$

where: N = sample size

var ($\hat{\alpha}_2$) = variance of the coefficient of the lagged Yt-1

$\hat{P}$ = estimate of the first order serial coefficient

The Durban h test allows one to detect first order serial correlation for large samples. It will not, however, detect higher order serial correlation (longer lagged relationship between error terms).

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[56]For a good discussion of this issue see D. Gujarati, Basic Econometrics, (McGraw Hill Book Co., 1978) pp. 269-270.

[57]J. Durban, "Testing for Serial Correlation in Least-Squares Regression When Some of the Regressors are Lagged Dependent Variables," Econometrica, vol. 38, 1970, pp. 410-421.

Random Walk Hypothesis and Lagged Dependent Variables

In a random walk process each successive change in the variable in question is independently drawn from a probability distribution for that variable. It is assumed that this probability distribution has a mean of zero. This is simply demonstrated below:

$$Y_t = Y_{t-1} + E_t$$

with: $E[E_t] = 0$

$$E[E_t E_s] = 0 \text{ for } t \neq s$$ [58]

An example of such a process would be successive flips of a coin. If we wanted to construct a forecast of such a random walk process and we had the past time series (Y1...Yt) we would need to estimate the following:

$$\hat{Y}_{t+1} = E[Y_{t+1} : Y_t \ldots Y_1]$$

The problem is that $Y_{t+1} = Y_t + E_{t+1}$ and E_{t+1} is independent of $(Y_t \ldots Y_1)$.

Consequently, $\hat{Y}_{t+1} = Y_t + E[E_{t+1}]$ and $E[E_{t+1}] = 0$

Therefore the best forecast of Y_{t+1} is Y_t.

If stock prices are a random walk process then it would be most appropriate to include a lagged dependent variable as an explanatory term. The enhanced explanatory power of the price model which includes a lagged price term as an

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[58]Robert S. Pindyck and Daniel L. Rubinfeld, op. cit., p. 432.

independent variable as opposed to one which does not is reflected in greatly increased R^2's.[59] Given that

$$E\ (Yt - \bar{Y})^2 = \text{Total Sum of Squares} = TSS$$

$$E\ (\hat{Y} - \bar{Y})^2 = \text{Regression (explained) Sum of Squares} = RSS$$

$$E\ \hat{U}t^2 = \text{Error (unexplained) Sum of Squares} = ESS$$

$$R^2 = \frac{RSS}{TSS} = 1 - \frac{ESS}{TSS}$$

R^2 = Coefficient of Determination

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[59] See Harry H. Kelejian and Wallace E. Oates, Introduction to Econometrics, (Harper & Row, 1981) p. 142-144.

PART II

ECONOMETRIC ANALYSIS OF THE DATA

CHAPTER SEVEN

STOCKPRICES

Dependent Variable Price

For price as the dependent variable several alternative specifications were considered. Initially the analysis was run using both definitions of the news variable -- Newsscale and news and scale separately as defined earlier.

Newsscale

The most fruitful specification is

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWSSCALE
+ B3*NEWSSCALE(-1) + B4*VOLUME + B5*VOLUME(-1) + B6*DOWJONES
+ B7*DOWJONES(-1) + B8*ESP + B9*EPSTRD + B10*BETA

This specification yields the following results.

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.2995309	0.83901651	-0.3570024
B1	0.98906710	0.00285686	346.207919
B2	-2.024E-06	2.5090E-06	-0.8065519
B3	-1.119E-06	2.5079E-06	-0.4462911
B4	0.00002897	0.00001792	1.61627218
B5	0.00001175	0.00001780	0.66052121
B6	0.02918685	0.00306634	9.51847264
B7	-0.0289361	0.00303871	-9.5224977
B8	0.12367638	0.03668650	3.37116863
B9	-0.1518125	0.12296471	-1.2346025
B10	0.00268961	0.00112921	2.38184733

RSQ* = 0.99762824 RBSQ* = 0.99761871 F(10,2489)= 104694.162
DURBIN-WATSON = 2.52393047 STD ERROR = 1.54010325

It is clear from an examination of the t-statistics for both contemporaneous and lagged newsscale that neither term has a significant impact upon stock prices. As the Random Walk Hypothesis would imply the most significant determinant of Pt is Pt-1. This is clear from the t-value of 346 for the coefficient of .989 for Pt-1. The coefficients for the contemporaneous and lagged values of the Dow Jones Industrial Average are clearly significant with t values of 9.51 and 9.52 respectively. However the coefficients of .029 and .028, while statistically significant, are relatively small in comparison to the lagged price term. The F-value of 104694 also clearly rules out the null hypothesis that none of the variables in this specification explain the variation in Pt. The R2 of .997 states that 99.7% of the variation in price is explained by this model.

Since the stock prices model contains a lagged dependent variable it is necessary to utilize the Durban h test to rule out first order serial correlation. It is necessary to perform this test to see if the low t-statistics from the previous regression are biased. The results yield a Durban h value of -13.11 which does not allow us to rule out first order serial correlation given a critical value of 1.65 for the 5 percent level of significance.

No effort is made to test for the potential bias in the Newsscale coefficients caused by serial correlation since these coefficients are clearly not significant.

The results from the specification listed below show that while total shares outstanding prove to be a very important variable in the trading volume model they are not an important determinant of price.

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWSSCALE
+ B3*NEWSSCALE(-1) + B4*VOLUME + 5*VOLUME(-1) + B6*DOWJONES +
B7*DOWJONES(-1) + B8*SHAREOUT + B9*ESP + B10*EPSTRD +
B11*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.1559668	0.84624045	-0.1843056
B1	0.98847490	0.00289306	341.670707
B2	-2.103E-06	2.5094E-06	-0.8380050
B3	-1.211E-06	2.5086E-06	-0.4827784
B4	0.00003241	0.00001812	1.78866014
B5	0.00001514	0.00001799	0.84184661
B6	0.02903468	0.00306819	9.46312621
B7	-0.0288091	0.00303989	-9.4770166
B8	-1.636E-06	1.2674E-06	-1.2911803
B9	0.12279450	0.03668794	3.34699870
B10	-0.1718021	0.12391912	-1.3864053
B11	0.00311135	0.00117536	2.64715247

RSQ* = 0.99762983 RBSQ* = 0.99761935 F(11,2488)= 95202.1734
DURBIN-WATSON = 2.52447054 STD ERROR = 1.53989689

News and Scale Separate

A similar specification is utilized to examine the impact the definition of news which has the monetary value and the scale separated. This model is as follows:

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWS + B3*NEWS(-1) + B4*SCALE + 5*SCALE(-1) + B6*VOLUME + B7*VOLUME(-1) + B8*DOWJONES + B9*DOWJONES(-1) + B10*ESP +B11*EPSTRD + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.3814794	0.84100599	-0.4535989
B1	0.98911952	0.00285860	346.014950
B2	-2.997E-05	0.00003035	-0.9808163
B3	-3.100E-05	0.00003061	-1.0127329
B4	0.02793443	0.02695599	1.03629786
B5	0.03591247	0.02698411	1.33087440
B6	0.00002844	0.00001793	1.58643492
B7	0.00001151	0.00001781	0.64639613
B8	0.02928560	0.00306867	9.54342117
B9	-0.0289746	0.00303943	-9.5329066
B10	0.12201888	0.03670744	3.32409135
B11	-0.1624873	0.12221414	-1.3295291
B12	0.00271909	0.00112668	2.41226939

RSQ* = 0.99763060 RBSQ* = 0.99761917 F(12,2487)= 87262.2967
DURBIN-WATSON = 2.52508294 STD ERROR = 1.53995363

One can easily see that neither news or scale is significant. The t-values for these terms range from .9 to 1.33 and are not high enough to warrant serious consideration. The same variables as the newsscale case are significant.

In the case of the separate news and scale definitions an effort was made to see was there any evidence to imply that longer lags might yield more fruitful results. Given that capital markets are supposed to be most efficient it would not seem likely that news which is more distant in the past should have a meaningful impact on stock prices.

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.0015635	0.94839449	-0.0016485
B1	0.98941616	0.00299139	330.754949
B12	0.00001398	0.00001880	0.74357563
B13	0.00001083	0.00001863	0.58101964
B14	0.02917974	0.00313153	9.31804242
B15	-0.0291754	0.00309264	-9.4338189
B16	0.11938756	0.03828796	3.11814844
B17	-0.1566424	0.12578213	-1.2453469
B18	0.00274417	0.00115992	2.36583119

Polynomial Lag Inter-retation for NEWS

DEGREE = 2 LAGS = 5 ZERO RESTRICTION = NONE

```
Para-    Co-         Std.     PLOT: *=value
me-   efficient     Error           *=std error band
ter

B2  -6.409E-05 0.00003368 +-----------*------------+          !
B3  -1.430E-05 0.00002014                          +-------*-------+
B4  8.1275E-06 0.00002398                                +-------*-----
B5  3.1804E-06 0.00002000                                +-------*-----
B6  -2.914E-05 0.00003360             +------------*------------+

SUM OF LAGS
MEAN LAG
    -9.621E-05 0.00006825
    1.09180828 7374.28569
```

Polynomial Lag Inter-retation for SCALE

DEGREE = 2 LAGS = 5 ZERO RESTRICTION = NONE

```
Para-    Co-         Std.     PLOT: *=value
me-   efficient     Error           *=std error band
ter

B7  0.04902574 0.02721807             !         +------------*-------
B8  0.01066860 0.01712643          +-------*-------+
B9  -0.0054924 0.01974287 +--------*--------+
B10 0.00054267 0.01709230     +-------*-------+
B11 0.02877388 0.02697445            !+------------*------------+

SUM OF LAGS
MEAN LAG
    0.08351845 0.06154719
    1.39379079 7.43749125
```

RSQ* = 0.99757259 RBSQ* = 0.99755834 F(14,2385) = 70010.1295
DURBIN-WATSON = 2.55267809 STD ERROR = 1.55336145

R-squared mean adjusted

Preliminary investigations using a polynomial distributed lag was initiated for both news and scale. If this preliminary work yielded indications of promise then further investigations would be pursued in this case as well as with the newsscale definition.

Listed below is a model featuring a second degree polynomial with 5 lags for both news and scale.

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + PDL:(NEWS, 5, B2, B3, B4, B5, B6) + PDL:(SCALE, 5, B7, B8, B9, B10, B11) + B12*VOLUME + B13*VOLUME(-1) + B14*DOWJONES + B15*DOWJONES(-1) + B16*ESP + B17*EPSTRD + B18*BETA

Once again the news and scale terms were not significant. This result is therefore consistent with the efficient markets view.

Neutral and Extreme News

Similar pooled regressions were run for the two more narrowly defined news samples -- non neutral news and extreme news. The results from this analysis are listed below.

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NNNEWSSCALE + B3*NNNEWSSCALE(-1) + B4*VOLUME + B5*VOLUME(-1) + B6*DOWJONES + B7*DOWJONES(-1) + B8*ESP + B9*EPSTRD + B10*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.1809387	0.85901022	-0.2106363
B1	0.98868194	0.00288558	342.628383
B2	-3.710E-06	6.5182E-06	-0.5692167
B3	5.4338E-07	6.5243E-06	0.08328594
B4	0.00002804	0.00001817	1.54274490
B5	0.00001468	0.00001807	0.81208284
B6	0.02894290	0.00309903	9.33933120
B7	-0.0287918	0.00305748	-9.4168574
B8	0.12676106	0.03703426	3.42280537
B9	-0.1693437	0.12306121	-1.3760934
B10	0.00279685	0.00113541	2.46330342

RSQ* = 0.9976114 RBSQ* = 0.99760207 F(10,2469) = 103133.960
DURBIN-WATSON = 2.5475896 STD ERROR = 1.55420930

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*EX1NEWSSCALE + B3*EX1NEWSSCALE(-1) + B4*VOLUME + B5*VOLUME(-1) + B6*DOWJONES + B7*DOWJONES(-1) + B8*ESP +B9*EPSTRD +B10*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.2842638	0.83881623	-0.3388868
B1	0.98915205	0.00285740	346.171922
B2	-1.154E-05	0.00001016	-1.1355624
B3	-1.609E-06	0.00001010	-0.1592972
B4	0.00003026	0.00001799	1.68236622
B5	0.00001196	0.00001785	0.67010298
B6	0.02927787	0.00306743	9.54475968
B7	-0.0290394	0.00303964	-9.5535666
B8	0.12129633	0.03676411	3.29931392
B9	-0.1608521	0.12221101	-1.3161834
B10	0.00269503	0.00112803	2.38914456

RSQ* = 0.99762877 RBSQ* = 0.99761924 F(10,2489) = 104717.566
DURBIN-WATSON = 2.52471582 STD ERROR = 1.53993154

These results do not seem to indicate any relationship between non-neutral news and extreme news. An examination of the t-statistics for each of these news variables reveals that all the values fall into the insignificant range.

Do Prices Lead the News

Most efficient markets theorists would not be surprised the previous results. They would believe that the stock market is so efficient that it has already internalized any information that might subsequently appear in The Journal. Moreover, one would assume that trades could be executed and prices adjust more quickly than news articles could appear. If prices do adjust more quickly than the newspaper publishing process then perhaps one could detect some significance to lead news variables. Consequently the following specifications were regressed for both news definitions:

Newsscale

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWSSCALE(+1)
B3*NEWSSCALE(+2) + B4*NEWSSCALE(+3)

News and Scale

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWS(+1) +
B3*NEWS(2+) + B4*NEWS(+3) + B5*SCALE(+1) + B6*SCALE(+2) +
B7*SCALE(+3)

This econometric analysis yielded the following results:

News and Scale

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
CORRECTED FOR HETEROSKEDASTICITY
CORRECTED FOR PARTIAL CORRELATION

FRE M INT 1960:3 TO 1980:9

STOCKPRICES = B0 + B1*STOCKPRICES(-1) + B2*NEWSSCALE(+1) +
B3*NEWSSCALE(+2) B4*NEWSSCALE(+3)

Parameter	Coefficient	Std. Error	T-Statistic
B0	-0.0162221	0.02075874	-0.7814599
B1	0.99983706	0.00090591	1103.68813
B2	-1.047E-06	1.0857E-06	-0.9643691
B3	-1.981E-06	1.0818E-06	-1.8310264
B4	2.3112E-06	1.0837E-06	2.13268753

RSQ* = 0.99682414 RBSQ* = 0.99681899 F(4,2465)= 193425.595
DURBIN-WATSON = 2.08908166 STD ERROR = 1.56414978

* R-squared mean adjusted

It is clear from these preliminary investigations that contemporaneous or lagged newsscale do not seem to influence stock prices. However, there does seem to be some evidence to indicate that lead news may influence stock prices. This is not surprising since it implies that the information which was subsequently printed in The Wall Street Journal affected stock prices presumably through the actions of investors who enjoyed prior access to it.

CHAPTER EIGHT

VOLUME

Volume

A similar econometric analysis was conducted for trading volume. After an initial search process a trading volume model was developed. This model was fitted for both definitions of news. The models are:

Newsscale

VOLUME = B0 + B1*NEWS + B2*NEWSSCALE(-1) + B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*SHAREOUT + B8*ESP + B9*EPSTRD + B10*BETA

News And Scale

VOLUME = B0 + B1*NEWSSCALE + B2*NEWS(-1) + B3*SCALE + B4*SCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*SHAREOUT + B10*ESP + B11*EPSTRD + B12*BETA

This model is similar to the price specification but that two new variables proved to exert significant influence. Shareout represents the total shares outstanding for that particular stock. This variable is included to provide an indication of the influence of the scale of the market for that particular stock. If these are more shares of a particular stock are potentially available then this might influence the number of shares traded.

The trading volume of the Dow Jones Industrials group is included to provide an indication of the influence of the trading volume of the market as a whole. This will help isolate any influence of firm-specific news by accounting for the influence of general market movements. On the other hand, the value of The Dow Jones Industrial Average, which was significant in the price model, did not prove to exert meaningful influence on firm-specific trading activity. The results of these pooled regressions are as follows:

Newsscale

VOLUME = B0+ B1*NEWSSCALE + B2*NEWSSCALE(-1) + B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*SHAREOUT + B8*ESP + B9*EPSTRD + B10*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2448.5766	183.664711	-13.331775
B1	0.01059579	0.00313694	3.37775076
B2	0.00590746	0.00313304	1.88553919
B3	73.2037390	24.6529116	2.96937498
B4	-63.564892	24.6189965	-2.5819449
B5	0.13179098	0.01430693	9.21168698
B6	0.02368391	0.01429816	1.65643019
B7	0.02018127	0.00151746	13.2994062
B8	458.316531	44.1693964	10.3763368
B9	-645.72016	154.124251	-4.1896078
B10	5.80768412	1.44948126	4.00673281

RSQ* = 0.34507144 RBSQ* = 0.34244015 F(10,2489)= 131.141450
DURBIN-WATSON = 1.06734156 STD ERROR = 1927.28319

News and Scale

VOLUME = B0+ B1*NEWS + B2*NEWS(-1) + B3*SCALE + B4*SCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*SHAREOUT + B10*ESP + B11*EPSTRD + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2474.2109	184.636770	-13.400235
B1	-0.0013079	0.00207079	-0.6315911
B2	-0.0005710	0.00207407	-0.2757764
B3	97.3966628	28.1082119	3.46506079
B4	47.7801178	28.0910143	1.70090397
B5	69.4246547	24.6656255	2.81463183
B6	-59.199353	24.6372561	-2.4028387
B7	0.13078325	0.01433608	9.12266701
B8	0.02387809	0.01431902	1.66757821
B9	0.02019982	0.00151807	13.3062253
B10	449.070156	44.3081843	10.1351514
B11	-597.32035	153.441118	-3.8211423
B12	5.36660590	1.45015471	3.70071267

RSQ* = 0.34525959 RBSQ* = 0.34210041 F(12,2487)= 109.287665
DURBIN-WATSON = 1.06637497 STD ERROR = 1927.78100

Both definitions of the news yielded interesting results. Newsscale and lagged newsscale had coefficients and t values of B1 = 0.01 and t (B1) = 3.38 and B2 = .006 and t (B2) = 1.88. The coefficient of contemporaneous newsscale is clearly significant while lagged newsscale demonstrates, at best, marginal significance. The R2 of 0.35 indicates that 35% of the variation in firm-specific trading volume is explained by this model. The F value of 42.4 allows us to reject the null hypothesis that all of the coefficients equal zero.

The Durban-Watson statistic of 1.07 indicates the potential presence of positive serial correlation. In an effort to correct for serial correlation the Cochrane-Orcutt procedure was used.

News and Scale

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:3 TO 1980:12

VOLUME = B0 + B1*NEWS + B2*NEWS(-1) + B3*SCALE + B4*SCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*SHAREOUT + B10*ESP + B11*EPSTRD + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2381.6179	260.435241	-9.1447606
B1	-0.0018186	0.00176756	-1.0288580
B2	-0.0003452	0.00176770	-0.1952736
B3	88.9642854	24.5945533	3.61723119
B4	29.9891630	24.5825568	1.21993669
B5	12.5690671	18.5704094	0.67683306
B6	6.31544227	18.5585305	0.34029862
B7	0.10618953	0.01240935	8.55721950
B8	0.01666104	0.01241085	1.34245715
B9	0.02404242	0.00245772	9.78242157
B10	341.058197	72.5202710	4.70293606
B11	-376.73236	237.362416	-1.5871610
B12	1.34471743	2.41854594	0.55600244

RSQ* = 0.16982904 RBSQ* = 0.16582339 F(12,2487)=42.3973736
DURBIN-WATSON = 2.12323506 STD ERROR = 1917.17883

An examination of the corrected results for both definitions of the news indicates that the coefficients for the news terms which were significant prior to the correction still maintain their significance. In particular, the coefficient of B1 = .012 indicates a meaningful impact of news on trading volume. In the news and scale case the negative signs of the news variables are not troubling since these coefficients do not have significant t values. On the other hand, the coefficient for the contemporaneous scale term of B3 = 64.98 indicates a large impact of the intensity of the news. This coefficient is statistically significant as indicated by the t-value of 3.53. The other large coefficient for lagged scale is not statistically significant and thus cannot be considered seriously.

The corrected results for both definitions of news are as follows:

<u>Newsscale</u> <u>Corrected for Autocorrelation</u>

TIME SERIES CROSS SECTION POLLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*NEWSSCALE + B2*NEWSSCALE(-1) + B3*STOCKPRICES + B4* STOCKPRICES (-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA + B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2330.8466	259.250312	-8.9907188
B1	0.00977810	0.00279624	3.49687882
B2	0.00310741	0.00279322	1.11248300
B3	12.7792966	18.6151162	0.68650104
B4	6.84405778	18.5915419	0.36812750
B5	0.10489944	0.01242770	8.44077735
B6	0.01793423	0.01240151	1.44613303
B7	330.998712	72.4674976	4.56754715
B8	-403.87600	238.473969	-1.6935852
B9	1.49458261	2.40951027	0.62028480
B10	0.02350015	0.00246447	9.53560080

RSQ* = 0.16248479 RBSQ* = 0.15909266 F(10,2469)=49.9006155
DURBIN-WATSON = 2.12306607 STD ERROR = 1910.54300

Attempts to Enrich the Model

The Influence of Short Interest

Having established the relationship between news and trading it would be reasonable to look for other ways to enrich the volume model. A good model of trading volume does not exist. The model currently employed to this point yielded R2's of .35 prior to correcting for serial correlation and .17 after. R2 or the coefficient of determination measures the proportion or percentage of total variation in the dependent variable that is explained by the regression model.[60]

$$R2 = \frac{E\ (\hat{Y}i - \bar{Y})2}{E\ (Yi - \bar{Y})2}$$

Each of the variables were individually significant as indicated by their t- statistics. In addition, an F-statistic of 45.28 indicated that the null hypothesis that there is no relationship between trading volume and the explanatory variables of the model could be ruled out.[61]

Unfortunately, one must be careful using R2's as a judgement criteria when adding variables to the model. R2's

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[60] D. Gujariti, Basic Econometrics, (McGraw Hill, New York, 1978) p. 49.

[61] For a good discussion of the properties of the F-statistic see J. Kmenta, Elements of Econometrics, (McMillian Publishing Co., New York, 1971) pp. 366-370.

will always increase as variables are added to the model.[62] Therefore, it normally is useful to look at the corrected R2 which has the following form:

$$R2 = 1- (1-R2) \frac{N-1}{N-K}$$

However, one still cannot rely solely on the corrected R2 to make decisions as to whether or not to add variables to a model. The decision concerning whether or not to add variables to a model should depend on theoretical considerations. If there is a good theoretical reason for including a variable in the model then generally it should be added.

There can be good theoretical reasons put forward for including the level of short interest as an explanatory variable. An investor who borrows a stock from his broker to sell it in anticipation of a price reduction is said to be selling the stock short. The New York Stock Exchange on the 15th of each month calculates the short interest levels. They are made public four days later. Since a trader merely borrows the stock he sold short so as to purchase it later, the level of short sales should be one of the factors that generate trading volume.

Including short interest trading volume in the volume model yields the following results:

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[62]P. Kennedy, A Guide to Econometrics, (MIT Press, Cambridge, Mass., 1979) p. 52.

Volume Specification Short Interest Added

Corrected for Autocorrelation

TIME SERIES CROSS SECTION POLLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*NEWSSCALE + B2*NEWSSCALE(-1) + B3*STOCKPRICES + B4* STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA + B10*SHAREOUT + B11*SHORTINT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-1927.5806	285.094790	-6.7611919
B1	0.01026682	0.00278509	3.68634706
B2	0.00296588	0.00278243	1.06593237
B3	12.8298239	18.9561727	0.67681510
B4	3.37374570	18.9246290	0.17827275
B5	0.10182210	0.01231737	8.26654433
B6	0.01789768	0.01229075	1.45619106
B7	360.759633	74.3343936	4.85319938
B8	-496.30721	239.878061	-2.0689979
B9	3.79448986	2.51936141	1.50613161
B10	0.01520550	0.00365965	4.15490287
B11	0.00023816	0.00007862	3.02935329

RSQ* = 0.16793375 RBSQ* = 0.16422519 F(11,2468)=45.2827247
DURBIN-WATSON = 2.11753894 STD ERROR = 1903.13705

CHAPTER NINE

AN ANALYSIS OF CERTAIN NEWS SUB-SAMPLES
NON-NEUTRAL NEWS AND EXTREME NEWS

The results developed in Chapter eight provided some quantitative evidence of the impact of news developments on firm-specific trading volume. It is then appropriate to see if this relationship is significantly different for different types of news. Consequently, both models are run for non-neutral and extreme news using both definitions of news. The a priori reasoning would be that if news has an impact on trading volume then more significant news (as measured by the scale term) should have a more pronounced or at least clearer impact. The results from this analysis are below.

<u>No Correction for Autocorrection</u>   <u>Newsscale-Non Neutral News</u>

VOLUME = B0 + B1*NNNEWSSCALE + B2*NNNEWSSCALE(-1) + B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*SHAREOUT + B10*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2488.5279	183.065802	-13.593625
B1	0.04634207	0.00801209	5.78401886
B2	0.02353711	0.00802088	2.93448048
B3	71.9272184	24.4364276	2.94344245
B4	-61.181661	24.3953646	-2.5079216
B5	0.12805028	0.01428890	8.96152329
B6	0.02503996	0.01418065	1.76578363
B7	443.127653	44.0980704	10.0486858
B8	-563.71649	152.503552	-3.6964155
B9	0.02039143	0.00150775	13.5243986
B10	5.34169344	1.44011757	3.70929650

RSQ* = 0.35691831 RBSQ* = 0.35431369 F(10,2469)=137.032561
DURBIN-WATSON = 1.07675219 STD ERROR = 1907.58710

News and Scale - Non Neutral News

VOLUME = B0 + B1*NNNEWS + B2*NNNEWS(-1) + B3*NNSCALE + B4*NNSCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD + B11*SHAREOUT + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2459.5224	182.893177	-13.447863
B1	0.20586337	0.04831786	4.26060611
B2	0.13298527	0.04847839	2.74318668
B3	-11.253422	40.0418566	-0.2810415
B4	-29.960222	40.1036429	-0.7470698
B5	72.2160608	24.5310843	2.94385931
B6	-62.380039	24.4998175	-2.5461430
B7	0.12770671	0.01425804	8.95681797
B8	0.02327180	0.01421936	1.63662798
B9	456.288125	43.9822054	10.3743803
B10	-584.80941	152.575769	-3.8329115
B11	0.02032365	0.00151022	13.4573836
B12	5.58111160	1.44109716	3.87282118

RSQ* = 0.35264920 RBSQ* = 0.34952567 F(12,2487)=112.900989
DURBIN-WATSON = 1.07919862 STD ERROR = 1916.87137

These results yield a more statistically significant impact. The coefficients for the news terms are larger than the "all news" variable. The t-statistic for these coefficients are also more significant.

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - Newsscale	.01	3.51	.003	1.21
Non Neutral - Newsscale	105	5.78	.024	2.93

However the Durban-Watson statistic of 1.07 once again indicated the presence of positive serial correlation. Using the Cochrane-Orcutt method to correct for the autocorrelated disturbances provides the following results:

Corrected for Autocorrelation Newsscale - Non Neutral News

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*NNNEWSSCALE + B1*NNNEWSSCALE(-1) +
B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*SHAREOUT
+ B10*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2414.2200	255.750546	-9.4397453
B1	0.04149081	0.00726848	5.70831910
B2	0.01864580	0.00727381	2.56341744
B3	13.0008983	18.4080031	0.70626337
B4	5.85786148	18.3860390	0.31860378
B5	0.10583208	0.01244044	8.50709850
B6	0.01846991	0.01239856	1.48968168
B7	342.339182	71.0480895	4.81841503
B8	-370.10565	233.933956	-1.5820946
B9	0.02370888	0.00243530	9.73550728
B10	1.63802888	2.37796080	0.68883763

RSQ* = 0.17177392 RBSQ* = 0.16841942 F(10,2469)=51.2070079
DURBIN-WATSON = 2.13514397 STD ERROR = 1898.02487

The corrected time series coefficients and t statistics can be compared to their corrected counterparts for the All News variables.

Corrected for Autocorrelation

	$\hat{B}_1$	$t(\hat{B}_1)$	$(\hat{B}_2)$	$t(\hat{B}_2)$
All News - Newsscale	.012	4.57	.005	1.71
Non Neutral - Newsscale	.041	5.71	.02	2.56

Similar results occur using non-neutral news for the news and scale definitions.

<u>News and Scale</u> <u>Non-Neutral News</u>

VOLUME = B0 + B1*NNNEWS + B2*NNNEWS(-1) + B3*NNSCALE + B4*NNSCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD +B11*SHAREOUT + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2459.5224	182.893177	-13.447863
B1	0.20586337	0.04831786	4.26060611
B2	0.13298527	0.04847839	2.74318668
B3	-11.253422	40.0418566	-0.2810415
B4	-29.960222	40.1036429	-0.7470698
B5	72.2160608	24.5310843	2.94385931
B6	-62.380039	24.4998175	-2.5461430
B7	0.12770671	0.01425804	8.95681797
B8	0.02327180	0.01421936	1.63662798
B9	456.288125	43.9822054	10.3743803
B10	-584.80941	152.575769	-3.8329115
B11	0.02032365	0.00151022	13.4573836
B12	5.58111160	1.44109716	3.87282118

RSQ* = 0.35264920 RBSQ* = 0.34952567 F(12,2487)=112.900989
DURBIN-WATSON = 1.07919862 STD ERROR = 1916.87137

The Non-Neutral News sample indicates a significant impact for the news variable but not the scale term A comparison between this time series and the all news sample is listed below.

<u>No Correction for Autocorrelation</u>

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - News	-.001	-1.02	-.0003	-.20
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
All News - Scale	88.96	3.62	22.99	1.22
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Non Neutral - News	.21	4.26	.13	2.74
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
Non Neutral - Scale	-11.25	- .28	-29.96	- .75

While the results are interesting one is cautioned from interpreting the coefficients too seriously because of the low Durban-Watson statistic of 1.08. Consequently, The Corchrane-Orcutt procedure is once again employed.

Corrected for Autocorrelation

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:3 TO 1980:12

VOLUME = B0 + B1*NNNEWS +B2*NNNEWS(-1) B3*NNSCALE+
B4*NNSCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1)
+ B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD +
B11*SHAREOUT + B12*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2434.1296	254.293251	-9.5721360
B1	0.17881522	0.04271283	4.18645168
B2	0.08785288	0.04284560	2.28384909
B3	-1.8732343	34.6547444	-0.0540542
B4	-22.625401	34.6719162	-0.6525570
B5	14.3757041	18.3352161	0.78404880
B6	3.78417991	18.3244060	0.20651037
B7	0.10787417	0.01240611	8.69524649
B8	0.01746324	0.01239690	1.40867812
B9	354.709107	70.9708590	4.99795427
B10	-388.19909	232.705619	-1.6681982
B11	0.02406887	0.00242303	9.93339081
B12	1.69843237	2.38076996	0.71339625

RSQ* = 0.17750235 RBSQ* = 0.17353372 F(12,2487)=44.7264028
DURBIN-WATSON = 2.13028945 STD ERROR = 1906.55981

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - News	- .001	- .86	- .0002	- .15
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
All News - Scale	64.98	3.57	33.31	1.80
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Non Neutral - News	.18	4.19	.10	2.28
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
Non Neutral - Scale	- 1.87	- .05	-22.63	- .65

After correcting for autocorrelation the news variable coefficients have increased in value relative to the corrected coefficients for the all-news sample. Moreover the t-statistics for these coefficients are both significant. On the other hand, the corrected scale coefficients are for non-neutral news are not significant.

Following the establishment of an enhanced relationship for non-neutral news the analysis is extended to the extreme news sample. The results are listed below.

Newsscale -- Extreme News

VOLUME = B0 + B1*EXNEWSSCALE + B1*EXNEWSSCALE(-1) +
B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*FJIVOLALL(-1) + B7* ESP + B8*EPSTRD + B9*BETA +
10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2508.8576	182.650361	-13.735848
B1	-.08125416	0.01256317	6.46764870
B2	0.04204678	0.01256874	3.34534685
B3	74.6765861	24.3789802	3.06315463
B4	-64.376245	24.3390427	-2.6449785
B5	0.12923399	0.01423620	9.07783982
B6	0.02807938	0.01413468	1.98655879
B7	456.381467	44.0132920	10.3691736
B8	-571.94821	152.138440	-3.7593932
B9	5.41585976	1.43678724	3.76942362
B10	0.02030303	0.00150374	13.5017103

RSQ* = 0.35998923 RBSQ* = 0.35739705 F(10,2469)=138.874761
DURBIN-WATSON = 1.08157102 STD ERROR = 1903.02698

News and Scale -- Extreme News

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2479.1298	182.526007	-13.582337
B1	0.29288836	0.08872090	3.30123313
B2	0.18874848	0.08822296	2.13944862
B3	95.6080034	92.8870502	1.02929314
B4	11.7305193	91.1313088	0.12872107
B5	74.4956292	24.4969823	3.04101250
B6	-65.181313	24.4612157	-2.6646800
B7	0.12837962	0.01422721	9.02352998
B8	0.02620048	0.01418976	1.84643522
B9	468.530693	43.9301271	10.6653617
B10	-595.11314	152.382757	-3.9053837
B11	5.65297719	1.44055861	3.92415633
B12	0.02023378	0.00150846	13.4134935

RSQ* = 0.35413246 RBSQ* = 0.35101609 F(12,2487)=113.636228
DURBIN-WATSON = 1.07853828 STD ERROR = 1914.67406

Once again the values of the coefficients and their t-statistics are greater. The table below provides a comparison.

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - Newsscale	.01	3.51	.003	1.21
Non Neutral - Newsscale	.05	5.78	.024	2.93
Extreme News - Newsscale	.08	6.47	.04	3.34

Unfortunately, we are once again cautioned from interpreting these values too seriously by the presence of the 1.08 value for The Durban-Watson statistic. The corrected for autocorrelation values are listed below.

Corrected for Autocorrelation

Newsscale Extreme News

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*EXNEWSSCALE + B2*EXNEWSSCALE(-1) +
B3*STOCKPRICES = B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA +
B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2434.5407	258.459985	-9.4194106
B1	0.07282099	0.01095252	6.64878990
B2	0.02513082	0.01096079	2.29488607
B3	12.3205854	18.7287768	0.65784250
B4	6.54493041	18.7060722	0.34988341
B5	0.10709231	0.01240437	8.63343675
B6	0.02048453	0.01236562	1.65657147
B7	348.854029	70.8385206	4.92463742
B8	-359.95882	233.627816	-1.5407361
B9	1.58106431	2.37302479	0.66626540
B10	0.02356208	0.00245291	9.60576790

RSQ* = 0.17483662 RBSQ* = 0.17149453 F(10,2469)=52.3134726
DURBIN-WATSON = 2.13405239 STD ERROR = 1892.34167

The pattern revealed earlier holds true again. The table below provides a comparison.

<u>Corrected for Autocorrelation</u>

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - Newsscale	.012	4.57	.005	1.71
Non Neutral - Newsscale	.041	5.71	.020	2.56
Extreme News - Newsscale	.073	6.65	.025	2.30

As we move from the complete news sample to extreme news, the value of the coefficients rise indicating a greater impact of news on trading volume.

In support of this conclusion the t-statistics all remained significant and in all but one case increased in value. A similar analysis is conducted for the other definition of news. The results of these pooled regressions are listed below.

News and Scale -- Extreme News

VOLUME = B0 + B1*EXNEWS + B2*EXNEWS(-1) + B3*EXSCALE + B4*EXSCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD + B11*BETA + B12*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2479.1298	182.526007	-13.582337
B1	0.29288836	0.08872090	3.30123313
B2	0.18874848	0.08822296	2.13944862
B3	95.6080034	92.8870502	1.02929314
B4	11.7305193	91.1313088	0.12872107
B5	74.4956292	24.4969823	3.04101250
B6	-65.181313	24.4612157	-2.6646800
B7	0.12837962	0.01422721	9.02352998
B8	0.02620048	0.01418976	1.84643522
B9	468.530693	43.9301271	10.6653617
B10	-595.11314	152.382757	-3.9053837
B11	5.65297719	1.44055861	3.92415633
B12	0.02023378	0.00150846	13.4134935

RSQ* = 0.35413246 RBSQ* = 0.35101609 F(12,2487)=113.636228
DURBIN-WATSON = 1.07853828 STD ERROR = 1914.67406

These results indicate that the contemporaneous and lagged news coefficients are significant but the scale coefficients, while large in magnitude, are not statistically significant. A comparison of these values with the non-neutral news and all news samples is below.

No Correction for Autocorrelation

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - News	- .001	-1.02	- .0003	- .20
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
All News - Scale	88.96	3.62	22.99	1.22
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Non Neutral - News	.21	4.26	.13	2.74
	$\hat{B}_3$	$t(\hat{B}_3)$	$\hat{B}_4$	$t(\hat{B}_4)$
Non Neutral - Scale	-11.25	- .28	-29.96	- .75
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Extreme News - News	.29	3.30	.18	2.14
	$\hat{B}_3$	$(\hat{B}_3)$	$\hat{B}_4$	$(\hat{B}_4)$
Extreme News - Scale	95.61	1.03	11.73	.13

The Corchrane-Orcutt procedure is then used to correct for serial correlation.

Corrected for Autocorrelation

News and Scale   Extreme News

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:3 TO 1980:12

VOLUME = B0 + B1*EXNEWS + B2*EXNEWS(-1) + B3*EXSCALE +
B4*EXSCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1)
+ B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD +
B11*BETA + B12*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2435.8877	258.155270	-9.4357465
B1	0.29238942	0.07242650	4.03705038
B2	0.12764981	0.07202929	1.77219302
B3	65.6972816	76.7849514	0.85560101
B4	-10.696425	75.6441011	-0.1414046
B5	13.3832211	18.6481414	0.71767051
B6	4.77345719	18.6307509	0.25621389
B7	0.10786714	0.01234349	8.73878695
B8	0.01923246	0.01233849	1.55873652
B9	358.156615	71.4909035	5.00982080
B10	-378.71439	232.997187	-1.6254033
B11	1.61226778	2.39214854	0.67398314
B12	0.02392805	0.00245512	9.74616775

RSQ* = 0.17974988 RBSQ* = 0.17579210 F(12,2487)=45.4168334
DURBIN-WATSON = 2.13100063 STD ERROR = 1903.46618

<u>Corrected for Autocorrelation</u>

	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
All News - News	- .001	- .86	- .0002	- .15
	$\hat{B}_3$	$(\hat{B}_3)$	$\hat{B}_4$	$(\hat{B}_4)$
All News - Scale	64.98	3.57	33.31	1.80
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Non Neutral - News	.18	4.19	.10	2.28
	$\hat{B}_3$	$(\hat{B}_3)$	$\hat{B}_4$	$(\hat{B}_4)$
Non Neutral - Scale	- 1.87	- .05	-22.63	- .65
	$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
Extreme News - News	.29	4.04	.13	1.77
	$\hat{B}_3$	$(\hat{B}_3)$	$\hat{B}_4$	$(\hat{B}_4)$
Extreme News - Scale	65.69	.85	-10.70	- .14

The coefficients for both contemporaneous and lagged news continue to get larger as we go from non-neutral to extreme news although in the case of lagged news the t- value is not significant. The scale coefficients are not significant so no effort is made to interpret their coefficients.

From the analysis of the gradations in the intensity of the news (from all news to extreme news) we can derive two conclusions. First, the news-scale definition of the news seems to explain variations in trading volume better than the separate news and scale definitions which seem to yield inconclusive and unstable results. Second, there is a most clear pattern for the impact of newsscale on trading volume as we move from all news to non-neutral news and on to extreme news. The results in this analysis seem to provide evidence that news stories which were rated more extreme seem to cause the greatest change in trading volume. These results are consistent with our intuition in that neutral news should not cause traders to alter their behavior. In addition, intuition would seem to support the empirical conclusion that more extreme articles should change investors behavior more than a news sample which includes moderately rated news.

This analysis might be enhanced by taking the news filtration process one step further. When one examines the pattern of news articles there does seem to be a certain repetitiousness in the frequency of news reporting. That is, a story may be reported on one day followed by continuation reports on the succeeding days which have similar content but perhaps a few additional facts. This pattern seems more pervasive for the more extreme articles. However, it would be surprising if investors were moved to act by these repetitious articles when they were, in fact, old news. Therefore a still more narrowly defined sample of news stories which featured just the first-run, extreme news might have an even more pronounced impact.

PART III

FACTORS INFLUENCING THE IMPACT OF NEWS ON TRADING VOLUME

CHAPTER TEN

POTENTIAL ASYMMETRIES IN THE IMPACT OF GOOD AND BAD NEWS

Potential Asymetrics in the Impact of Good vs Bad News

Market analysts have different opinions regarding whether good news lifts the market more than bad news depresses it. A structured analysis of the comparative effects of good and bad news has always been hindered by the lack of a numerical measure of the value of the news. One of the possible contributions of this study is to provide a quantitative, market derived measure of the value of the news. Using these market derived measures, we can investigate whether the impact of good news is significantly different from bad news. If the impact is pretty much the same we could say the effect is symmetric. If the impact is significantly different then it is asymmetric.

There does seem to be evidence that good and bad news affects stock prices in an asymmetric manner. In a recent study on the effect of bond rating changes on common stock prices, Robert Holthausen and Richard Leftwich produced results which seemed to support this hypothesis.[63] Their results showed that downgradings on bonds by Moodys and Standard and Poors resulted in abnormal negative returns at the time of the press release by the rating agency.[64]

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[63]R. Holthausen and R. Leftwich, "The Effect of Bond Rating Changes on Common Stock Prices," University of Chicago Center for Research in Security Prices, Working Paper #141, March 1985, Chicago, Illinois.

[64]There are three major bond rating agencies in the United States. They are Standard and Poors, Moodys Investor Service, and The Fitch Investor Service. Their rating gradation scales differ somewhat. However, all agencies focus only on default risk in their ratings and generally do not consider the risk of interest rate changes such as might occur if inflation rate increases created a disparity between the normal and real interest rates.

However, they did not notice abnormal positive returns when the announcement was on upgrade.

Holthausan and Leftwich measured abnormal performance through the calculation of average prediction errors. They defined a prediction error in the following manner:

$$PE_{it} = R_{it} - (\hat{\alpha}_i + \hat{B}_i \; R_{Mt})$$

where PE_{it} = the prediction error associated with the i th firm on each event day t

R_{it} = The rate of return for the common stock of the i th firm on day t

R_{Mt} = The rate of return of an equally weighted New York and American Stock Exchange indices for day t

$\hat{\alpha}_i$, $\hat{B}_i$ = The ordinary least squares estimates of the market model parameters

The prediction errors were then averaged for each day to arrive at the average prediction errors referred to above.

It is interesting to note that Holthausen and Leftwich were careful to separate their bond rating sample from general news about a given firm. "To control for obvious contemporaneous announcements, we eliminated firms if The Wall Street Journal story about the rating change contained information from a source other than the rating agency, or if any other firm-specific information appears in The Wall Street Journal during the five trading days centered on the date of the press release by the rating agency."[65]

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[65]Holthausen and Leftwich, op. cit., p. 1.

The results put forward by Holthausen and Leftwich has been supported by other research. Griffen and Sanvicente showed a significant negative response for bond downgrades using monthly stock return day.[66]

The case of bond rating agencies is particularly relevant to this study. The rating agencies are an intermediary between the actual primary information sources and the investment public in a manner analogous to the financial media. Consequently, it is of interest to ascertain whether or not such agencies truly provide information to the capital markets. If they do not provide information which is useful to investors then why haven't the forces of competition created pressures that threaten their existence? This argument might not apply to the financial media as it serves other purposes such as entertainment and general enrichment of the knowledge base of investors which might pay future returns in later trades or in impressive discussions of cocktail parties.

To facilitate the search for asymmetries in the impact of the news the news sample is divided into two sub-samples based upon the scale evaluation coding. Neutral values, number 4 on the scale, were eliminated. Good news--scale values 5 thru 7 were separated from Bad news -- scale values 1 thru 3. Since the previous analysis failed to detect any impact of news on price, this investigation was only directed to the trading volume specification.

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[66]P. Griffen and A. Sanvincente, "Common Stock Returns and Rating Changes: A Methodological Comparison," Journal of Finance, vol. 37, pp. 103-119

Good News

The results listed below show that both the contemporaneous and lagged values of newsscale have a significant impact on trading volume. The correlation for autocorrelation is warranted given the Durban-Watson value of 1.07. The corrected results show coefficients and t-statistics which indicate clear statistical significance.

Good News Newsscale

Corrected for Autocorrelation

$\hat{B}1$	$\hat{t}$ (B1)	$\hat{B}2$	$\hat{t}$ (B2)
.04	5.58	.02	2.65

Good News   No Correction for Serial Correlation

VOLUME = B0 + B1*GOODNEWSSCALE + B2*(GOODNEWSSCALE(-1) + B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA + B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2464.5431	183.153770	-13.456142
B1	0.04894616	0.00860594	5.68748825
B2	0.02292086	0.00861337	2.66107948
B3	71.0524263	24.4442115	2.90671786
B4	-61.199947	24.4023755	-2.5079504
B5	0.12792291	0.01428918	8.95243291
B6	0.02507074	0.01418287	1.76767826
B7	451.908278	44.1207876	10.2425252
B8	-576.61070	152.555947	-3.7796672
B9	5.61544987	1.44170329	3.89501080
B10	0.02034849	0.00150807	13.4930304

RSQ* = 0.35650861 RBSQ* = 0.35390233 F(10,2469) = 136.78817
DURBIN-WATSON = 1.07386883   STD ERROR = 1908.19466

Good News   Corrected for Serial Correlation

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*GOODNEWSSCALE + B2*(GOODNEWSSCALE(-1)) + B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL + B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA + B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2385.1575	257.662537	-9.2569046
B1	0.04376452	0.00784153	5.58111817
B2	0.02081141	0.00784509	2.65279510
B3	12.5358818	18.3911266	0.68162664
B4	5.50821598	18.3710818	0.29983079
B5	0.10499453	0.01246273	8.42467819
B6	0.01811815	0.01242329	1.45840227
B7	351.263556	71.1295295	4.93836467
B8	-382.73766	234.795482	-1.6300895
B9	1.92393590	2.38037459	0.80824922
B10	0.02358117	0.00245046	9.62314871

RSQ* = 0.16983862 RBSQ* = 0.16647628 F(10,2469)=50.5120526
DURBIN-WATSON = 2.13658801   STD ERROR = 1898.79602

Bad News

The comparison between good news and bad news is striking. After correcting for serial correlation we see that contemporaneous and lagged ncwsscale does not exert a significant impact on trading volume. Given the coefficients and t-statistics listed below we cannot detect a significant impact.

$\hat{B}_1$	$t(\hat{B}_1)$	$\hat{B}_2$	$t(\hat{B}_2)$
.01	1.12	.01	.96

These results seem to imply that, as far as these ten firms are concerned, good news seems to have a positive and statistically significant impact on trading volume. The good news sample provided us with the most significant t-statistics for any definition of news in this study. This seems to indicate that trading volume reacts more to good news than bad news. Obviously, we cannot extrapolate from this ten firm sample the general conclusion that good news causes more trading than bad news. However, the results are, nonetheless, interesting. Many market analysts believe that the market has an inherent optimistic tendency. That is it reacts more to good news than bad news. These results do not contradict this view and, perhaps, might lend some support to it.

Bad News No Correction for Serial Correlation

VOLUME = B0 + B1*BADNEWSSCALE + B2*BADNEWSSCALE(-1) +
B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA +
B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2484.1353	184.990402	-13.428455
B1	-0.0080720	0.01890546	-0.4269651
B2	-0.0007027	0.01890485	-0.0371724
B3	72.3895542	24.6867873	2.93231977
B4	-61.550845	24.6439216	-2.4976076
B5	0.13233057	0.01440933	9.18367429
B6	0.02882578	0.01431911	2.01309887
B7	446.186080	44.5808543	10.0084686
B8	-571.01786	154.289269	-3.7009564
B9	5.24408987	1.45805034	3.59664529
B10	0.02006066	0.00152264	13.1749127

RSQ* = 0.34371621 RBSQ* = 0.34105812 F(10,2469)=129.309203
DURBIN-WATSON = 1.06200729 STD ERROR = 1927.06846

Bad News Corrected for Serial Correlation

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*BADNEWSSCALE + B2*BADNEWSSCALE(-1) +
B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*DJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA +
B10*SHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2314.7989	260.661683	-8.8804725
B1	0.00679676	0.01651540	0.41154092
B2	0.00837526	0.01654016	0.50635916
B3	12.7099832	18.6860909	0.68018417
B4	7.11966052	18.6582959	0.38158150
B5	0.10311216	0.01244476	8.28559015
B6	0.01973533	0.01240444	1.59098898
B7	328.791099	72.9203061	4.50890878
B8	-351.12251	238.171724	-1.4742409
B9	1.17176330	2.41902285	0.48439530
B10	0.02344031	0.00247685	9.46374596

RSQ* = 0.15790183 RBSQ* = 0.15449144 F(10,2469)=46.2962187
DURBIN-WATSON = 2.12120552 STD ERROR = 1916.03521

CHAPTER ELEVEN

A THEORETICAL DISCUSSION OF THE USE OF BETA AS A MEASURE OF RISK

Risk Measurement and Beta

Risk is a technical measure of the difference between the expected return of an asset and the actual return. There are several different categories of risk to which a security might be subjected. Barr Rossenburg and Vinay Marathe have provided a useful categorization of these risk factors:[67]

1. Market Variability - This refers to the company's risk as perceived by the market. A risk descriptor such as historical beta (beta will be defined shortly) is often used to measure this type of risk. Rosenburg and Marathe also assert that share trading volume, one of the variables used in this study, is an indicator of this source of risk.

2. Earnings Variability - This refers to an unpredictable variation in the firm's earnings. A descriptor such as earnings per share is used to measure this source of risk.

3. Low Valuation and Unsuccess - This characteristic of firm risk considers how successful a company has been. Growth in earnings per share as well as the return on equity are utilized here.

4. Immaturity and Smallness - Rosenburg and Marathe include this category because of the widely held belief that "old and large firms that have accumulated substantial fixed assets are found to be in a more secure economic position, with a lower degree of risk. Conversely, a small young firm is generally more risky". The logarithm of total assets is used as a risk descriptor for this category.

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[67]Barr Rosenburg and Vinay Marathe, "The Prediction of Investment Risk: Systematic and Residual Risk," Proceedings of the Seminar on the Analysis of Security Prices, University of Chicago, November 1975, pp. 85-225.

5. Growth Orientation - This refers to the aggressive growth strategy of a firm which might involve embarking on new projects with uncertain cash flows. The dividend yield is used here.

6. Financial Risk - The last category considers how heavily levered the financial structure of the firm is. The total debt to total assets ratio is used as a descriptor for this category.[68]

The proceeding discussion of the work of Barr Rosenburg and Vinay Marathe is important in that it points out the various categories of risk as well as the numerous measures which can be used to describe each of them. They claimed that when they calculated a beta based on both technical descriptors (the group of descriptors used for the market variability index) and fundamental descriptors (descriptors from the other categories) they were able to explain 86% more of the variance in a security's return than with use of a simple historical beta. This study uses a historical beta. Therefore I think it is noteworthy to point out that there exist other beta measures which some finance theorists feel perform better. However, since the term beta has been used several times prior to this point it is time to more clearly describe its meaning.

Beta is simply a numerical description of systematic risk. It can be said that despite the mathematical manipulations involved, beta is simply a measurement which assigns numerical values to the subjective feelings which portfolio managers regularly use to construct and adjust

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[68]A complete list of all the descriptors used by Rosenburg and Marathe is provided in an appendix at the end of this chapter.

their portfolios. Systematic risk refers to the tendency for individual stocks or portfolios to react to market movements. Systematic risk is also called market risk or simply an assets "volatility". Unsystematic risk refers to the variability of stock prices which results from factors particular to the firm in question. For example, the awarding of a large new contract, labor difficulties, or an unforseen disaster such as the Three Mile Island incident would all be considered unsystematic risk. The important distinction between these two types of risk is that the former can be diversified away while the latter cannot. One of the most basic tenets of portfolio theory is that to the extent that stocks do not move together all the time, variations in one security will tend to be offset by variations in other securities. The chart highlighted in Illustration G points out the relationship between total risk and diversification.[69] It can be seen from the graph that as we add more securities to a portfolio the unsystematic risk is substantially eliminated.

The relationship between systematic and unsystematic risk is most important to the determination of a security's price. Burton Malkiel summarizes this issue quite well.[70]

> Both financial theorists and practitioners agree that investors should be compensated for taking on more risk by a higher expected return. Stock prices must therefore adjust to offer higher returns where more risk is perceived, to insure that all securities are held by someone. Obviously,

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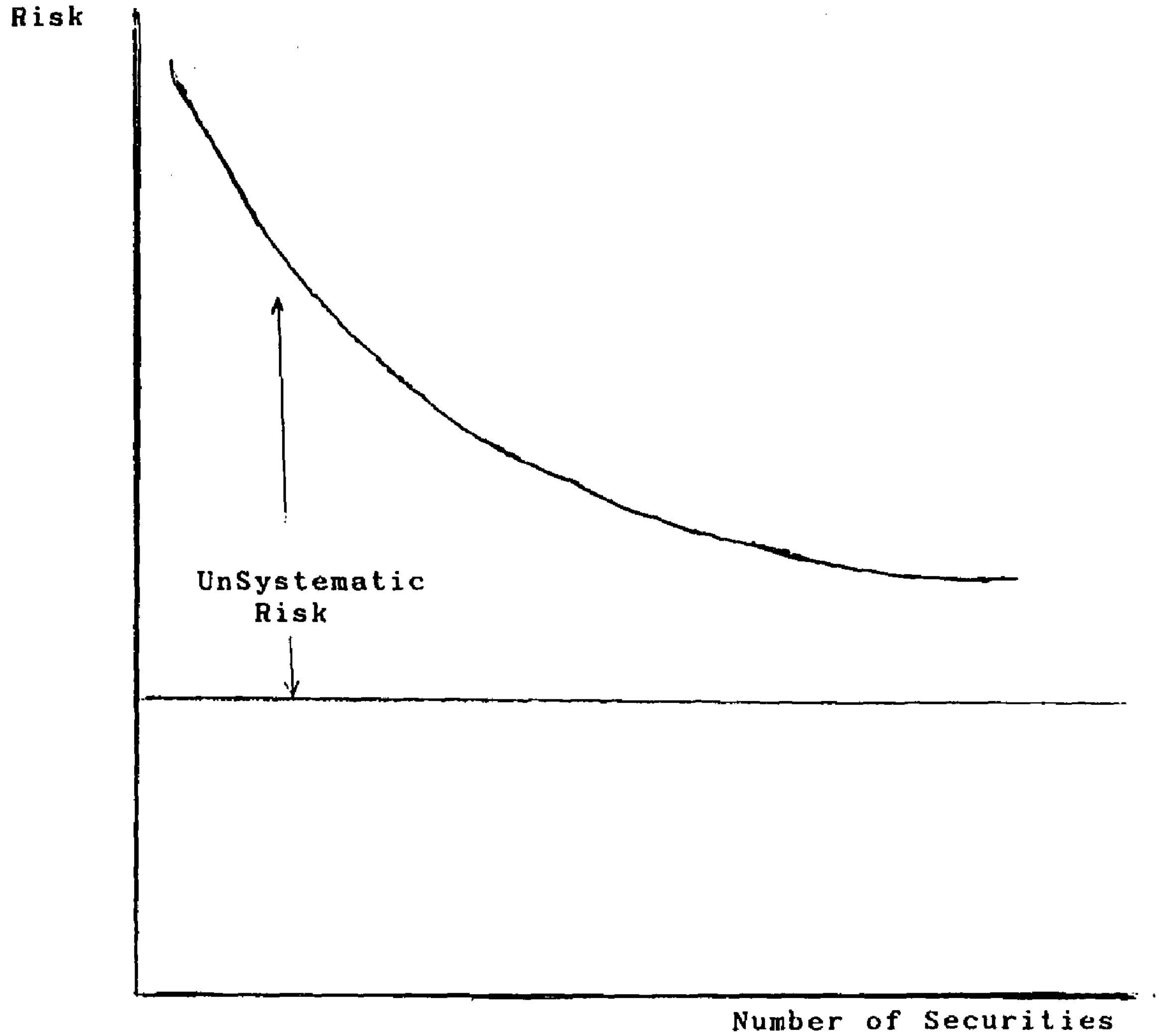
[69] F. Modigliani and G. Pogue, "An Introduction to Risk and Return," Financial Analysts Journal, March-April 1974.

[70] B. Malkiel, op. cit., pp. 210-202.

> risk-adverse investors wouldn't buy securities with extra risk without the expectation of extra reward. But not all of the risk of individual securities is relevant in determining the premium for bearing risk. The unsystematic part of the total risk is easily eliminated by adequate diversification. So there is no reason to think that investors will be compensated with a risk premium for bearing unsystematic risk. The only part of total risk that investors will get paid for bearing is systematic risk, the risk that diversification cannot help. Thus, the capital-asset pricing model says that returns (and, therefore, risk premiums) for any stock (or portfolio) will be related to beta, the systematic risk that cannot be diversified away.

Prior to the development of the capital asset pricing model (this model will be discussed more later) finance theorists tended to believe that each security's return was related to the total risk inherent in that security. However, developments associated with the capital asset pricing model have showed that each security's total risk is irrelevant. Only the systematic component of the security's variation should be taken into account in its valuation.

ILLUSTRATION G



Method for Calculating Beta

The most basic type of equation that is used to calculate beta is called the Market Model. It assumes the following form:

$$R_{it} = \alpha + B\ R_{Mt} + E_{it}$$ [71]

where R_{it} = The percentage return for security i for period t (a historical time period)

R_{Mt} = The percentage return for a market portfolio for period t

B = The beta value to be estimated

α = The intercept term to be estimated

E = The error term derived from the estimation process

The estimated line that results from each firms equation is called its characteristic line. The usual estimation technique would be regression analysis. Illustration H shows that the intercept forecasts the stocks return when the market return is zero. The slope of the characteristic line B reflects the tendency of the security's return to vary with the market.

Capital Asset Pricing Model

The security return-market return relationship can alternatively be represented in the following manner:

$$R_{it} = R_{Ft} + B\ (R_{Mt} - R_{Ft}) + E_{it}$$

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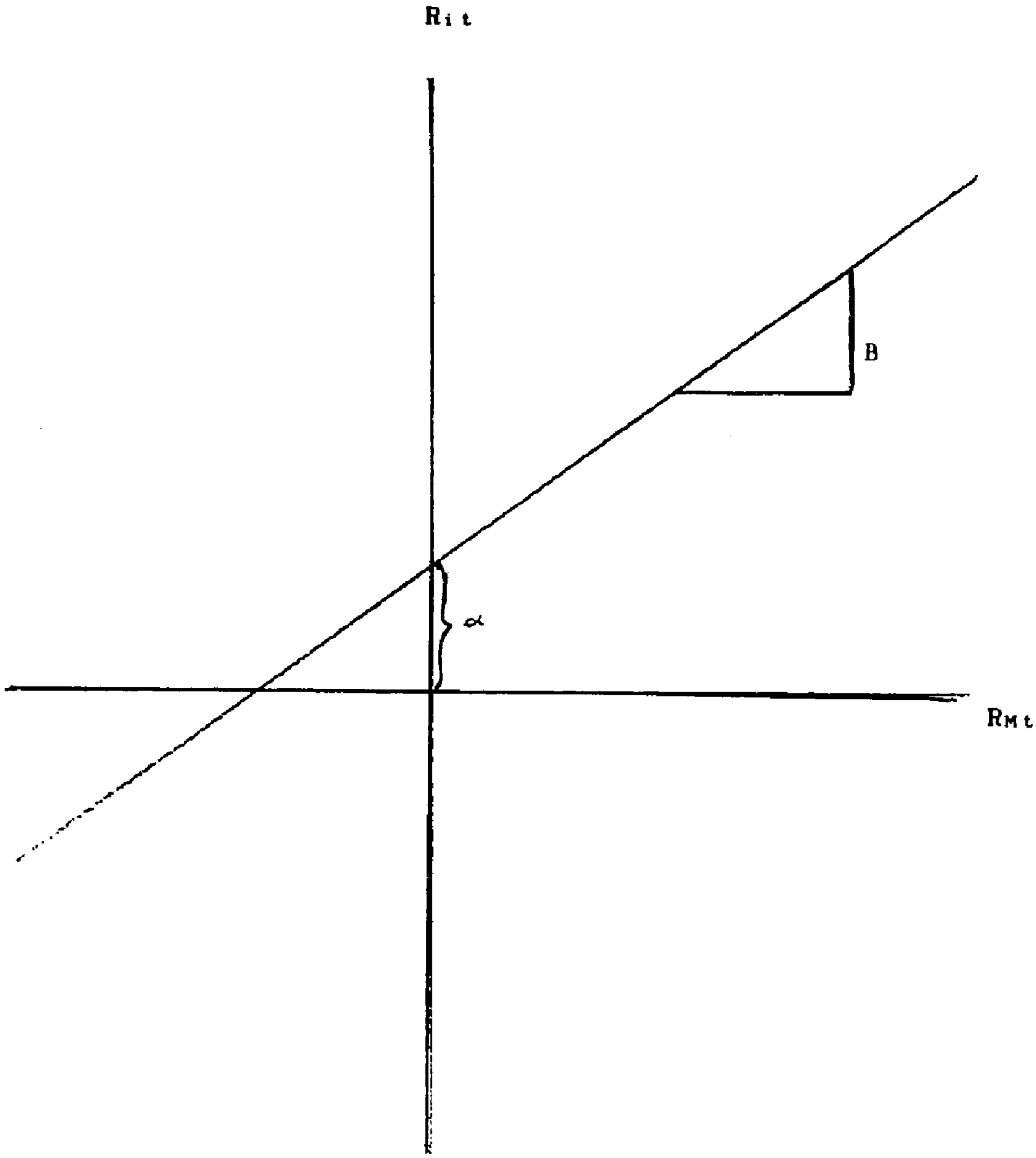
[71] B. Branch, Investments Longman Financial Services Publishing, Chicago, p. 124.

ILLUSTRATION H



$$R_{it} = \alpha + BR_{Mt} + E_{it}$$

This relationship is the Capital Asset Pricing Model.[72]

A graphical representation of the relationship between risk and return as indicated by the capital asset pricing model is given in Illustration I. The resulting line is referred to as The Security Market Line.

Stability of Beta

The issue of the stability of beta gives one reason for caution when using beta to assess risk. There has been much debate in the finance literature regarding how stable beta is and how useful it is in helping to predict future asset returns. Unstable betas mean that historical beta values may not be reflective of future beta values. If this is the case then the use of beta based on the prior performance of a security may not be useful in a study with a sample period beyond the historical beta estimation period.

Robert Levy demonstrated that betas based on weekly rates of return were not stable for individual stocks.[73] He did notice, though, that when the estimation period was lengthened or the stocks grouped into a portfolio that the stability improved. The results of Levy were supported in an extensive analysis of beta by Marshall Blume in which he

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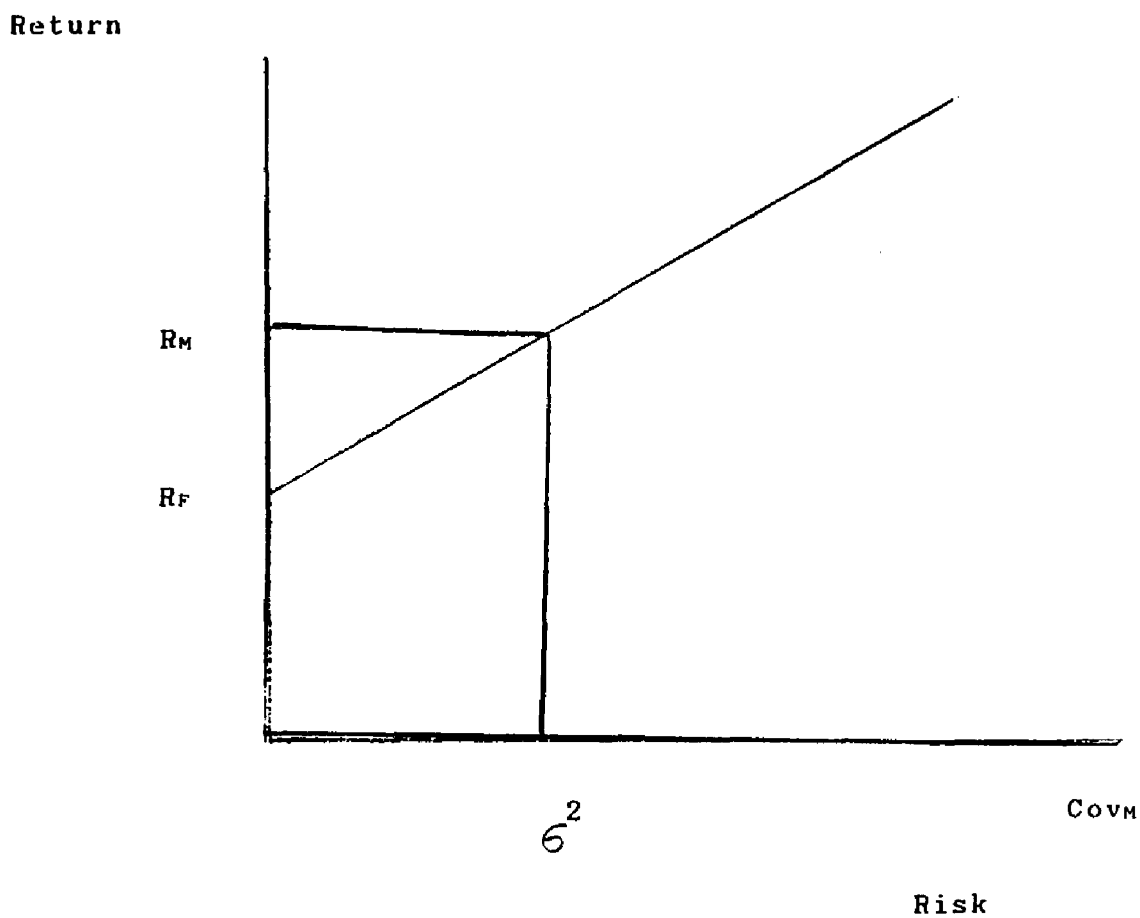
[72]Much of the recent finance research uses excess returns rather than returns themselves. Excess returns are returns minus a risk-free rate. These are used in an effort to eliminate estimation bias if the risk-free rate and the market return are correlated. See M. Miller and M. Scholes, "Rates of Return in Relation to Risk: A Re-examination of Recent Findings," in M. Jenson editor Studies of Capital Markets Praeger Press, New York, 1972 pp. 47-48.

[73]R. Levy, "On the Short Term Stationarity of Beta Coefficients," Financial Analysts Journal, vol. 27, #6, Nov-Dec. 1971, pp. 55-62.

ILLUSTRATION I



Security Market Line

Source: G. Hirt and S. Block, "Fundamentals of Investment Management," Irwin & Co., Illinois 1986, p. 576.

looked at the stability of beta for all common stocks listed on the New York Stock Exchange over the period January 1926 through June 1968.[74] Blume found that the correlation of individual stocks over adjoining periods was good (range between .60 to .73). He also noticed that the betas became more stable when grouped into portfolios of 20 or more stocks.

A crucial factor in the estimation of beta is the number of months in the estimating period. This study uses betas estimated from a 36 month estimation period. A study which varied the estimation period from 12 to 108 months and showed that the betas became more stable as the length of the estimation period increased.[75] Based upon these results we would expect that this study's beta should exhibit relative stability.

However, there have been several studies which question the usefulness of beta even after the stocks have been grouped into portfolios and the estimation period lengthened. James Farrell of Citibank examined the returns of two mutual funds which had similar betas... 1.09 and 1.11.[76] One would expect that with similar betas the funds should exhibit similar preformance. However, as the table below indicates the funds preformed very differently.

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[74]M. Blume, "On the Assessment of Risk," Journal of Finance, vol. 26, no. 1, March 1971, pp. 1-10.

[75]J. Baesel, "On the Assessment of Risk: Some Further Considerations," Journal of Finance, vol. 29, no. 5, December 1974, pp. 1491-1494.

[76]J. Farrell, "Homogeneous Stock Groupings," Financial Analysts Journal, May-June 1975, p. 50-65.

TABLE I[77]

	Affiliated Fund	T. Rowe Price	S & P 500
Portfolio Beta	1.09	1.11	1.00
Fund Preformance	-16%	-42%	-29%

We can conclude that beta is a risk measure that is not without its drawbacks. However there are numerous studies which help to support and improve the usage of beta as an indicator of future preformance. Rudd and Clasing note that part of the problems experienced with the usage of betas may lie in flaws in their estimation.

> Naturally, the power of beta to predict portfolio returns will depend upon the accuracy with which beta is estimated. It is important to realize that no one has even seen the actual beta itself. Therefore, the usefulness of the beta coefficient to predict returns is a function of the accuracy of the beta estimate. "Bad" betas will produce little explanation of the returns from both assets and portfolios. (In part, the mixed results from studies of the compensation for risk can be attributed to this simple fact.) "Good" betas, on the other hand, have shown remarkable ability at explaining the risk of portfolios.[78]

Rudd and Clasing use an illustration to highlight this distinction between good and bad betas. Illustration J demonstrates the prediction of systematic risk in a month when the market return was negative. The vertical axis shows the return on individual securities over the month. The horizontal axis shows the historical beta. If all assets

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[77]Source: Farrell op. cit.

[78]A. Rudd and H. Clasing, Modern Portfolio Theory, (Dow Jones Irwin, 1982), pp. 120-121.

exhibited a return exactly like the historical beta then each asset would fall on the solid line.

In reality all points will not fall on the line but should scatter around the line. "A good beta will explain a comparatively large amount of the scatter about the solid line; a bad beta will not explain the scatter. In other words, the good beta's fit to the data will be much better than that of a bad beta. Thus, a better prediction of the beta for stock B may have been smaller then its historical beta."[79]

Illustration K shows an actual scatter of points produced by Rosenburg and Marathe.[80] The solid line is the regression line of best fit to the data. However if returns were to be predicted using historical beta then the dashed line would indicate the predicted values.

Supporters of beta contend that through the construction of more carefully calculated betas using longer histories of returns the usefulness of beta can be substantially improved. From this viewpoint beta is a valuable indicator of future preformance in that it successfully accounts for systematic risk.

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[79]A. Rudd and H. Classing, p. 122.

[80]B. Rosenburg and V. Marathe, op. cit., p. 92.

ILLUSTRATION J

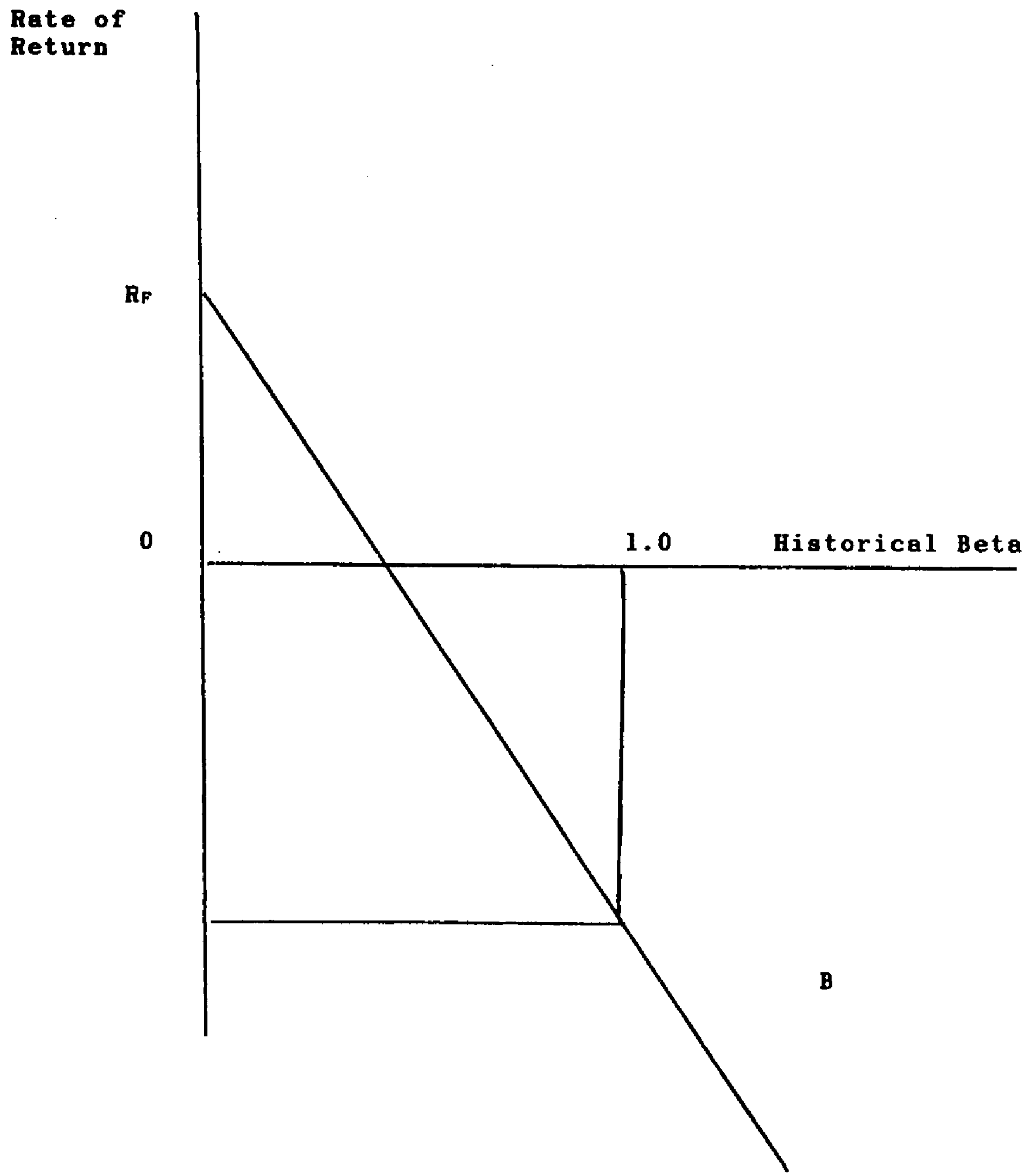
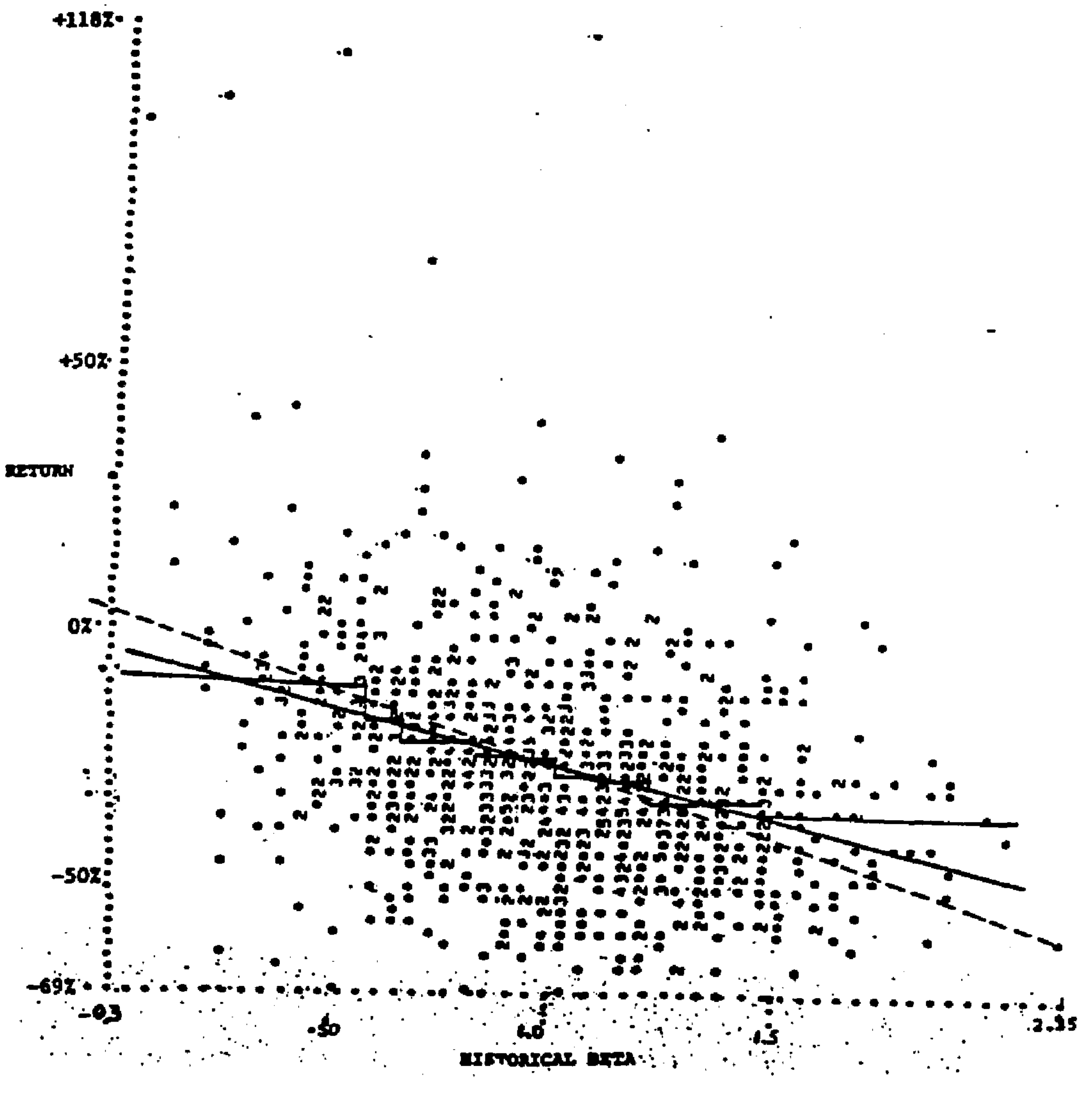


ILLUSTRATION K

AN ILLUSTRATION OF PREDICTION OF EXPOSURE TO SYSTEMATIC RISK (BETA)

INDIVIDUAL SECURITY RETURNS 1/1/73 - 6/30/73

PLOTTED AGAINST 12/30/72 HISTORICAL BETA



Comparability of Published Estimates of Beta

Many researchers in finance utilize published estimates of beta in an effort to economize on computational costs. The two main sources of published betas are The Merrill Lynch Security Risk Evaluation Report and The Value Line Investment Survey. This study uses The O'Neills Service betas. Most estimates of beta should use the same market model equation referred to above. However, their values can still differ since they employ different data. Merrill Lynch uses 60 monthly observations while Value Line uses 260 weekly observations.[81] Meir Statman found the following relationship between adjusted betas for 195 securities:

Merrill Lynch Beta = 0.127 + 0.879 Value Line Beta

The Statman study, however, does not provide us with any reason to believe that the variability between published betas is significantly different.

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[81]M. Statman, "Betas Compared: Merrill Lynch vs Value Line," Journal of Portfolio Management, vol. 7, no. 2, Winter 1981, pp. 41-44.

CHAPTER TWELVE

EMPIRICAL ANALYSIS OF THE ROLE OF RISK

Having established the impact of news on trading volume it is now appropriate to look further into what factors might influence this effect. Beta seemed to be a significant determinant; however, after correcting for autocorrelation, the coefficients of the beta variable did not prove to be significant. On the other hand, in other specifications beta demonstrated clear significance. For example, the original specification without the shares outstanding term (shareout) and after correcting for autocorrelation yields a coefficient of B = 9.05 with t(B) = 3.93. The results from this analysis are listed below:

Focus on Beta - Original Specification Without Shareout

Corrected for Autocorrelation

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:3 TO 1980:12

VOLUME = B0 + B1*NEWS + B2*NEWS(-1) + B3*SCALE + B4*SCALE(-1) + B5*STOCKPRICES + B6*STOCKPRICES(-1) + B7*DJIVOLALL + B8*DJIVOLALL(-1) + B9*ESP + B10*EPSTRD + B11*BETA

Parameter	Coefficient	Std. Error	T-Statistic
B0	-846.39502	208.758555	-4.0544207
B1	0.08969912	0.03429813	2.61527751
B2	0.05385171	0.03438012	1.56636174
B3	25.3950137	28.6271207	0.88709633
B4	12.1922833	28.6954623	0.42488541
B5	22.5215669	19.5247430	1.15348852
B6	-11.363002	19.5018533	-0.5826627
B7	0.09667819	0.01238871	7.74124722
B8	0.02083448	0.01248037	1.66937947
B9	419.687112	73.5171434	5.70869722
B10	-820.98022	244.781047	-3.3539370
B11	9.05473099	2.30649466	3.92575416

RSQ* = 0.15862002 RBSQ* = 0.15490009 F(11,2488)=42.6406198
DURBIN-WATSON = 2.16597278 STD ERROR = 1980.07554

Role of Risk

To isolate the role of risk as measured by beta this study divides the total sample of twenty firms into two subgroups of five firms each. They are composed of the five firms with the highest betas and the five firms with the lowest betas. These groupings are listed below.

High Beta		Low Beta	
Firm	Beta	Firm	Beta
Martin Marietta	1.66	IC Industries	.88
Diamond Shamrock	1.59	Bristol Myers	.71
Time	1.52	Heinz	.68
Champion Int'l	1.37	CPC	.62
Digital Equipment	1.36	Borden	.38
Average	1.5	Average	0.65

Two separate pooled regressions are run for each of the above groups in an attempt to isolate the impact of news on relatively more risky firms versus less risky firms. The regressions are run with both stock price and stock trading volume as the dependent variables. An examination of the values of the news and scale evaluation coefficients as well as its level of statistical significance should indicate whether different betas (different levels of risk) result in a significantly different impact of a given dollar value of news.

Betas	December 31, 1983
Int' Paper	1.22
Motorola	1.20
Burroughs	1.07
Archer Daniels Midland	1.38
Digital Equipment	1.36
Borden	0.38
Champion Int's	1.37
Armco	0.96
Esmark	1.18
Diamond Shamrock	1.59
CPC	0.62
Time	1.52
John Deere	0.94
Bristol Myers	0.71
Martin Marietta	1.66
Firestone	1.14
I C Industries	0.88
North American Phillips	1.19
Pfizer	0.96
Heinz	0.68

Provided by O'Neills Service

The five high beta firms were included in this study's original sample. The low beta firms were not included in the original ten. The results are listed below:

No Correction for Serial Correlation

High Beta Newsscale

TIME SERIES CROSS SECTION POOLED REGRESSION

NO CORRECTION FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*HIGHNEWSSCALE + B2*HIGHNEWSSCALE(-1) + B3*HIGHPRICE + B4*HIGHPRICE(-1) + B5*HIGHDJIVOL + B6*HIGHDJIVOL(-1) + B7*HIGHPS + B8*HIGHSHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-3697.8948	271.742738	-13.608072
B1	0.00284735	0.00129507	2.19861247
B2	0.00304356	0.00129425	2.23160913
B3	96.6561738	30.3118836	3.18872212
B4	-104.34610	30.2836496	-3.4456251
B5	0.12111839	0.02029129	5.96898546
B6	0.04482083	0.02020661	2.21812698
B7	727.411391	79.5630887	9.14257356
B8	0.03377686	0.00191223	17.6636195

RSQ* = 0.43216720 RBSQ* = 0.42847698 F(8,1231)=117.111460
DURBIN-WATSON = 1.20840693 STD ERROR = 1923.65214

The Durban-Watson indicates the need to correct for serial correlation. The corrected results are listed below:

Corrected for Serial Correlation

High Beta Newsscale

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*HIGHNEWSCALE + B2*HIGHNEWSCALE(-1) + B3*HIGHPRICE + B4*HIGHPRICE(-1) + B5*HIGHDJIVOL + B6*HIGHDJIVOL(-1) + B7*HIGHPS + B8*HIGHSHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-3219.4142	362.284665	-8.8864213
B1	0.00190721	0.00105877	1.80133708
B2	0.00214397	0.00105790	2.02663141
B3	53.3358323	25.5514229	2.08739186
B4	-60.086506	25.4908620	-2.3571783
B5	0.06033090	0.01766456	3.41536398
B6	0.03753593	0.01762533	2.12965781
B7	731.634120	135.493780	5.39976619
B8	0.03511034	0.00271778	12.9187805

RSQ* = 0.24685939 RBSQ* = 0.24196490 F(8,1231)=50.4361190
DURBIN-WATSON = 2.02796488 STD ERROR = 1909.72057

After correcting for serial correlation the contemporaneous newsscale coefficient has a value of B (0) = .002 with t (B1) = 1.8. Lagged newsscale has a coefficient of B2 = .002 with t (B2) = 2.03. The high beta regression indicates that news influences trading volume of relatively high risk firms as measured by their beta.

The low beta model does not reflect a similar impact of Wall Street Journal news articles on trading volume.

No Correction for Serial Correlation

Low Beta   Newsscale

VOLUME = B0 + B1*LOWNEWSSCALE + B2*LOWNEWSSCALE(-1) +
B3*LOWPRICE + B4*LOWPRICE(-1) + B5*HIGHDJIVOL +
B6*HIGHFJIVOL(-1) + B7*LOWEPS + B8*LOWSHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	-203.81772	169.740328	-1.2007619
B1	0.00525981	0.00213385	2.46493694
B2	0.00022695	0.00213164	0.10646534
B3	13.8181497	13.5586220	1.01914116
B4	-17.273385	13.5879192	-1.2712310
B5	0.06596351	0.00862738	7.64582906
B6	0.00216451	0.00858757	0.25205125
B7	-131.72433	35.2060328	-3.7415274
B8	0.01889158	0.00060527	31.2119789

RSQ* = 0.47395246   RBSQ* = 0.47053380   F(8,1231)=138.636588
DURBIN-WATSON = 1.20949553   STD ERROR = 816.432088

Initially it appears that contemporaneous newsscale is significant however an examination of the Durban-Watson statistic calls for a correction for serial correlation.

Corrected for Serial Corelation

Low Beta   Newsscale

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
CORRECTED FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*LOWNEWSSCALE + B2*LOWNEWSSCALE(-1) +
B3*LOWPRICE + B4*LOWPRICE(-1) + B5*HIGHDJIVOL +
B6*HIGHDJIVOL(-1) + B7*LOWEPS + B8*LOWSHAREOUT

Parameter	Coefficient	Std. Error	T-Statistic
B0	313.476824	152.505445	2.05551234
B1	0.00177126	0.00257426	0.68806496
B2	-0.0007743	0.00257589	-0.3005783
B3	9.11144959	9.15193075	0.99557676
B4	-9.3763012	9.16857026	-1.0226569
B5	0.04002328	0.00635241	6.30049226
B6	0.00314073	0.00632598	0.49078944
B7	-220.97208	33.3664523	-6.6225823
B8	0.01811437	0.00101408	17.8627989

RSQ* = 0.16217509   RBSQ* = 0.15673025   F(8,1231)=29.7850916
DURBIN-WATSON = 2.12261816   STD ERROR = 785.826778

The corrected results do not indicate a meaningful impact of news on trading volume. The values of B1 = .002 with t (B1) = 1.11 and B2 = .0003 with t (B2) = .166 reflect this lack of significance.

The question naturally arises as to why should high beta firms react to news developments and low beta firms not react. After considering the meaning of beta this result seems in line with a priori reasoning. High beta firms are inherently more volatile than low beta firms.[82] With this higher volatility one would expect a greater reaction to news developments.

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[82]It is noteworthy to point out that beta applies to a particular beta calculation period. If a firms return characteristics change it is possible that this year's high beta firm could be next year's low beta firm.

Why do High Beta Firms React Differently than Low Beta Firms

High beta firms are by definition more volatile than low beta firms. Their returns respond more to market movements than low beta firms. To some this might imply that low beta firms are more staid and less active than their high beta counterparts. The above results seem to imply that their trading volume also does not react to changes in news. It would be useful to see if low beta firms receive as much attention in The Wall Street Journal as high beta firms. One way to attempt this would be to compare the number of articles on high beta firms relative to low beta firms. These results are listed below.

Number of Articles

High Beta

Firm Name	Beta	Number of Articles
Martin Marietta	1.66	40
Diamond Shamrock	1.59	26
Time	1.52	19
Champion International	1.37	21
Digital Equipment	1.36	29
		$\bar{y}_1 = 27$

Low Beta

Firm Name	Beta	Number of Articles
I C Industries	.88	23
Bristol Myers	.71	15
Heinz	.68	14
CPC	.62	8
Borden	.38	9
		$\bar{y}_2 = 13.8$

A good way to analyze whether or not the difference in the number of these articles is significant is to use one-way analysis of variance.[83] This technique allows us to test whether or not the two means of each of these two groups differ significantly. Merely looking at the two means is not enough. We need to examine the difference between relative to the spread of observations relative to the means.

To accomplish the comparison we need to test the null hypothesis that there is no difference between the two mean number of articles.

$$Ho: \bar{Y}_1 = \bar{Y}_2$$

To facilitate the test of this null hypothesis we need to compute a t-statistic that is calculated in the manner indicated below.

<u>Numerator of the t-statistic</u>

$$(\bar{Y}_1 - \bar{Y}_2) - (u_1 - u_2) = \bar{Y} - Y_2 - 0 = 27 - 13.8 - 13.2$$

<u>Denominator of the t-statistic</u>

If

$$S_1^2 = \sum_{i=1}^{5} (Y_1 - \bar{Y}_1)^2 / n_{1-1} = 68.5$$

$$S_2^2 = \sum_{i=1}^{5} (Y_2 - \bar{Y}_2)^2 / n_{2-1} = 35.7$$

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[83]G. Iverson and H. Norpoth, "Analysis of Variance," Sage Publications, Beverly Hills, 1976, pp. 11-25.

Then the denominator = $S = S_1^2/n_1 + S_2^2/n_2$

$$S = 34.54$$

$$t = \frac{13.2}{34.54} = .38 \text{ for } n1 + n2 - 2 = 8 \text{ degrees of freedom}$$

For 8 degrees of freedom we need a t value of 2.31 to reject the null hypothesis (that there is no difference between the means) at the 5% significance level. Clearly we cannot reject the null hypothesis and cannot conclude that, given the observations we have, high beta firms receive more or less attention in The Wall Street Journal than low beta firms. However, one can intuitively get the impression from looking at the small sample of firms on page 178, which are assembled in order of descending betas, that higher beta firms receive more news articles. The data does not allow us to conclude this at the 5% significance level. This could be more clearly established (either way) through the examination of a larger sample.

CHAPTER THIRTEEN

JANUARY ANOMALY AND THE NEWS

January Anomaly and the News

This part of the study addresses the issue of whether there is a significant difference in the impact of the news during the period of time normally associated with the January anomaly. This investigation is directed only at the volume specification as the news variable was clearly not significant in the price specification.

The concept of a turn of the year effect was first introduced by Ben Branch in 1977 when he pointed out that there might be some clear tax advantages to selling securities at the end of the year.[84] He pointed out that investors have engaged in selling at the end of the year to establish tax losses. However, if investors believed in the long term value of that particular security as an investment he might repurchase it after the new year. If this scenario is consistent with investor behavior then one might expect some downward pressure on stock prices in December and upward pressure in January as investors return to the security. In addition, one would expect additional trading activity (assuming other factors are constant).

Such a pattern as that described in the preceding paragraph should not persist in efficient markets. It would be expected that arbitragers, knowing the existence of such a seasonal pattern (assuming it existed), would buy securities in December when they were temporarily depressed and thus under-valued and sell in January when they reached higher

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[84]Ben Branch, "A Tax Loss Trading Rule," Journal of Business, vol. 50, no. 2, April 1977, pp. 198-207.

values. The existence of arbitragers would then eliminate this form of seasonality thereby assuming market efficiency. The attempts to substantiate this effect have been numerous. One such attempt was a study by Edward Dyl in 1977.[85] Dyl notices abnormally high trading volume during December for stocks that had experienced large losses during the previous year. In addition, Dyl noticed that volume was abnormally low for those stocks that experienced large capital gains. Dyl further noticed that those stocks that experienced losses during the previous year reported significant abnormal returns in January. These observations provided considerable support for the theory of a turn-of-the-year effect.

A more interesting study by Richard Roll which related the January anomaly to the size effect in an attempt to detect a relationship between these two anomalies.[86] Roll established the presence of the price pattern described above for the last day of December and the first four days of January he sought to see if this effect was influenced by the size of the firm. He showed that smaller firms had a clearer turn-of-the-year effect when one compared New York Stock Exchange firms with American Stock Exchange companies.

The analysis of the January anomaly included adding a dichotomous variable to the volume specification which equals 1 for the first five days of January and zero otherwise.

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[85]E. Dyl, "Capital Gains Taxation and Year-End Stock Market Behavior," Journal of Finance, Vol. 32, no. 1, March 1977, pp. 165-175.

[86]R. Roll,"Vas Ist Das"? Journal of Portfolio Management, Vol. 9, no. 2, Winter 1983, pp. 18-28.

Several studies have a period of similar length although a good argument could be made for using a longer period such as 3 to 4 weeks. If investors like a stock as a long term investment and it has a depressed price there may not be a good reason to rush back into the investment in the first few trading days of the year. However, since this issue is far from resolved in the finance literature this study will chose to maintain the first five days of the year as the period of focus.

The results for the volume specification with the January dichotomous variable (called Jan in the model) added to the model are listed below:

Volume Specification   January Anomaly Test

Corrected for Autocorrelation

TIME SERIES CROSS SECTION POOLED REGRESSION

CORRECTED FOR AUTOCORRELATION
NO CORRECTION FOR HETEROSKEDASTICITY
NO CORRECTION FOR PARTIAL CORRELATION

FRE M INT 1960:5 TO 1980:12

VOLUME = B0 + B1*NEWSSCALE + B2*NEWSSCALE(-1) +
B3*STOCKPRICES + B4*STOCKPRICES(-1) + B5*DJIVOLALL +
B6*FJIVOLALL(-1) + B7*ESP + B8*EPSTRD + B9*BETA +
B10*SHAREOUT + B11*JAN

Parameter	Coefficient	Std. Error	T-Statistic
B0	-2377.3901	259.493160	-9.1616676
B1	0.00972227	0.00279341	3.48042788
B2	0.00306587	0.00279036	1.09873734
B3	13.8951052	18.5683987	0.74832006
B4	6.40868972	18.5420038	0.34563091
B5	0.10792680	0.01246858	8.65589983
B6	0.02011805	0.01242150	1.61961599
B7	323.362890	72.2396541	4.47625192
B8	-392.59873	238.321618	-1.6473484
B9	1.27588445	2.40466803	0.53058652
B10	0.02354328	0.00246756	9.54111520
B11	-1425.5266	538.848193	-2.6455068

RSQ* = 0.16437489 RBSQ* = 0.16065046 F(11,2468)=44.1343217
DURBIN-WATSON = 2.12256279   STD ERROR = 1909.14592

One can see from these results that the coefficient of the January dummy variable is significant. However, this alone does not provide us with additional information on the potential interaction of this variable with the newsscale term that might alter its impact on trading volume. The object of this test is to see if the coefficient of the newsscale term is significantly different from the newsscale term in the volume specification without the January dummy variable. To ascertain this a t test must be conducted but not with the usual t-statistic which is

$$t = \frac{\hat{B}' - o}{se\ (\hat{B})}$$

The t-statistic for this test should be

$$t = \frac{\hat{B}' - \hat{B}}{se\ (\hat{B}')}$$

where $\hat{B}'$ = coefficient of newsscale term with the January dummy variable in model

$\hat{B}$ = coefficient of newsscale term in original specification

This calculation provides the following results:

$\hat{B}_1$ = .00972 $\quad$ $\hat{B}_1$ = .00978 $\quad$ se $(\hat{B}_1)$ = .002793

$\hat{B}_2$ = .00306 $\quad$ $\hat{B}_2$ = .00310 $\quad$ se $(\hat{B}_2)$ = .002790

$$t_1 = \frac{\hat{B}_1 - \hat{B}_1}{se\ (\hat{B}_1)} = .021 \qquad \text{contemporaneous newsscale}$$

$$t_2 = \frac{\hat{B}_2 - \hat{B}_2}{se\ (\hat{B}_1)} = .014 \qquad \text{lagged newsscale}$$

It can be seen from these t values that the newsscale coefficients are not significantly different from the newsscale coefficients in the model without the January dichotomous variable.

AREAS FOR FURTHER RESEARCH

News and the Small Firm Effect

An anomaly which has received abundant attention in the finance literature is the size effect. There were two studies in particular that seemed to establish a relationship between risk adjusted returns and firm size.[87] Risk was measured according to the Capital Asset Pricing Model with a beta from the model developed by Fama, Fisher, Jensen, and Roll.[88] These studies showed that smaller firms consistently enjoyed significantly higher risk adjusted returns than their larger counterparts.

Following the publication of these studies there was much debate in the finance literature as to whether or not they truly reflected a market inefficiency. Some studies contended that the previous studies were flawed in that they did not accurately adjust for risk.[89] Richard roll pointed out that small firms are traded less frequently.[90] They may experience days of little or no trading. Roll felt

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[87]R. Banz, "The Relationship between Return and Market Value of Common Stocks," Journal of Financial Economics, vol. 9, no. 1, March 1981, pp. 3-18.
and
M. Reinganom, "Abnormal Returns in Small Firm Portfolios," Financial Analysts Journal, vol. 37, no. 2, March-April 1981, pp. 52-57.

[88]E. Fama, L Fisher, M. Jensen, and R. Roll, "The Adjustment of STock Prices to New Information," International Economic Review, vol. 10, no. 1, February 1969, pp. 1-21.

[89]M. Reinganum, "Abnormal Returns in Small Firm Portfolios," Financial Analysts Journal, vol. 37, no. 2, March-April 1981, pp. 52-57.

[90]R. Roll, "A Possible Explanation of the Small Firm Effect," Journal of Finance, vol. 36, no. 4, September 1981, pp. 879-888.

that infrequent trading causes serial correlation between stock prices over time. He stated that this would tend to result in a beta estimate that was understated. This issue was debated back and forth and a complete discussion of the controversy will not be presented here. However, it would be worthwhile to investigate whether or not the impact that the news appears to have on trading volume is different for smaller firms. One way to attempt this comparison is to compile a separate news-trading volume some for smaller firms. The firms which may serve this purpose could be the ten largest firms on the Over The Counter Market. Ten firms from this group would be contrasted with the largest ten firms in the Over The Counter Market. These firms are:

Wetterau, Inc.	$2,684.1
MCI Communications Corp.	1,664.7
Apple Computer, Inc.	1,515.9
Service Merchandise Co., Inc.	1,458.1
Paccar, Inc.	1,412.0
CFS Continental, Inc.	1,377.3
Roadway Services, Inc.	1,253.0
Cullum Companies, Inc.	1,228.2
Atlanta Gas Light Co.	1,225.7
Pay 'N Save Corp.	1,220.5

The Role of Expectations

The semi-strong version of the efficient markets hypothesis implies that if an event has been adequately anticipated by investors then it should not have an impact at the time of its occurrence. If markets are truly efficient then stock prices should have already internalized this information. In a sense, investors do not view an article on such an event as news.

To investigate the role of expectations on the impact of news on trading volume and stock prices it might be beneficial to focus on just one industry. Narrowing the focus to one industry might help to eliminate bias resulting from industry-specific events. An example that comes to mind would be to concentrate the analysis on the airline industry. By examining this industry we have the opportunity to compare the potentially depressing effects on stock prices as well as variations in trading volume from two major sources of bad news; air crashes and airline employee strikes.

Airline crashes make the flying public concerned over the quality control of a particular airline. This fact has recently been underscored by the difficulties Japan Air Lines is having following the crash of a JAL jet which resulted in the deaths of 520 passengers.

This tragedy has led to management shakeups at Japan Air Lines which included the resignation of company president Yasumoto Takagi. "JAL's domestic passenger traffic since September has been running about 25% below the pace of last year. Although international business has continued to increase slightly, the company expects lower earnings for the six month period that began October 1. JAL has lowered its forecast for pre-tax profit for the year ending next March to the current equivalent of $36.2 million, from $106.8 million in the previous fiscal year."[91]

An airline crash presumably cannot be predicted by investors. As a result of the stochastic nature of the event investors must quickly adjust their expectations of the future profitability of the firm as well as the future path of the firm's stock.

On the other hand, airline strikes are rarely total surprises. Usually the actual event is preceded by a series of news stories indicating the status of negotiations between management and the union. Strikes can severely hurt a firm's immediate and future profitability. The loss of rider revenue due to a reduced number of flights is obvious. In addition, future revenues can be hurt by two factors. First, bad will can be generated by the inconvenience stranded passengers may experience following the employee walk-out. Second, future customers might be lost to competitors who may try another airline and discover that they prefer it to the airline in question.

The fact that the strike generally does not come as a surprise should not cause investors to significantly adjust their expectations. As the news of the progressing contract negotiations (prior to the strike) reach investors, they alter their estimate of the probability of the strike

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[91] The Wall Street Journal, December 5, 1985, p. 34.

occurring. They also have reacted (if necessary) to this information, adjusted their portfolio and this would be reflected in the stock's price as well as variations in trading volume.

Since both events are a priori determined to be bad news, no panel scaling need be employed. The data on the importance of the news is self-scaled in that the amount of the space that the story commands will indicate its importance.

Industry Specific Responses to News

It might also be interesting to learn to what extent the reaction of trading volume varies across industries. For example, are certain utilities more susceptible to negative news developments than others. To attempt to answer this question a study might want to focus on the following industries:

1) Telecommunications
2) Airlines
3) Power Utilities
4) Computers

The telecommunications and airlines are chosen since both are industries undergoing significant changes as a result of deregulation allowing market forces to interact. For example the long distance telecommunications business has gotten most competitive with several firms fiercely fighting for survival.

The airline industry paints a similar picture but its reactions to the pressures of competition has elicited a different response. Many firms, in an effort to obtain broader routes or simply financial resources, has sought out merger partners. Both industries are in a period of unsettling change. Consequently, it might be interesting to compare their reactions to printed news in this period of turmoil.

The power utility industry is chosen because utilities, being regulated monopolies, have been the traditional symbol of stability. The picture has been steadily changing in the wake of Three Mile Island as well as the financial default associated with the WPPSS case. However, they still appear to be stable investments as compared to the highly volatile computer industry. Therefore, the comparative reaction of these two industries to news developments might be an interesting comparison.

CONCLUSION

CONCLUSION

This study seems to put forward certain conclusions:

(1) The monetary quantification of the news allows us to econometrically analyze the impact of published news on important market variables. Defining news in this manner may set the stage for further research in this area.

(2) The lagged and contemporaneous values of the published news does not seem to have a clearly discernable impact on stock prices. The lead values of the news variable, on the other hand, seem to suggest an impact. The results maintain a consistency with the efficient markets view.

(3) The lagged and contemporaneous values of the published news do seem to have an impact on trading volume. Conclusions (1) and (2) need not be inconsistent. For example, a theoretical model of offsetting preferences such as that described earlier would account for such effects.

(4) The effects pointed out in (3) are more pronounced when one moves from a general sample of all the available news to more extreme subsamples of news. More extreme news seemed to have a greater impact that the more broadly defined news samples. This result falls in line

with intuition as one would expect more trading activity to result from more extreme news.

(5) Good and bad news had an asymmetric impact on trading volume. Good news alone seemed to have a greater impact on trading volume than the more generally defined samples. On the other hand, bad news that is printed in The Wall Street Journal could not be statistically associated with fluctuations in trading volume. There could be numerous explanations for such a result. For example it is often believed that investor, desirous of wealth, are inherently optimistic and react to good news. Another explanation which might account for part of this effect would be that the bad news was already acted upon before the details were published.

(6) The trading volume of risky firms seems to exhibit a clear reaction to news while the volume of low risk firms do not demonstrate a statistically significant reaction to news. This result also seems to fall in line with intuition as one would expect that high risk and therefore more volatile firms would react more to news developments than their less volatile counterparts.

(7) More risky firms seem to attract more news articles than low risk firms. This sets the stage for a larger sample evaluation of this phenomena.

APPENDIXES

APPENDIX TO CHAPTER SEVEN

INDIVIDUAL FIRM RESULTS
DEPENDENT VARIABLE PRICE

Dependent Variable - Price

SMPL 1801-2051
251 Observations
LS // Dependent Variable is ARMP1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-1.3599472	0.5915483	-2.2989624	0.022
ARMP1(-1)	1.0004938	0.0048430	206.58511	0.000
NEWS1	-3.472D-05	2.035D-05	-1.7056651	0.088
NEWS1(-1)	1.971D-05	2.091D-05	0.9426003	0.346
SCALE1	0.0226556	0.0256177	0.2843742	0.376
SCALE1(-1)	-0.0416114	0.0253116	-1.6439649	0.100
ARMVL1	2.722D-07	2.732D-05	0.0099236	0.992
ARMVL1(-1)	-6.860D-06	2.608D-05	-0.2630360	0.793
DJIA	0.0146368	0.0019715	7.4241067	0.000
DJIA(-1)	-0.0135119	0.0019339	-6.9868971	0.000
ARMJAN	0.3170642	0.1841556	1.7217193	0.085

R-squared	0.994953	Mean of dependent var	15.10827
Adjusted R-squared	0.994743	S.D. of dependent var	4.252809
S.E. of regression	0.308347	Sum of squared resid	22.82866
Durbin-Watson stat	1.990699	F-statistic	4731.682
Log likelihood	-55.22035		

Armco Inc.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is BURP1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.4988189	1.2212730	0.4084417	0.683
BURP1(-1)	0.9731299	0.0171006	56.906147	0.000
BURNEW	2.768D-05	3.087D-05	0.8967957	0.370
BURNEW(-1)	1.535D-05	3.065D-05	0.5008546	0.616
BURSCL	-0.0116476	0.0322646	-0.3610031	0.718
BURSCL(-1)	0.0037916	0.0320417	0.1183336	0.906
BURVOL	-4.539D-05	2.577D-05	-1.7614828	0.078
BURVOL(-1)	-4.896D-06	2.551D-05	-0.1919493	0.848
DJIA	0.0494326	0.0044032	11.226460	0.000
DJIA(-1)	-0.0485359	0.0043420	-11.178304	0.000
BURJAN	-0.3116078	0.4763741	-0.6541240	0.513

R-squared	0.956260	Mean of dependent var	52.28436
Adjusted R-squared	0.954437	S.D. of dependent var	3.223818
S.E. of regression	0.688137	Sum of squared resid	113.6478
Durbin-Watson stat	2.183587	F-statistic	524.6950
Log likelihood	-256.7139		

Burroughs Corp.

Dependent Variable - Price

SMPL 1801-2051
251 Observations
LS // Dependent Variable is CHPP

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.0339548	0.7088486	0.0479014	0.962
CHPP(-1)	0.9881429	0.0121610	81.255280	0.000
CHPNEW	-5.714D-05	2.943D-05	-1.9410933	0.052
CHPNEW(-1)	2.187D-05	2.957D-05	0.7397929	0.459
CHPSCL	-0.0373193	0.0244329	-1.5274189	0.127
CHPSCL(-1)	0.0107295	0.0244208	0.4393584	0.660
CHPVOL	2.242D-05	1.173D-05	1.9121066	0.056
CHPVOL(-1)	4.172D-06	1.137D-05	0.3667374	0.714
DJIA	0.0153636	0.0024234	6.3396374	0.000
DJIA(-1)	-0.0152372	0.0023986	-6.3526351	0.000
CHPJAN	-0.0003622	0.1854925	-0.0019529	0.998

R-squared	0.981124	Mean of dependent var	21.51742
Adjusted R-squared	0.980337	S.D. of dependent var	2.620831
S.E. of regression	0.367501	Sum of squared resid	32.41376
Durbin-Watson stat	2.206421	F-statistic	1247.452
Log likelihood	-99.27138		

Champion International Inc.

SMPL 1801-2050
250 Observations
LS // Dependent Variable is DGEP1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-0.9523935	3.2817414	-0.2902098	0.772
DGEP1(-1)	0.9655963	0.0172303	56.040714	0.000
DGENEW	-0.0001783	0.0001225	-1.4551950	0.146
DGENEW(-1)	-1.275D-05	0.0001225	-0.1040763	0.917
DGESCL	0.0837781	0.1015707	0.8248250	0.409
DGESCL(-1)	0.0656494	0.1018014	0.6448768	0.519
DJIA	0.0352906	0.0117670	2.9991068	0.003
DJIA(-1)	-0.0320844	0.0111688	-2.8726800	0.004
DGEVL1	0.0001128	4.772D-05	2.3649229	0.018
DGEVL1(-1)	-8.058D-06	4.586D-05	-0.1757130	0.861
DGEJAN	-0.5114442	1.0782258	-0.4743387	0.635

R-squared	0.956922	Mean of dependent var	92.13770
Adjusted R-squared	0.955119	S.D. of dependent var	8.179047
S.E. of regression	1.732735	Sum of squared resid	717.5664
Durbin-Watson stat	2.316405	F-statistic	530.9053
Log likelihood	-486.5352		

Digital Equipment Corp.

Dependent Variable - Price

SMPL 1801-2051
251 Observations
LS // Dependent Variable is DMSP

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.1284028	0.6895439	0.1862142	0.852
DMSP(-1)	0.9716457	0.0187659	51.777327	0.000
DMSNEW	0.0001428	4.804D-05	2.9723581	0.003
DMSNEW(-1)	-3.613D-05	4.811D-05	-0.7509962	0.453
DMSSCL	-0.0355497	0.0188351	-1.8874219	0.059
DMSSCL(-1)	0.0049258	0.0188176	0.2617664	0.794
DMSVOL	1.297D-05	8.295D-06	1.5635453	0.118
DMSVOL(-1)	2.738D-06	8.314D-06	0.3292570	0.742
DJIA	0.0049030	0.0018881	2.5968012	0.009
DJIA(-1)	-0.0045984	0.0018526	-2.4821054	0.013
DMSJAN	-0.0024517	0.1572433	-0.0155918	0.988

R-squared	0.925963	Mean of dependent var	19.38397
Adjusted R-squared	0.922878	S.D. of dependent var	1.053111
S.E. of regression	0.292458	Sum of squared resid	20.52761
Durbin-Watson stat	1.964230	F-statistic	300.1611
Log likelihood	-41.94149		

Diamond Shamrock Corp.

SMPL 1801-2051
250 Observations
LS // Dependent Variable is FRSP

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.5434255	0.4883606	1.1127545	0.266
FRSP(-1)	0.9283972	0.0203397	45.644609	0.000
FRSNEW	-4.426D-05	2.129D-05	-2.0785074	0.038
FRSNEW(-1)	-4.174D-05	2.155D-05	-1.9373764	0.053
FRSSCL	0.0304686	0.0194788	1.5641915	0.118
FRSSCL(-1)	0.0311525	0.0195549	1.5930823	0.111
FRSVOL	7.721D-05	1.843D-05	4.1903027	0.000
FRSVOL(-1)	-2.649D-05	1.778D-05	-1.4901974	0.136
DJIA	0.0063192	0.0018141	3.4832776	0.000
DJIA(-1)	-0.0057537	0.0018163	-3.1677970	0.002
FRSJAN	0.2045120	0.1548931	1.3203434	0.187

R-squared	0.952597	Mean of dependent var	17.90139
Adjusted R-squared	0.950621	S.D. of dependent var	1.248995
S.E. of regression	0.277543	Sum of squared resid	18.48721
Durbin-Watson stat	1.896987	F-statistic	482.2921
Log likelihood	-28.80265		

Firestone Inc.

Dependent Variable - Price

SMPL 1801-2051
251 Observations
LS // Dependent Variable is INPP

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.4801313	1.3413535	0.3579454	0.720
INPP(-1)	0.9449242	0.0203494	46.434996	0.000
INPNEW	6.358D-05	8.178D-05	0.7774817	0.437
INPNEW(-1)	-8.400D-05	8.307D-05	-1.0112068	0.312
INPSCL	-0.0093155	0.0677020	-0.1375958	0.891
INPSCL(-1)	0.0266386	0.0688306	0.3870162	0.699
DJIA	0.0459472	0.0046947	9.7869280	0.000
DJIA(-1)	-0.0440320	0.0047035	-9.3614439	0.000
INPVOL	5.444D-05	3.018D-05	1.8035982	0.071
INPVOL(-1)	-3.884D-06	2.972D-05	-0.1306957	0.896
INPJAN	0.0046779	0.3966806	0.0117927	0.991

R-squared	0.951103	Mean of dependent var	52.01494
Adjusted R-squared	0.949066	S.D. of dependent var	3.237364
S.E. of regression	0.730628	Sum of squared resid	128.1160
Durbin-Watson stat	2.206885	F-statistic	466.8298
Log likelihood	-271.7527		

International Paper Inc.

SMPL 1801-2051
250 Observations
LS // Dependent Variable is MMP1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	0.4288751	1.2367632	0.3467722	0.729
MMP1(-1)	0.9856204	0.0138377	71.227188	0.000
MMNEW	-1.222D-05	6.180D-05	-0.1977265	0.843
MMNEW(-1)	-1.368D-05	5.955D-05	-0.2297025	0.818
MMSCL	0.0338328	0.0270075	1.2527189	0.210
MMSCL(-1)	0.0364352	0.0273499	1.3321871	0.183
MMVOL	0.0001688	4.484D-05	3.7637138	0.000
MMVOL(-1)	-1.423D-05	4.724D-05	-0.3011215	0.763
DJIA	0.0230608	0.0042233	5.4604136	0.000
DJIA(-1)	-0.0231448	0.0041047	-5.6385383	0.000
MMJAN	0.4753750	0.3503290	1.3569390	0.175

R-squared	0.976993	Mean of dependent var	36.83317
Adjusted R-squared	0.976035	S.D. of dependent var	4.103519
S.E. of regression	0.635256	Sum of squared resid	96.85192
Durbin-Watson stat	1.826294	F-statistic	1019.172
Log likelihood	-236.6437		

Martin Marietta Corp.

Dependent Variable - Price

SMPL 1801-2051
251 Observations
LS // Dependent Variable is MTAP

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-0.6416669	4.0645335	-0.1578698	0.875
MTAP(-1)	0.9528041	0.0182039	52.340729	0.000
MATNEW	-9.947D-05	0.0001636	-0.6080785	0.543
MTANEW(-1)	-6.245D-05	0.0001645	-0.3796948	0.704
MTASCL	0.1466065	0.1135708	1.2908825	0.197
MTASCL(-1)	-0.0106197	0.1132444	-0.0937771	0.925
MTAVOL	-0.0001571	6.221D-05	-2.5248614	0.012
MTAVOL(-1)	5.934D-05	6.266D-05	0.9469245	0.344
DJIA	0.1283801	0.0142554	9.0057067	0.000
DJIA(-1)	-0.1231118	0.0141889	-8.6766364	0.000
MTAJAN	0.6323738	1.1945446	0.5293849	0.597

R-squared	0.961328	Mean of dependent var	111.6901
Adjusted R-squared	0.959716	S.D. of dependent var	11.02652
S.E. of regression	2.213106	Sum of squared resid	1175.481
Durbin-Watson stat	2.182402	F-statistic	596.6012
Log likelihood	-549.9231		

Motorola Corp.

SMPL 1801-2051
250 Observations
LS // Dependent Variable is TIMEP1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-2.1614600	2.1284552	-1.0155064	0.310
TIMEP1(-1)	0.9257751	0.0191227	48.412294	0.000
TIMNEW	1.969D-05	7.092D-05	0.2776563	0.781
TIMNEW(-1)	-7.277D-05	7.135D-05	-1.0198129	0.308
TIMSCL	0.0322033	0.0825142	0.3902756	0.696
TIMSCL(-1)	0.0479841	0.0836834	0.5734010	0.566
TIMVL1	-3.026D-05	4.481D-05	-0.6753937	0.499
TIMVL1(-1)	-5.200D-05	4.477D-05	-1.1613356	0.246
DJIA	0.0234666	0.0065427	3.5867022	0.000
DJIA(-1)	-0.0189224	0.0065531	-2.8875399	0.004
TIMJAN	0.0318603	0.0823211	0.3870253	0.699

R-squared	0.962724	Mean of dependent var	42.38466
Adjusted R-squared	0.961171	S.D. of dependent var	5.182300
S.E. of regression	1.021182	Sum of squared resid	250.2751
Durbin-Watson stat	1.793286	F-statistic	619.8410
Log likelihood	-355.7906		

Time Inc.

APPENDIX TO CHAPTER EIGHT

INDIVIDUAL FIRM RESULTS
DEPENDENT VARIABLE VOLUME

Dependent Variable - Volume

SMPL 1801-2051
251 Observations
LS // Dependent Variable is MTAVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	5141.6578	1527.3005	3.3665005	0.001
MTAVOL(-1)	0.4655200	0.0565332	8.2344510	0.000
MTANEW	-0.0015777	0.1526800	-0.0103333	0.992
MTANEW(-1)	-0.0448814	0.1534561	-0.2924708	0.770
MTASCL	-47.785619	105.58844	-0.4525649	0.651
MTASCL(-1)	-36.538562	104.82167	-0.3495783	0.727
MTAP	-159.49603	53.557917	-2.9780103	0.003
MTAP(-1)	110.91097	52.534013	2.1112220	0.035
DJ1VOL	0.4051489	0.0501578	8.0774810	0.000
DJIVOL(-1)	-0.1246317	0.0543629	-2.2925877	0.022
MTAJAN	-1302.6063	1107.5410	-1.1761247	0.240

R-squared	0.475929	Mean of dependent var	4415.956
Adjusted R-squared	0.454093	S.D. of dependent var	2792.794
S.E. of regression	2063.470	Sum of squared resid	1.02D+09
Durbin-Watson stat	2.077587	F-statistic	21.79534
Log likelihood	-2266.198		

Motorola Corp.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is TIMVL1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	1477.1005	817.24032	1.8074279	0.071
TIMVL1(-1)	0.1915856	0.0649322	2.9505472	0.003
TIMNEW	-0.2803225	0.1010041	-2.7753565	0.006
TIMNEW(-1)	0.0448910	0.1025145	0.4378988	0.661
TIMSCL	349.07777	117.88107	2.9612708	0.003
TIMSCL(-1)	-24.136124	120.84836	-0.1997224	0.842
TIMEP1	-39.897225	91.769836	-0.4347531	0.664
TIMEP1(-1)	30.816758	89.142072	0.3457039	0.730
DJ1VOL	0.0313308	0.0357608	0.8761215	0.381
DJIVOL(-1)	-0.0210587	0.0354104	-0.5947039	0.552
TIMJAN	161.40886	119.31403	1.3528070	0.176

R-squared	0.099052	Mean of dependent var	1539.211
Adjusted R-squared	0.061513	S.D. of dependent var	1530.670
S.E. of regression	1482.845	Sum of squared resid	5.28D+08
Durbin-Watson stat	2.029138	F-statistic	2.638613
Log likelihood	-2183.261		

Time Inc.

Dependent Variable - Volume

SMPL 1801-2051
251 Observations
LS // Dependent Variable is CHPVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	4359.4139	1225.3468	3.5576980	0.000
CHPVOL(-1)	0.3477000	0.0578293	6.0125221	0.000
CHPNEW	0.6669095	0.1479200	4.5085810	0.000
CHPNEW(-1)	-0.3480645	0.1564107	-2.2253234	0.025
CHPSCL	-107.60576	128.13836	-0.8397623	0.401
CHPSCL(-1)	237.25306	127.08388	1.8669012	0.062
CHPP	629.75458	309.85815	2.0323964	0.042
CHPP(-1)	-895.45023	307.86097	-2.9086189	0.004
DJ1VOL	0.3160942	0.0480265	6.5826649	0.000
DJIVOL(-1)	-0.0083481	0.0511252	-0.1632870	0.870
CHPJAN	-194.99734	956.21981	-0.2039252	0.838

R-squared	0.580892	Mean of dependent var	2630.873
Adjusted R-squared	0.563429	S.D. of dependent var	2707.437
S.E. of regression	1921.046	Sum of squared resid	8.86D+08
Durbin-Watson stat	2.177472	F-statistic	33.26444
Log likelihood	-2248.246		

Champion International Inc.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is DGEVL1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	3754.8803	1819.6506	2.0635172	0.039
DGEVL1(-1)	0.3723772	0.0602855	6.1768909	0.000
DGENEW	0.2154729	0.1658816	1.2989559	0.194
DGENEW(-1)	0.3374266	0.1615130	2.0891609	0.037
DGESCL	139.52969	137.48386	1.0148805	0.310
DGESCL(-1)	-88.126920	136.61778	-0.6450618	0.519
DGEP1	272.44836	84.357593	3.2296839	0.001
DGEP1(-1)	-297.77895	84.456144	-3.5258412	0.000
DJ1VOL	0.0704899	0.0596747	1.1812370	0.238
DJIVOL(-1)	0.0654673	0.0569700	1.1491547	0.250
DGEJAN	-1520.4886	1277.4228	-1.1902783	0.234

R-squared	0.318851	Mean of dependent var	4746.088
Adjusted R-squared	0.290469	S.D. of dependent var	2789.749
S.E. of regression	2349.907	Sum of squared resid	1.33D+09
Durbin-Watson stat	2.242986	F-statistic	11.23456
Log likelihood	-2298.824		

Digital Equipment Corp.

Dependent Variable - Volume

SMPL 1801-2051
251 Observations
LS // Dependent Variable is ARMVL1

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
ARMVL1(-1)	0.1757082	0.0612100	2.8705788	0.004
NEWS1	0.0615106	0.0481217	1.2782313	0.201
NEWS1(-1)	0.0227412	0.0494212	0.4601502	0.645
SCALE1	-28.219680	60.418352	-0.4670713	0.640
SCALE1(-1)	-25.446914	59.927328	-0.4246295	0.671
ARMP1	10.882468	138.72630	0.0784456	0.937
ARMP1(-1)	1.5061284	137.76219	0.0109328	0.991
DJIVOL	0.0681159	0.0164235	4.1474686	0.000
DJIVOL(-1)	-0.0018174	0.0168411	-0.1079146	0.914
ARMJAN	2326.4291	396.21488	5.8716350	0.000

R-squared	0.303486	Mean of dependent var	1070.880
Adjusted R-squared	0.277475	S.D. of dependent var	852.9038
S.E. of regression	724.9806	Sum of squared resid	1.27D+08
Durbin-Watson stat	2.135196	F-statistic	11.66766
Log likelihood	-2004.174		

Armco Inc.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is BURVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-6126.1624	1863.0841	-3.2881836	0.001
BURVOL(-1)	0.3134061	0.0605139	5.6748251	0.000
BURNEW	-0.0914128	0.0773406	-1.1819517	0.237
BURNEW(-1)	-0.0640523	0.0771830	-0.8298752	0.407
BURSCL	56.289270	80.774615	0.7036774	0.482
BURSCL(-1)	-7.5899305	80.336632	-0.0944766	0.925
BURP1	-48.975551	133.02034	-0.3681809	0.713
BURP1(-1)	187.95067	134.51441	1.3972530	0.162
DJIVOL	0.1124449	0.0415490	2.7063216	0.007
DJIVOL(-1)	-0.0633490	0.0412776	-1.5347060	0.125
BURJAN	1048.4529	1145.0124	0.9156694	0.360

R-squared	0.249038	Mean of dependent var	2418.761
Adjusted R-squared	0.217748	S.D. of dependent var	1950.779
S.E. of regression	1725.367	Sum of squared resid	7.14D+08
Durbin-Watson stat	2.006051	F-statistic	7.939014
Log likelihood	-2221.281		

Burroughs Corporation

Dependent Variable - Volume

SMPL 1801-2051
251 Observations
LS // Dependent Variable is DMSVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
DMSVOL(-1)	0.3509196	0.0603884	5.8110452	0.000
DMSNEW	0.1866293	0.3709045	0.5031735	0.615
DMSNEW(-1)	0.0837494	0.3657599	0.2289737	0.819
DMSSCL	14.375593	143.10766	0.1004530	0.920
DMSSCL(-1)	54.713068	141.82448	0.3857801	0.700
DMSP	911.60102	477.13361	1.9105781	0.056
DMSP(-1)	-882.62972	476.41523	-1.8526480	0.064
DJIVOL	0.1192441	0.0529388	2.2524904	0.024
DJIVOL(-1)	0.0546261	0.0523323	1.0438322	0.297
DMSJAN	131.93639	1138.0425	0.1159327	0.908

R-squared	0.243010	Mean of dependent var	3520.327
Adjusted R-squared	0.214741	S.D. of dependent var	2499.020
S.E. of regression	2214.503	Sum of squared resid	1.18D+09
Durbin-Watson stat	2.022982	F-statistic	8.596242
Log likelihood	-2284.450		

Diamond Shamrock Corp.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is FRSVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	193.72717	961.28829	0.2015287	0.840
FRSVOL(-1)	0.2437223	0.0601374	4.0527551	0.000
FRSNEW	0.0465535	0.0731361	0.6365327	0.524
FRSNEW(-1)	0.1430628	0.0730710	1.9578594	0.050
FRSSCL	-63.749394	66.576379	-0.9575377	0.338
FRSSCL(-1)	-108.31791	66.395142	-1.6314132	0.103
FRSP	990.35722	206.08362	4.8056087	0.000
FRSP(-1)	-977.74905	197.94991	-4.9393760	0.000
DJIVOL	0.0545845	0.0229608	2.3772889	0.017
DJIVOL(-1)	-0.0144576	0.0227870	-0,6344682	0.526
FRSJAN	-262.74093	527.72300	-0.4978766	0.619

R-squared	0.191254	Mean of dependent var	1017.849
Adjusted R-squared	0.157556	S.D. of dependent var	1030.033
S.E. of regression	945.4136	Sum of squared resid	2.15D+08
Durbin-Watson stat	2.040915	F-statistic	5.675555
Log likelihood	-2070.287		

Firestone Inc.

Dependent Variable - Volume

SMPL 1801-2051
251 Observations
LS // Dependent Variable is INPVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-3506.4934	1663.9197	-2.1073694	0.035
INPVOL(-1)	0.2143554	0.0616681	3.4759517	0.001
OMNPNEW	0.3121638	0.1665224	1.8746057	0.061
INPNEW(-1)	0.3389193	0.1695582	1.9988379	0.046
INPSCL	-350.25876	136.70287	-2.5621901	0.010
INPSCL(-1)	-330.12258	139.59939	-2.3647853	0.018
INPP	236.71032	112.40477	2.1058744	0.035
INPP(-1)	-163.52056	110.38535	-1.4813610	0.139
DJIVOL	0.1294506	0.0362581	3.5702497	0.000
DJIVOL(-1)	0.0340377	0.0368860	0.9227803	0.356
INPJAN	-1442.8597	732.52042	-1.9697190	0.049

R-squared	0.265967	Mean of dependent var	2263.853
Adjusted R-squared	0.235382	S.D. of dependent var	1710.464
S.E. of regression	1495.671	Sum of squared resid	5.37D+08
Durbin-Watson stat	2.076392	F-statistic	8.696076
Log likelihood	-2185.422		

International Paper Inc.

SMPL 1801-2051
251 Observations
LS // Dependent Variable is MMVOL

VARIABLE	COEFFICIENT	STD.ERROR	T-STAT.	2-TAIL SIG.
C	-1736.4375	533.41194	-3.2553406	0.001
MMVOL(-1)	0.1645293	0.0673408	2.4432377	0.015
MMNEW	0.0937736	0.0835319	1.1226081	0.262
MMNEW(-1)	-0.0402271	0.0791333	-0.5083462	0.611
MMSCL	-43.232546	36.099574	-1.1975916	0.231
MMSCL(-1)	86.441259	35.924893	2.4061661	0.016
MMP1	320.55587	79.160655	4.0494343	0.000
MMP1(-1)	-271.46493	79.681097	-3.4068925	0.001
DJ1VOL	0.0925132	0.0209013	4.4261926	0.000
DJIVOL(-1)	-0.0032731	0.0213492	-0.1533126	0.878
MMJAN	-654.94579	444.57749	-1.4731870	0.141

R-squared	0.320825	Mean of dependent var	1163.458
Adjusted R-squared	0.292526	S.D. of dependent var	1007.635
S.E. of regression	847.5365	Sum of squared resid	1.72D+08
Durbin-Watson stat	2.035467	F-statistic	11.33700
Log likelihood	-2042.855		

Martin Marietta Corp.

APPENDIX TO CHAPTER ELEVEN

DESCRIPTORS AND INDUSTRY GROUPS

TABLE 1

DESCRIPTORS AND INDUSTRY GROUPS

A. Descriptors of Market Variability

1.	Historical Beta, the Regression Coefficient in a Least Squares Regression of Return Relatives on Return Relatives for the S&P 500	HBET
2.	Historical Standard Deviation of Residual Risk	HSIG
3.	Historical Beta Squared	BET2
4.	Historical Sigma Squared	SGSQ
5.	Square Root of (Historical Beta Times Historical Sigma)	BTSG
6.	Bayesian Adjustment for Measurement Error in HBET	BADJ
7.	Share Turnover Rate, Last Quarter	STOQ
8.	Share Turnover Rate, Last 12 Months	STOA
9.	Share Turnover Rate, Last Five Calendar Years	STO5
10.	Trading Volume/Standard Deviation of Return in the Previous Year (Natural Logarithm)	VLVR
11.	Current Price (Natural Logarithm)	LPRI
12.	Average Absolute Monthly Range of Price, Last 12 Months (Natural Logarithms)	ABRA
13.	Average Absolute Monthly Range of Price, Last 5 Years (Natural Logarithms)	ARB5
14.	Cumulative Range, Last 12 Months (Natural Logarithm)	CMRA

B. Descriptors of Earnings Variability

15.	Variability (Coefficient of Variation) of Annual Earnings per Share in Last 5 Years	VERN
16.	Typical Proportion of Earnings that are Extraordinary Items	EXTE
17.	Variability (Coefficient of Variation) of Cash Flow	VFLO
18.	Accounting Beta, Equal to Standard Deviation of Earnings' Changes Explained by Regression on U.S. Corporate Earnings' Changes, Divided by Absolute Mean Earnings	ABET
19.	"Beaver" Beta, Regression Coefficient for Normalized Earnings/Price Ratio of the Firm on Normalized Earnings/Price Ratio of the Economy	BBET
20.	A Measure of the Absence of Diversification Across Industries	CONC
21.	Reported Foreign Operating Income as a Percent of Total Operating Income	FRGN

Descriptors of Unsuccess and Low Valuation

22. Growth in Earnings per Share: Trend Rate in Earnings Divided by Average Earnings for Last Five Years. Defined Only for Firms with Capitalization > 20,000,000 at the Beginning of the Five-year Period	EGRO
23. Delta Earnings: A Measure of Proportional Changes in Adjusted Earnings per Share in the Last Two Fiscal Years	DELE
24. "Relative Strength": Logarithmic Rate of Return Over Last Year	RSTR
25. Indicator of Very Low Current Earnings	DMNE
26. Ratio of Book Value of Equity per Share to Stock Price	BTOP
27. Applicable Federal Tax Rate, Last 5 Years	ATAX
28. Average Proportional Cut in Dividends, Last 5 Fiscal Years	CUTD
29. Return on Equity, Last 5 Years	ROEQ

D. Descriptors of Immaturity and Smallness

30. Logarithm of Total Assets	ASSI
31. Capitalization: Logarithm (Natural) of the Market Value of Common Equity	CAPT
32. Capitalization: Market Value of Common Equity	OVAR
33. A Measure of Market Share	MKTS
34. Net Plant to Gross Plant	NPGP
35. Ratio of Gross Plant to Common Equity	PTEQ
36. Ratio of Estimated Net Plant in Current Dollars to Common Equity	RPTE
37. Measure of Trading Recency, Equal to Reciprocal of Number of Prior Years of Available Monthly Prices	TREC
38. Indicator of Availability of Earnings Growth Information, from a Substantial Base 5 Year Previously	DMS5

E. Descriptors of Growth Orientation

39. A Measure of Normal Payout in the Last Five Years	PAYO
40. Dividend Yield	YILD
41. Dividend Yield, Normal Value for Last Five Years	YLD5
42. Indicator for Dividend Yield Less Than 1/2 Percent	DMYL
43. Asset Growth Rate, Equal to Trend in Total Assets Divided by Average Value, Last Five Years	AGRO
44. Variability of Capital Structure, Last Five Years	VCAP
45. Earnings/Price Ratio	ETOP
46. Normalized Earnings/Price Ratio	ENTP
47. Typical Earnings/Price Ratio, Last Five Years	ETP5

F. Descriptors of Financial Risk

48.	Book Leverage: Book Value {Long-term Debt + Equity}/Book Value {Common Equity}	BLEV
49.	Market Leverage: (Book Value {Long-term Debt + Preferred Equity} + Market Value {Common Equity})/ Market Value {Common Equity}	MLEV
50.	Total Debt to Asscts	DTOA
51.	Estimated Probability of Noncoverage of Fixed Charges, Using a Trended Value for Current Operating Income	PNCV

Source: Rosenburg and Marathe, op. cit., pp. 100-101.

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