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The Impact of Sarbanes-Oxley on Corporate Reporting of Working Capital

Jason Lin and Steve Jones

Abstract

The Sarbanes-Oxley Act was passed in July 2002 in response to a few high profile of accounting scandals in publicly-traded companies. Among other provisions created to prevent such scandals is Section 404, which requires the executives of publicly-traded companies to formally state their responsibility for the company's system of internal controls and assess the effectiveness of those internal controls as of the end of the fiscal year. Internal controls, though perhaps costly, should theoretically improve management's ability to monitor business processes and make better decisions. It is this latter benefit that may be the hardest to recognize, and the one that this study hopes to identify. This study indicates that Sarbanes-Oxley may have led to progress in the area of working capital management. However, the results could have been influenced by other factors implicit in the business environment. As more time passes, a more definitive trend should emerge. To fully understand the impact of Sarbanes-Oxley, further research will be needed.

Introduction

I. 1. The Sarbanes-Oxley Act (SOX)

The Sarbanes-Oxley Act was passed in July 2002 in response to a few high profile of accounting scandals in publicly-traded companies. Among other provisions created to prevent such scandals is Section 404, which requires the executives of publicly-traded companies to formally state their responsibility for the company's system of internal controls and assess the effectiveness of those internal controls as of the end of the fiscal year. It also requires auditors to report on this assessment, thereby forcing management to implement an effective internal control system. Internal controls certainly existed prior to this time but were used as a business saw fit to operate efficiently and effectively. Under 404, management had to implement a complete system of internal control and file an internal control report that explained management's responsibility for controls and its assessment of the company's internal control structure ("Summary of Sarbanes-Oxley Act of 2002").

The costs of Section 404 have been well documented. First, many companies have had to overhaul their system of controls in order to comply with the rules. This required significant amounts of time and money, particularly for smaller companies whose control systems were less advanced. Second, all companies had to document their internal control systems and verify that they were operating as planned. Again, this required significant expenditures of both time and money by publicly-traded corporations. Recent data indicates that the average first-year cost of implementing Sarbanes-Oxley in public companies was \$4.3 million and that the average company spent over 26,000 hours implementing internal controls related to 404 ("404: Worth the Cost?").

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The benefits of Section 404 have not been as quantifiable. The main goal seems to be that it will increase the level of control management has over its operations and thereby improve the accuracy of financial reporting, which will enhance investors' ability to make informed decisions. However, there is also the potential that 404 can help companies improve their operational efficiency. Internal controls, though perhaps costly, should theoretically improve management's ability to monitor business processes and make better decisions. It is this latter benefit that may be the hardest to recognize, and the one that this study hopes to identify.

The Committee of Sponsoring Organizations (COSO) has created a framework that identifies five key components of an effective internal control system: control environment, risk assessment, control activities, information and communication, and monitoring. The control environment is management's attitude, which in turns influences the ethics and behavior of all company employees. Risk assessment is the identification of risks that threaten the company's ability to achieve its goals. Control activities are procedures put into place in order to mitigate those risks and may include authorizations, independent checks, security of assets, and segregation of duties. The information and communication component involves capturing and communicating information to enable employees to carry out their responsibilities. Finally, the monitoring component emphasizes that the internal control system must be monitored to ensure that it is working appropriately and to make any necessary adjustments ("COSO").

I. 2. Working Capital Management

One area of operational efficiency that one might expect to improve after instituting a better system of internal controls is working capital management. Working capital can be looked at as a measure of a company's ability to meet its short-term obligations as well its underlying operational efficiency. Most companies have three essential parts of net working capital: accounts receivable, inventory, and accounts payable. These three items demonstrate how well a company is able to manage its everyday operations and how quickly it is able to turn its earnings into cash. A company that minimizes inventories, entices customers to pay their bills faster, and delays its payments to vendors can minimize the amount of money that is tied up in working capital and also take advantage of the time value of money. It can therefore decrease the amount of borrowing it needs to fund its operations.

By instituting a better internal control system, one might expect that companies would improve their working capital management. Each component of the COSO framework could play some role in this improvement. First, as management sets the tone and encourages employees to follow policies, employees will be more careful to follow the company's procedures. Second, management's identification of risks will help it formulate control procedures to mitigate those risks. Third, and perhaps most importantly, specific procedures will be identified and implemented to ensure that things are done right. These procedures will increase the accuracy of financial reporting but also increase adherence to company guidelines, which should benefit the company. Fourth, by capturing and communicating important information, management can see more of the details, identify problems as they arise, and respond to those problems. Finally, management's monitoring of the control system will increase employees' adherence to policies.

Specifically, this study hopes to identify meaningful improvement in each of the three main accounts that comprise working capital since the enactment of Sarbanes-Oxley. Regarding accounts receivable, one might expect that companies with more effective control systems would be less apt to bend the rules to grant credit to uncreditworthy customers. They might also place greater emphasis on uncollectible accounts and seek ways to entice overdue customers to pay up. Regarding accounts payable, companies would hope to extend credit terms as long as possible and pay at the latest date so as to take greatest advantage of the time value of money. Regarding inventory, an effective internal control system should cause a company to carefully monitor its processes so that it minimizes the inventory that it must carry on hand. For example, inventory purchases would be delayed until the inventory or supplies were actually needed in operations.

It might be anticipated that Section 404 would have different impacts on different companies. Two ways in which this might occur depend on a company's size and its industry. A large company, as previously noted, would be more likely to have already instituted an effective internal control system and would have less improvement to gain from complying with 404. A small company, on the other hand, may not have previously seen the benefits of an internal control system as outweighing the cost and so would not have implemented strong controls. Thus, it would be more likely to show improvements once it is forced to implement the new rules. It seems likely that different industries will be impacted differently as well. The nature of the industry may even dictate to some degree the controls that companies must have in place. Thus, it seems that some industries that previously had weaker control systems could show more significant improvements than industries that may have already had strong systems.

Data and Methodology

In order to analyze the impact of Sarbanes-Oxley on working capital, a sample was selected from four industries: electric, retail, technology, and financial services. Thirty companies were selected from each industry based on their market capitalization. Ten companies were selected from large (greater than \$5 billion), medium (between \$1 and \$5 billion), and small cap (less than \$1 billion). However, only seven medium and one small cap company were selected for the financial services industry due to limitations in information availability. In all cases, data was compared at the end of the companies' fiscal years. In order to create some consistency in the year ends of disparate companies, each company's year end was classified according to its nearest year end. In other words, companies with a fiscal year ending between January 1, 2001 and June 31, 2001 were classified as having 2000 year ends while those ending July 1, 2001 through December 31, 2001 were classified as having a 2001 year end. Since Sarbanes-Oxley was enacted in July 2002, it is assumed that companies began working towards meeting its requirements at that time and that any improvements would begin to materialize in the statements classified in this study as 2002. Data were gathered from <http://www.marketguide.com/>, a website created by Reuters. Unfortunately, there was some difficulty in gathering the data from this site as it provided only the five most recently released financial statements, which caused some companies to have results for years ended 2000-2004 and others to have results for 2001-2005.

Four measurements were calculated to assess working capital management: DSO, DPO, DIO, and DWC. To evaluate management of accounts receivable, Days Sales Outstanding (DSO) was used. It provides a measure of how quickly cash is collected from sales. Typically, well managed receivables would result in lower DSO since there would be fewer outstanding receivables for the amount of sales made. To evaluate accounts payable, Days Payables Outstanding (DPO) was used. It provides a measure of how long a company takes to pay its vendors. Typically, a company would seek to maximize outstanding payables and thereby have a higher DPO although sometimes discounts are offered for early payments which make prompt payment more advantageous. To evaluate inventory, Days Inventory Outstanding (DIO) was used. Ordinarily, well managed inventory will result in carrying less inventory and thereby a lower DIO. Finally, Days Working Capital (DWC) was used as a measure of overall working capital management. It essentially combines the three previous elements into one broad measure of working capital management. A company improving its working capital management would hope to see DWC fall as a result of improvements in the three previous measurements.

Calculations were made as follows:

$$\text{DSO} = \text{A/R} \times 365 / \text{sales}$$

$$\text{DPO} = \text{A/P} \times 365 / \text{sales}$$

$$\text{DIO} = \text{Inventory} \times 365 / \text{sales}$$

$$\text{DWC} = (\text{A/R} - \text{A/P} + \text{Inventory}) \times 365 / \text{sales}$$

The four ratios were computed for each of the 108 companies selected. These were then analyzed to assess trends by industry, by size, and aggregately. Two methods of discerning improvement were used. First, the number of companies showing improvement over the one-, two-, three-, and four-year periods following the passage of Sarbanes-Oxley was computed. Second, the average accounts receivables, payables, inventory, and sales were computed and the four ratios computed based on the averages.

Empirical Results

It is difficult to discern very significant trends from the empirical results of the study. In computing the ratios for each company individually, the ratios often fluctuate widely for each company, regardless of size or industry. This could be due to the fact that the measurements used (DSO, DPO, DIO, and DWC) are not good indicators of working capital management. Because they are based on year-end amounts which may fluctuate greatly from the normal levels, these measurements may introduce additional ambiguity in the recognition of trends. Similarly, the use of these ratios may not reflect improvements in a company's management of its working capital. For example, a company may increase its use of credit sales or decrease its use of credit purchases, which may create false impressions in this study. In compiling the data aggregately, by industry, and by size, some small trends of improvement emerge.

When the data are aggregated, the study seems to indicate that working capital management has improved since the passage of Sarbanes-Oxley. Table 1 reveals that when looking at the one-, two-, three-, and four-year horizons following 2001, over half of the companies showed improvements in DWC in each horizon. This indicates that improvements have occurred since the signing of the Act and that those improvements have not disappeared with the passage of time. However, the percentage of companies showing DWC decreases did

not increase each year, indicating that there may not be continuous improvement occurring because of the Act. By looking at average DWC as in Table 2, however, it appears that there is a steady decline in DWC, indicating a steady improvement in working capital management over the time period studied. The aggregate improvements were fueled by high percentages of companies showing increases in DPO and decreases in DIO. Less than half of companies showed DSO decreases in each time horizon, which hurt the overall improvement demonstrated.

When the data are analyzed by industry, some interesting results develop. All industries showed signs of improvement, although not all of the signals were the same. Table 3 indicates that over half of firms in each industry improved over their 2001 ratios during nearly every time horizon. Table 4 indicates that DWC averages for each industry also showed steady improvement nearly every year. Improvements in each industry were fueled by improvements in DPO and DIO while DSO generally weakened the overall improvement in each industry.

In the electric industry, DWC improved in each of the four time horizons, with 71% of firms showing improvements by 2005. Likewise, the average DWC declined each year. This seems to indicate that the Act had a significant impact on the electric industry and has improved working capital management in this industry.

The effect on other industries was less clear. In the retail industry, only 43% and 50% of companies showed improvements in DWC in the first two years following the Act. However, this percentage increased to 53% and 69% by 2004 and 2005, respectively. The average DWC for the industry actually increased in the first year after the Act, but declined significantly in the second year and slightly in the third year. This indicates that improvement did occur but did not occur immediately or steadily.

In the technology industry, over half of the companies showed DWC improvements in the first three time horizons, reaching 63% in the three-year horizon. However, only 43% of companies showed improvements over the four-year horizon, indicating that improvements may not have been sustained. The average DWC, however, steadily declines, indicating that improvement may have steadily occurred.

In the financial services firm, the results again appear strong. Over half of companies showed improvements in DWC under each of the four time horizons, although the percentage of improving companies declined over the longer time horizons. In analyzing average DWC, it drops sharply in the first year, drops again in the second year, but then increases slightly in the third year. This seems to indicate that an improvement in working capital management did occur but continuous improvement may not be occurring.

When the data are accumulated by firm size, the results are somewhat surprising. Firms of all sizes still showed signs of improvement, indicating that progress occurred regardless of firm size. Table 5 shows that percentage of small firms with DWC improvements was at least as great as that of large firms. Table 6, however, shows that average DWC actually increased for smaller firms and to some extent for medium-sized firms, creating some ambiguity in the results by size. As previously noted, advances in DWC were fueled by DPO and DIO improvements and slowed by DSO increases.

Large firms showed a significant progressive trend. Over half of firms showed improvements under each of the four time horizons. This number did not steadily increase, however, and only 54% of firms showed increases by 2005. Average DWC steadily declined each year, indicating that large firms did show steady improvement since the passage of the Act.

Medium-sized firms also demonstrated improvement, although it was less significant. Less than half of the firms showed progress in the first year following the act. However, in the two-, three-, and four-year horizons, over half of the firms decreased their DWC. Average DWC declined in the first and second years, but then increased sharply in the third year. This creates some ambiguity regarding the overall improvement of these firms.

The results of small firms were also ambiguous. While the percentage of firms showing DWC improvements was over 50% under each time horizon and reached 75% by 2005. However, the average DWC declined only in the first year and was followed by substantial increases in years two and three after the passage of Sarbanes-Oxley. This paints two distinct pictures of small firms' working capital management since 2001.

Further Analysis

The main goal of the study was to determine if Sarbanes-Oxley has led to advancements in working capital management. Based on the empirical results, these advancements do seem to have occurred. It seems that of those studied, more companies improved their working capital management since the passing of the Act than did not. This conclusion is supported by the fact that over half of the firms decreased their DWC in each of the one-, two-, three-, and four-year time horizons and average DWC declined steadily each of the years after the passage of Sarbanes Oxley. It should be noted, however, that only 54% of companies studied had lower DWC in 2005 than they had in 2001. This indicates that the results are still somewhat ambiguous and further studies may be required to fully analyze Sarbanes-Oxley's impact on working capital management.

A secondary goal of the study was to determine if working capital management was affected differently in different industries. Although each industry showed signs of progress, the strongest signs were seen in the electric and financial services industries. (Note: Excluding DIO in financial service industry.) The percentages of firms showing improvements in DWC in these industries were much higher under each time horizon and the average DWC declined significantly and fairly steadily in each. The retail and technology industries were less clearly impacted. In the retail industry, progress in DWC seems to have occurred, but not until 2003. After that time, however, the improvements do seem significant. In the technology industry, only 43% of firms showed a lower DWC in 2005 than they had in 2001. However, average DWC steadily decreased and over half of the firms showed DWC decreases under the three other time horizons. The 2005 data may therefore have been skewed and the overall improvement may still exist in this industry. Overall, it does seem that the financial services and electric industries were more strongly impacted than the retail and technology industries.

The third goal of the study was to determine if working capital management varied due to the size of firms. The original idea was that smaller firms would be more affected by increased internal control requirements and so would show greater improvements. This study does not provide a conclusive answer. Overall, a higher percentage of small companies showed DWC progress than did large companies over the various horizons surveyed. However, the average DWC for small companies actually increased while that of large companies steadily decreased. The results of medium-sized firms were also ambiguous. It cannot be conclusively claimed that smaller firms were affected more strongly than their larger counterparts.

Conclusions

This study indicates that Sarbanes-Oxley may have led to progress in the area of working capital management. However, the results could have been influenced by other factors implicit in the business environment. As more time passes, a more definitive trend should emerge. To fully understand the impact of Sarbanes-Oxley, further research will be needed.

There are several ways in which this study could be expanded upon in future research. First, a closer link between internal controls and working capital management could be theoretically developed. Such research could examine the behavioral influence of increased scrutiny due to new 404 requirements or focus on demonstrating that better internal controls have a direct effect on working capital management. Second, measurements could be refined so as to better capture the impact that internal control changes have had on operations. Such measurements should seek to avoid the complications that arise when using point measurements. Point measurements may increase the variability and introduce error due to unusual transactions or changes near the fiscal year end. Third, more time is required to adequately assess the impact of Sarbanes-Oxley. Many companies have focused purely on complying with the act rather than using its requirements to improve its business processes. Over time, it is more likely that the benefits of the Act will begin to materialize or a trend will become more discernable.

This study has shed some light on an important topic related to Sarbanes-Oxley—how its requirements may provide meaningful financial benefits for companies. Although it is difficult to prove the extent of such benefits, this study has demonstrated that they do exist and has provided a foundation that future studies can build upon to more definitively analyze this topic.

	2001-05*	2001-04	2001-03	2001-02
DSO	37%	46%	42%	44%
DPO	65%	59%	59%	56%
DIO*	57%	56%	59%	55%
DWC	54%	57%	61%	57%
*For firms that included 2005 data				
**Improvement in DIO based on firms with inventory data (51 firms)				

Table 1: The percentage of firms showing improvement from the entire data set

	2004	2003	2002	2001
DSO	110.7	100.8	98.0	105.2
DPO	183.1	167.6	160.6	158.6
DIO*	26.1	26.5	27.9	27.2
DWC	(46.3)	(40.3)	(34.7)	(26.2)
*Inventory averages were based on non-financial (90 firms)				

Table 2: Overall average of the four measurements

		2001-05	2001-04	2001-03	2001-02
Electric	DSO	43%	57%	53%	40%
	DPO	86%	50%	43%	57%
	DIO	50%	60%	57%	53%
	DWC	71%	57%	63%	60%
Retail	DSO	54%	47%	33%	57%
	DPO	62%	53%	50%	40%
	DIO	69%	50%	60%	50%
	DWC	69%	53%	50%	43%
Technology	DSO	24%	47%	40%	33%
	DPO	67%	63%	70%	63%
	DIO	62%	60%	63%	63%
	DWC	43%	63%	57%	53%
Financial Services	DSO	47%	28%	39%	50%
	DPO	67%	78%	83%	72%
	DIO	N/A	N/A	N/A	N/A
	DWC	60%	56%	83%	83%

Table 3: The percentage of firms showing an improvement by industry

		2004	2003	2002	2001
Electric	DSO	62.9	61.1	77.9	85.5
	DPO	58.8	56.8	72.4	77.8
	DIO	21.6	23.5	27.6	29.2
	DWC	25.7	27.9	33.1	36.9
Retail	DSO	7.7	7.6	9.1	8.5
	DPO	28.6	27.4	27.6	27.6
	DIO	38.4	37.7	38.9	38.7
	DWC	17.5	17.8	20.3	19.7
Technology	DSO	61.7	67.6	66.6	64.1
	DPO	41.0	39.4	37.2	33.8
	DIO	20.6	20.7	21.2	23.0
	DWC	41.4	48.8	50.6	53.4
Financial Services	DSO	685.2	627.3	533.6	450.7
	DPO	1,282.2	1,227.0	1,075.7	810.9
	DIO	N/A	N/A	N/A	N/A
	DWC	(596.9)	(599.6)	(542.1)	(360.2)

Table 4: Industry averages of the four measurements

		2001-05	2001-04	2001-03	2001-02
Large	DSO	39%	48%	48%	53%
	DPO	64%	63%	60%	58%
	DIO	55%	45%	43%	35%
	DWC	54%	63%	55%	63%
Medium	DSO	43%	43%	38%	41%
	DPO	74%	57%	62%	59%
	DIO	63%	50%	57%	47%
	DWC	57%	54%	65%	49%
Small	DSO	33%	48%	39%	39%
	DPO	75%	58%	55%	52%
	DIO	67%	60%	67%	73%
	DWC	75%	55%	65%	61%

Table 5: The percentage of firms showing improvement by size

		2004	2003	2002	2001
Large	DSO	120.2	109.8	106.6	115.0
	DPO	204.7	187.6	179.8	178.8
	DIO	34.1	34.9	37.1	36.4
	DWC	(50.4)	(42.8)	(36.2)	(27.4)
Medium	DSO	52.1	45.3	48.6	52.9
	DPO	51.5	49.8	50.5	48.1
	DIO	29.6	28.8	29.2	26.7
	DWC	30.2	24.2	27.3	31.6
Small	DSO	60.3	63.7	55.1	48.7
	DPO	59.3	62.6	59.9	52.2
	DIO	28.9	26.4	25.5	26.2
	DWC	29.9	27.4	20.7	22.6

Table 6: Average of the four measurements by firm size

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Excel Charts: Why? What kind? How?

Robert J. Balik and Jamshid Mehran

Introduction

According to Karen A. Schriver (1997, page xxiii), an expert in document design, “Poor documents are so commonplace that deciphering bad writing and bad visual design have become part of the coping skills needed to navigate in the so-called information age.” Additionally, Stephen Few (2004, page 4) indicates that “the reason for this sad state of affairs is simple – very few of us have ever been trained to design tables and graphs effectively.”

A common form of visual design used in finance is a chart or graph. Excel’s chart feature is used to create virtually all charts. Most finance teachers and their students know how to use Excel to create basic charts, but many do not know how to decide when to create a chart, how to decide what kind of chart to create, and how to decide what features the chart should have.

Most Excel books emphasize only chart procedures. One example of this type of book is *Excel 2003 Bible* by John Walkenbach (2003). This book contains 40 chapters, two are devoted to charts (Chapters 16 and 17), and there is virtually no discussion of chart design. A book about Excel and finance is *Principles of Finance with Excel* by Simon Benninga (2006). There is one chapter devoted to charts. The only design issue mentioned, but not explained, is the suggestion to eliminate chart gridlines.

To illustrate better Excel chart design consider the following example from the book *Excel Charts* by Walkenbach (2003, pages 351 and 352). Table 1 contains four annual revenue observations that Walkenbach used to create Figures 1 and 2.

Year	Revenue
1999	\$2,125,300
2000	\$1,545,500
2001	\$2,253,400
2002	\$2,751,200

Table 1: Annual Revenue Data

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Figure 1 shows the chart Walkenbach creates using the default procedures in Excel 2003.

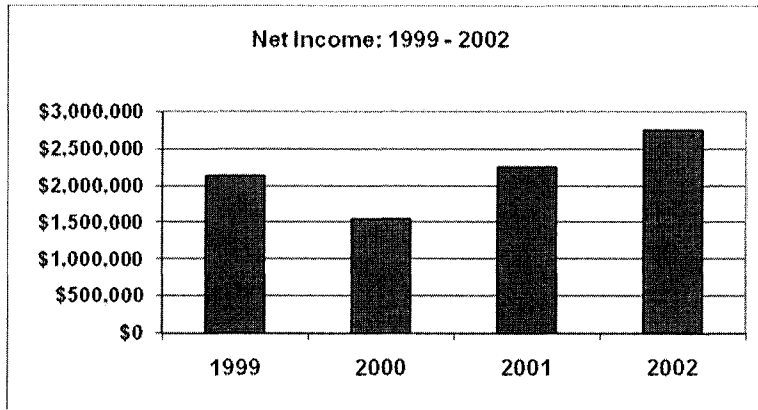


Figure 1: Default Excel 2003 Chart

This chart has all of the default features except the legend. It is deleted because there is only one Y-axis variable.

Using suggested guidelines, Walkenbach creates the revised column chart in Figure 2.

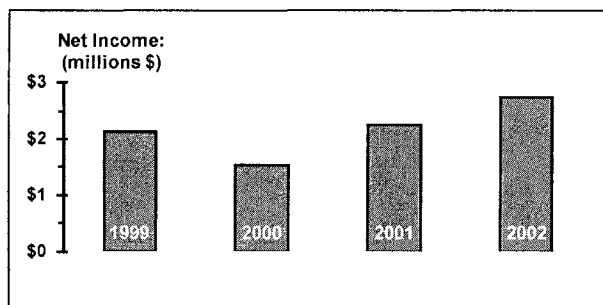


Figure 2: Revised column chart.

There are significant differences between these two charts, Figure 1 and Figure 2. What guidelines did Walkenbach use to create the desired chart? Notice, other than the gray columns the “revised” chart has much less “ink” (background color and values on the axes).

Purpose

The primary purpose is to provide, explain, and illustrate chart guidelines (best practices). We provide guidelines that explain:

- How to decide when a chart is needed.
- How to determine the type of chart to create.
- The appropriate chart features.

There is also a discussion of specific Excel 2003 procedures or commands to use to create the charts discussed. The specific Excel chart procedures or commands mentioned are those that reduce the time needed to create a chart. Finally, we provide an example of Excel 2007 chart features.

Chart Guidelines

The chart guidelines discussed here are ideas taken from Aitken (2006), Few (2004), Jelen (2007), Tufte (2001), and Walkenbach (2003). The chart guidelines are in outline format.

Charts in business communication should:

- Communicate important information effectively.
- Not entertain.
- Not indulge in self expression.
- Not make numbers interesting through flash and dazzle that you would otherwise deem boring.

Use a chart when:

- The message is contained in the shape of the values.
- The document is used to reveal relationships among multiple values.

Use a table instead of a chart when:

- The purpose is to look up individual values.
- The purpose is to compare specific values.
- Precise values are required.
- The quantitative information to communicate involves more than one unit of measure.

General design guidelines:

- Reduce the non-data ink. Examples of non-data ink are chart gridlines or chart borders. Reduce means to eliminate or make less visible (for instance, light gray rather than black).
- Enhance the data ink. An example of data ink is the chart line or chart columns.

General chart guidelines:

- Avoid 3D charts. They require non-data ink and in most cases are difficult to read.
- Avoid pie charts. It is usually difficult to interpret angles.
- Generally include the value zero in your quantitative scale, and alert your readers when you do not include zero.
- Include no more than eight data sets in a single graph.

Graphs with points (such as an Excel XY scatter chart):

- When points are obscured by lines (usually gridlines), make the points more prominent or mute the chart gridlines.
- When points cannot be distinguished
 - Enlarge the points.

Balik and Mehran - Excel Charts: Why? What kind? How?

- Select objects that are more visually distinct.
- Remove fill color.
- If possible, enlarge the size of the graph.

Bar charts:

- Use horizontal bars when the graph displays a ranking relationship in descending order.
- Use horizontal bars when the categorical subdivisions that label the bars do not fit side by side.
- Do not overlap bars.
- Set the width of white space separating bars that are labeled along the axis equal to the width of the bars, plus or minus 50 percent.
- Filling bars:
 - Avoid fill patterns.
 - Use fill colors that are clearly distinct.
- Use borders on the bars:
 - When the fill colors are not distinct.
 - To highlight one or more bars.

Tick marks:

- Mute relative to data objects.
- Place outside the data range.
- Use with quantitative scales on the X-axis.
- Do not use with categorical scales on the X-axis.
- Avoid using them to mark values at odd intervals.
- Have one tick mark for each value.
- Use tick marks and values/categories judiciously. That is, there should not be too many or too few tick marks/values (this is illustrated below).

Chart grid lines:

- Use to enhance specific values.
- Use to enhance comparison of values.
- Should be thin and light color (muted).

Chart Legend:

- Use only when more than one Y-axis series.
- Remove legend border.
- Place legend inside plot area.
- Consider deleting Excel's legend and using text boxes for text placement.

Value or Y-axis:

- Scale values (do not have numerous zeros, express in millions rather than have 1,000,000 and so forth on the chart).
- Use even increments between values.

- Use values that are rounded. For instance, 10,000 increments, starting at zero, not 8,000 increments.

Chart Titles and Notes: Place as close as possible to the data values.

The default Excel 2007 chart incorporates some of these guidelines. Examples are:

- The plot area background is white. It is gray when using Excel 2003.
- The chart and plot area border colors are muted. They are no longer black.
- The column borders (for a column chart) no longer have a black border. The border color is the same color as the rest of the column.

Chart Examples

The next step is to illustrate some of these guidelines.

Figure 3 shows a pie chart to visually present market share data. Because the angles in the pie chart are difficult to interpret, the market share data is difficult to interpret. When looking at the Excel pie chart, Figure 3, can you easily compare the market share of one company with another?

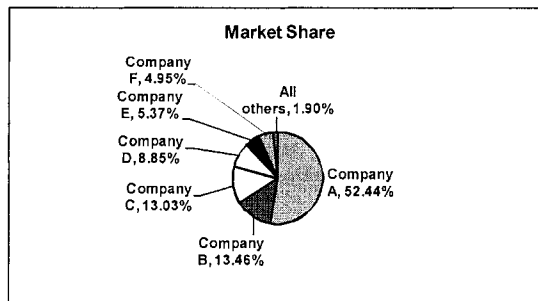


Figure 3: Pie chart.

Figure 4 shows a more effective way to display this information. It is an Excel bar chart (horizontal column chart). Notice the orientation and alignment of the words and numbers. Also, notice how easy it is to determine the ranking of any company.

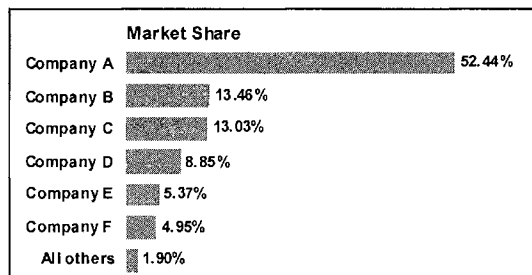


Figure 4, Pie chart data used for bar chart.

Figure 5 is an Excel column chart with sales orders on the Y-axis and salesperson on the category or X-axis.

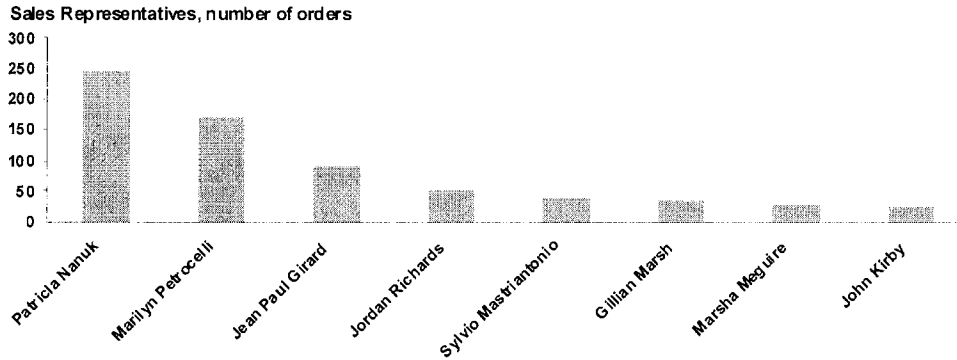


Figure 5: Column chart with Category values (names) on X-axis at an angle.

Ideally, the names on the X-axis or Category axis should be horizontal. They can be made horizontal by decreasing their font size or increasing the horizontal chart size. Doing either is not consistent with chart best practices. A better approach is to create a horizontal bar chart. Figure 6 is an illustration.

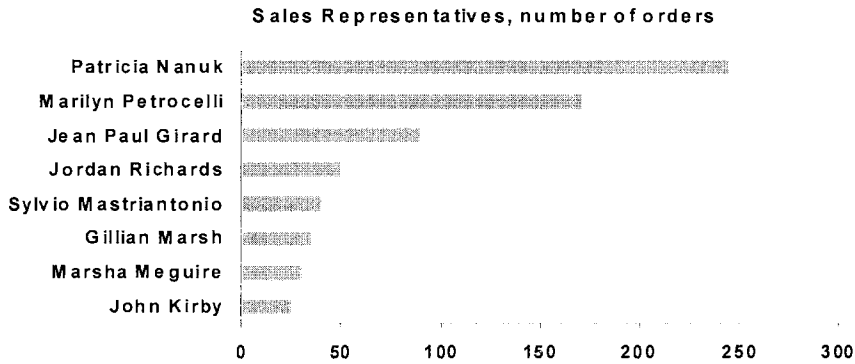


Figure 6: Bar chart (Horizontal column chart) with text and numbers horizontal.

Notice, this horizontal bar chart is much easier to interpret.

Figure 7 shows a line chart that illustrates what happens to a \$10,000 investment in the Standard and Poor 500 index and Medtronic (MDT) stock with and without dividends from the end of 1989-2006.

The legend is placed in Excel’s default position, to the right of the plot area. This is the default position for both Excel 2003 and Excel 2007. Chart best practices would suggest that it should be in the plot area. In this case, the most likely position would be in the upper left corner of the plot area. Why? Because this area is “empty” and the legend is closer to the chart data.

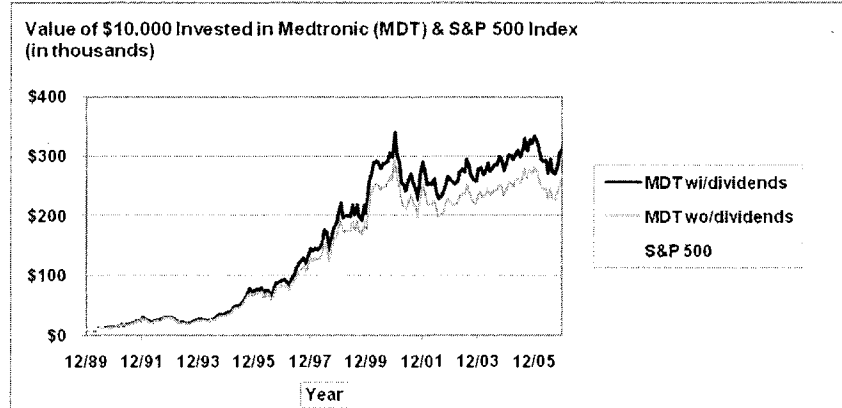


Figure 7: Value of \$10,000 investment (legend in Excel default position).

Another alternative is to delete Excel’s legend and create “legends.” Figure 8 shows the legend moved to the chart’s plot area.

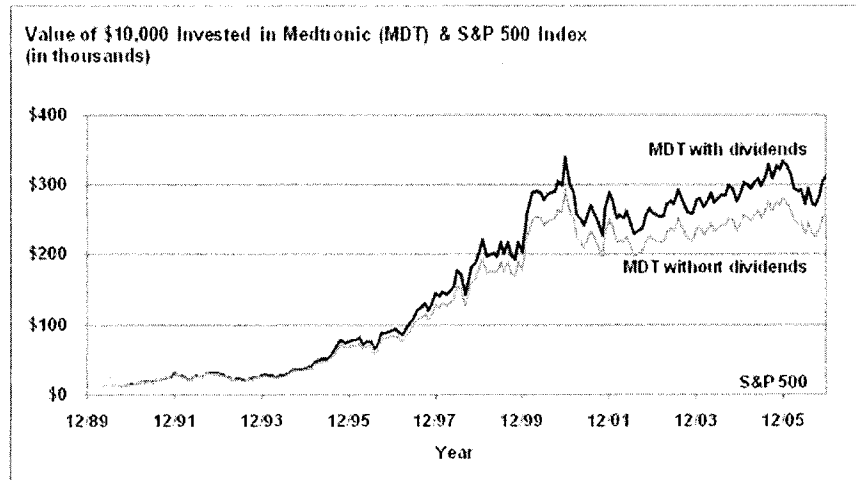


Figure 8: Value of \$10,000 investment (with legend moved to plot area).

Figure 9 illustrates the three types of tick marks, outside the axis, inside the axis and across the axis.

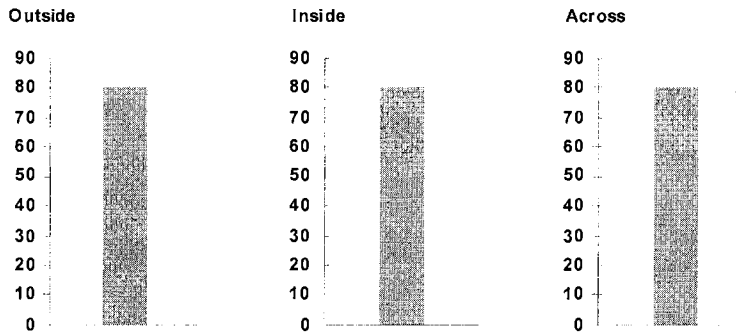


Figure 9: Three types of Y axis tick marks.

Few (2004, page 201) prefers placing tick marks on the outside. This leaves the Excel plot area free of all but the values. This provides a “clear backdrop” to view the values/data.

Figure 10 is a chart that illustrates the number of y or value axis tick marks and labels/values. There is no correct number. It is a balance between too many, which would clutter the chart, and too few, which makes it difficult to interpret the chart. The frequency of values and tick marks on the Y-axis applies also to the X-axis when it has values.

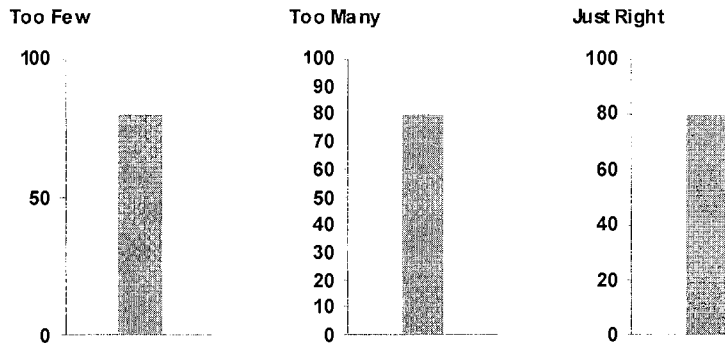


Figure 10: Three illustrations of frequency of Y axis tick marks and values.

Figure 11 is a 3-dimensional column chart. Does this chart need a third dimension? Does the third dimension enhance the chart? Is it consistent with chart best practices? No.

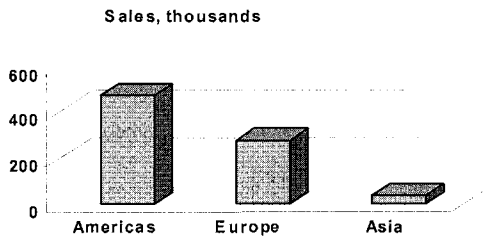


Figure 11: Two variables on a 3-dimension column chart.

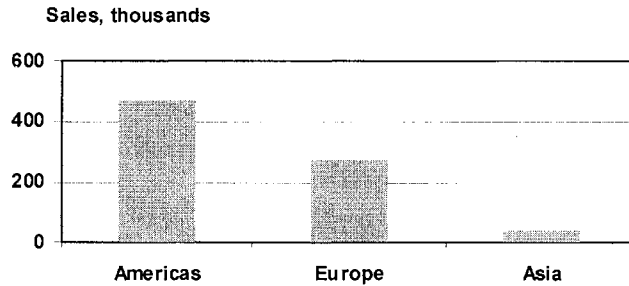


Figure 12: Two variables on a 2-dimension column chart.

Figure 12 shows the same data on a two-dimensional column chart. This chart is much easier to interpret.

How

When Excel 2003 is used to create a chart, there are some procedures that are important but are not stressed (or even mentioned) in most Excel books. We discuss two important procedures and five related tips.

Procedure 1: To create a chart using Excel 2003 use the Chart Wizard. The Chart Wizard has four steps. The most important step (or dialog box) is Step 2 of 4, Chart Source Data. This dialog box has two tabs. The most important is the Series tab (see Figure 13).

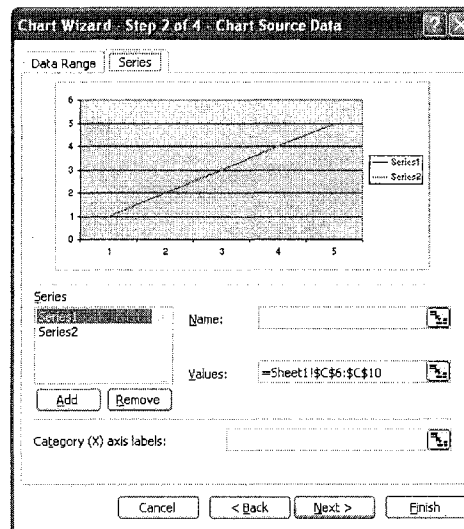


Figure 13: Chart Source Data, Series Tab.

This tab is not the default display. It shows what ranges or series (sets of data) are being used and on which axis (Series section displays Y-axis values). If a data series is assigned incorrectly, the chart is incorrect. In this example two data series are selected but Excel places both in the Series section (that is, both series are being used as Y-axis values), and no series is in the Category or X-axis text box. If no X-axis series is selected Excel assigns integer values starting with one.

Procedure 2: Once an Excel chart is created there are three ways to edit it:

- Select the chart and use the menu choice chart.
- Move the mouse pointer over the desired area of the chart, right click, and choose from the pop up menu.
- Use the chart toolbar.

Using the mouse pointer is usually the quickest way.

Once the basic chart is created it must be edited to be consistent with the above mentioned

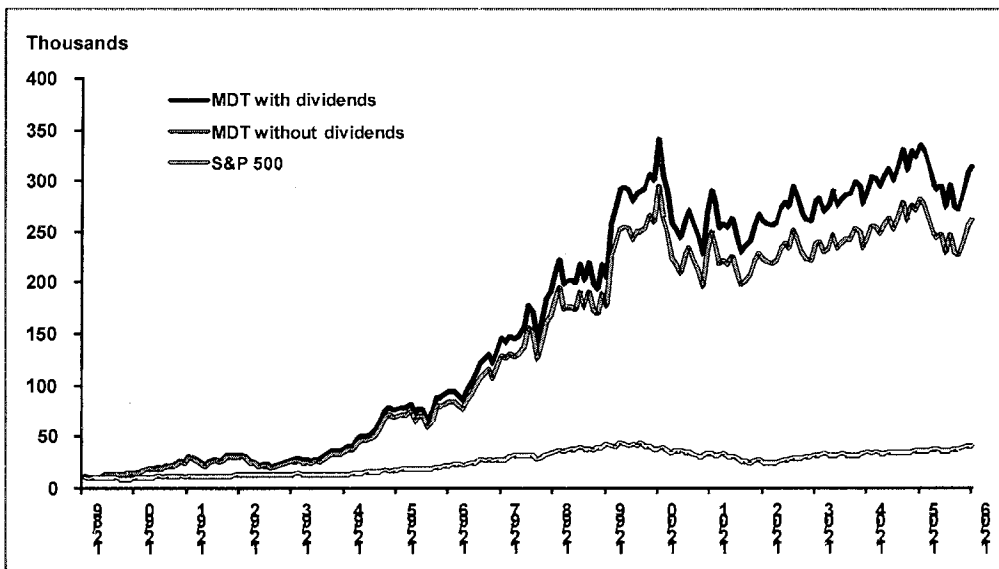


Figure 14: Line chart with Category X axis values/dates with vertical orientation.

guidelines. Here are five chart editing “tips.”

Tip 1: You create a chart and the values or dates on the category or X-axis are not “horizontal,” they are vertical or appear at an angle (see Figure 14).

If the chart is made significantly wider, the X-axis dates become horizontal. Sometimes this is not an option. Figure 14 is on a chart sheet that fills the screen. To make the values or dates on the category axis horizontal do the following:

1. Move the mouse pointer over the horizontal axis until Category Axis appears.
2. Right click. A pop up menu appears.
3. Choose Format Axis. The Format Axis dialog box appears.

4. Go to the alignment tab and the Orientation section.
5. In the orientation section there is a text arrow implies that the text is horizontal. Move the red rectangle away from the horizontal and then move it back to horizontal.
6. To return to the chart choose OK.

Tip 2: You create a chart and the legend shows Series1, Series2 and so forth (instead of the more descriptive text legend shown in Figure 14) and you want something more descriptive. To change the text in the legend:

1. Right click next to, but not over, the legend.
2. From the pop up menu select Source Data.
3. On the Source Data dialog box go to the series tab (see Figure 13).
4. Select a series in the Series section and then enter an appropriate name in the Name box.
5. When done, select OK.

Tip 3: You have just completed the fourth step of the chart wizard and placed an embedded chart on a worksheet. One procedure to format all of the text and numbers on the chart at once is to:

1. Right click in the chart area. From the pop up menu choose Format Chart Area. The Format Chart Area dialog box appears.
2. Select the Font tab.
3. On the font tab choose the Font, Font style, and Font size.
4. Also de-select Auto scale.
5. To exit select OK.

Note, this procedure does all of the numbers and text on the chart. Best Practices would suggest that the chart title should have a larger font size (relative to other text and numbers). This is quickly done by selecting the chart title and then using the formatting toolbar to increase its font size.

What is Auto scale and why deselect Auto scale? When Auto scale is selected the font size is selected by Excel and changes whenever the chart size is changed/resized. When Auto scale is de-selected the chart size does not change when the chart size is changed. Note, in Excel 2007 the size of the font does not change when the chart size is changed.

Tip 4: You have just completed a chart and placed it on a chart sheet (rather than embedded on a worksheet). The chart does not cover the screen. There is a significant gray area on the right and left side of the chart. To get the chart to fill the screen choose, from the menu, View and Size with Window. Note, Excel 2007 does not have this feature.

Tip 5: You create a time series chart with time on the horizontal axis (also called category axis or X-axis) and two variables, GDP and interest rates, on the vertical axis (also called value axis or Y-axis). This chart needs two Y-axes, one for the GDP values and one for the interest rates. The steps to add a second axis are:

1. Right click on line (in the plot area) that forms the series for which you want to create a second Y-axis.
2. From the pop up menu choose Format Data Series.

3. When the Format Data Series dialog box appears go to the Axis tab.
4. On the Axis tab select Secondary Axis.
5. To exit the dialog box select OK.

Chart created using Excel 2007

Figure 15 is an un-edited (default) XY scatter chart created using Excel 2003. A trend line with the best fit regression line and r-squared has been added.

The gray background in the plot area and the black borders easily identifies this as a chart created using Excel 2003.

Figure 16 shows the same un-edited (default) chart created using Excel 2007.

The significant differences are:

1. There is no gray background in the plot area.
2. The horizontal chart gridlines, X-axis, and Y-axis are light gray, not black.
3. The legend does not have a border.

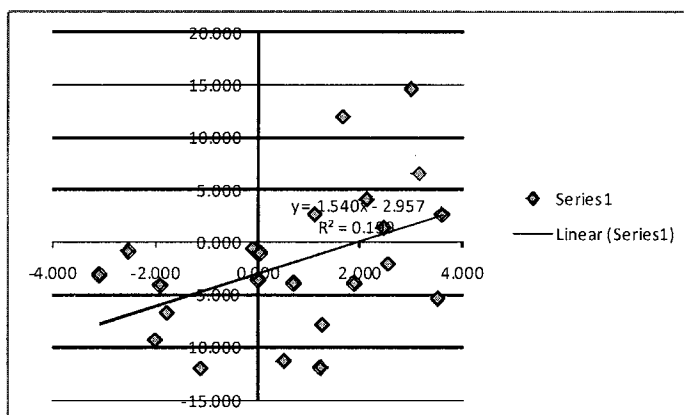


Figure 16: Excel 2007 default XY scatter chart.

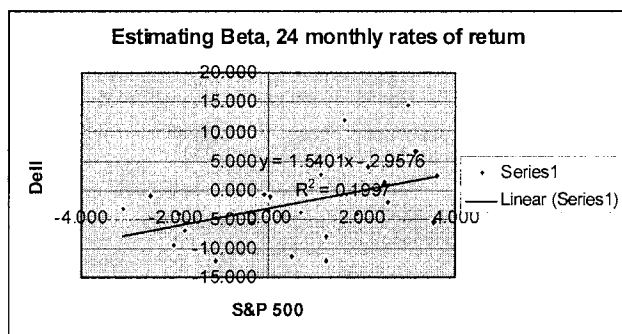


Figure 15: Excel 2003 default XY scatter chart.

These changes are all consistent with the suggested best practices for chart design.

Summary

For finance teachers and students knowing how to use Excel to create charts is not enough. It is important that they also know some of the best practices to use to design charts.

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The Academy of Finance: Past, Present and Future, 1987-2007¹

Don T. Johnson* and James Philpot**

Abstract

It is important for members of an organization to, from time to time, look back and review what progress has been made and to look forward to see what opportunities the future holds. In this study, we analyze the history of the Academy of Finance. We categorized all the papers presented at the Academy's 21 annual meetings, identified the authors and employing institutions, measured the geographic distributions of participants, calculated the retention rates for participants, and addressed a variety of other issues. We highlight the Academy's accomplishments and detail its improvements and maturation as an organization. Finally, we offer suggestions for further improvements and growth into the future.

Introduction

Finance was an integral part of the MBAA International from that organization's beginning. The Midwest Business Administration Association (now MBAA International) held its inaugural meeting in Kansas City in 1965, during the meetings of the older Midwest Economics Association and Midwest Finance Association. The Midwest Finance Association continued to meet with MBAA until 1985, at which time it and the Midwest Economics Association began meeting independently of MBAA. The remaining MBAA associations continued hosting finance-related papers until several finance faculty, former members of Midwest Finance who wanted to remain in MBAA, began to meet as a developmental group under the MBAA umbrella.

During the 1989 MBAA meetings in Chicago, finance faculty from four universities met and shared their interest in reinstating a finance association at MBAA. The faculty and their respective universities were:

Robert Balik	Western Michigan University
Kenneth Crepas	Illinois State University
Fred Ebeid	Western Illinois University
Jamshid Mehran	Indiana University at South Bend
G.N. Naidu	Illinois State University
Edwin Sims	Western Illinois University

¹ This article builds on Ebeid and Johnson's 2003 about the history of the Academy of Finance. As such, it borrows heavily from the earlier article in many areas.

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These original members founded in 1990 the Midwest Academy of Finance and Insurance (MAFI), reflecting a then strong academic interest in insurance among mid-western universities. As the MBAA required its member organizations have a minimum of 50 members, MAFI was recognized as an allied organization during the 1990, 1991 and 1992 MBAA conferences, gaining full membership status in MBAA in the summer of 1992. In 2000 MAFI changed its name to the Academy of Finance, acknowledging its broadened subject matter scope and geographical representation.

The Academy has long supported its members in disseminating their research findings. From 1992 until 2002, the Academy published the *Midwest Review of Finance and Insurance*, a peer-refereed review that published selected conference papers. In 2003, the *Review* became the *Journal of the Academy of Finance* (ISSN 1932-4251). The *Journal (JAF)* is included in *Cabell's Directory of Publishing Opportunities in Economics and Finance*, and publishes research papers that have passed through a traditional double-blind, peer-review process. The Academy has always published a *Proceedings* of its conference. In addition, the Academy has, since 1993, encouraged excellence in research by awarding an annual distinguished paper award to the best paper presented at that year's conference. Originally sponsored by Irwin, the award is now the *McGraw-Hill/Irwin Distinguished Paper Award*. In 2006, the Academy expanded its recognition of excellent research by establishing Best in Track Awards in up to nine finance areas. Table I contains a timeline of important developments in the Academy's history.

Table I

Academy of Finance: Important Events in the Timeline

1985	Midwest Finance Association broke away from MBAA, prompting a group of finance professors who wanted to remain as part of MBAA to plan the establishment of what has become the Academy of Finance
1987	Finance and Insurance Division created within MBAA
1992	Midwest Academy of Finance and Insurance recognized as an official organization by MBAA MBAA-supported Distinguished Paper Award began
1992	Significant increase in program size, from 33 papers to 46 <i>Midwest Review of Finance and Insurance</i> established
1994	Secretary/Treasurer position separated into two positions; Treasurer position converted into a 3-year term
1997	Significant increase in program size, from 45 papers to 58
2002	Significant increase in program size, from 48 papers to 66
2003	<i>Journal of the Academy of Finance</i> established as the successor to <i>Midwest Review of Finance and Insurance</i> First annual Board of Directors' meeting
2005	Annual Luncheon established Significant increase in program size, from 61 papers to 100
2006	Board of Directors expanded from 3 members to 6 Outstanding Teaching Award established (industry sponsored) Best Paper in Tracks Awards established

	Newsletter established
2007	Significant increase in program size, from 100 papers to 112
	Attendance at Academy sessions approved for CFP continuing education

In 1996, Fred Ebeid (then at Western Illinois University) developed an organizational website. The website has since been maintained, improved and expanded by Robert Balik (Western Michigan University). The website serves members by making available useful information about the Academy and its members. Also, the website serves as the face of the Academy to the outside world.

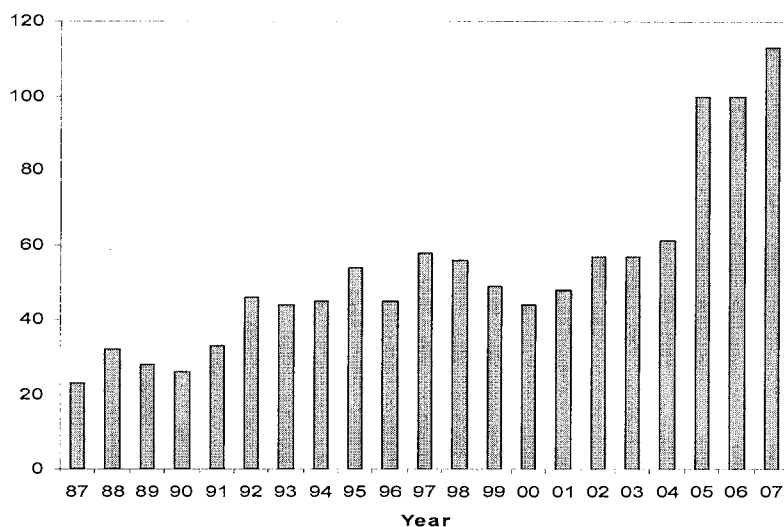
In 2006, the Academy further encouraged its members' professional development by instituting the Distinguished Teaching Excellence Award. MB Financial provided initial funding for the award, which recognizes annually a member for exemplary teaching. In 2007, the Academy expanded its efforts to reach out to practitioners by registering and offering its program sessions as continuing education for Certified Financial Planner® certificants.

Paper Topics

We analyzed the Academy of Finance programs by entering programs as they appear in the MBAA-International master program books, into an Excel spreadsheet.² During the 21-year history of the organization, 1987-2007, authors presented 1118 papers at the Academy's annual meetings. At the first meeting, 11 (48%) of the papers were from the areas of corporate, investments and institutions and markets, while another 48% came from insurance and risk management, reflecting the heavy involvement of Illinois State University insurance and risk management faculty in the organization. The program has experienced steady growth over the past 21 years and has set a new record for size during each of the past four years (see Figure I).

² Occasionally a paper on the program did not actually get presented. Also, sometimes a paper is accidentally omitted from the program and presented anyway. Sometimes, a session chair or discussant has to be replaced after the program is printed. We have no way of tracking these events, but we believe they occur seldom enough that they would have little impact on this analysis.

Figure I
Number of Papers



The Academy of Finance now draws papers from a variety of sub-disciplines. We classify papers into one of nine categories: Corporate Finance, Investments, Institutions and Markets, Real Estate, Insurance, Personal Finance, Financial Education, Risk Management and General Interest. Additionally, if the paper had a global finance interest, we indicated so. For example, if a paper concerned the Russian banking system, we categorize it as institutions and markets and also indicate that it has a global angle.

As Table II shows, the largest category of papers has been Investments, accounting for 31% of papers. Corporate Finance is second with 17% of the papers and Institutions and Markets followed closely with 15% of the papers. Financial Education is the fourth largest category (10%), and an increasing level of interest (accounting for 14% and 11.5% in the last two years, respectively). Insurance is the fifth largest category (9%), although it has accounted for only 4.7% of the papers in the past 3 years. Real Estate and Personal Finance each account for 6% of the papers.

Approximately 21% (236 of 1118) of the papers addressed a global financial issue. There were few global papers in the Academy's early years (2 papers in the first 3 years), but by 1993 global issues became a steady and important part of the program. In 2003, one-third of the program's papers had a global emphasis, and during the past 5 years 24.6% of the papers had a global emphasis. This high percentage of papers addressing global financial issues may indicate faculty are fulfilling AACSB's desire for global issues coverage.

Participants

The three key players for a successful academic meeting are the presenters, the discussants and the session chairs. During the Academy's history there have been 774 unique authors and 803 unique participants. In total, the programs list 1929 (nonunique) authors. We ranked authors on both the total and adjusted number of papers they presented (dividing credit evenly among multiple authors). The top six slots for most productive authors for total papers presented were John S. Bowdidge (60), George S. Swales, Jr. (44), Robert J. Balik (28), Jamshid Mehran (25), and (tied) Monzurul Hoque (24), Don T. Johnson (24) and Thomas M. Krueger (24). On an adjusted basis, the top six authors were John S. Bowdidge (27.9), George S. Swales, Jr. (19.4), Robert J. Balik (19.2), Thomas M. Krueger (18), and Raj K. Kohli (16.8). Table III lists the most productive authors. On average over time, each paper had 1.7 authors, and that the average has remained quite steady at around 1.7-1.8, despite growth in the program's size and typically large annual turnover in program authors. Given that different sets of authors still produce the 1.7 average year to year, we conclude that this must be an efficient number of authors per paper, perhaps reflecting institutional support for limited co-authorship. We would be remiss if we didn't identify those who have contributed as session chairs (keeping sessions in order and facilitating presentations), and as discussants (providing valuable feedback to authors, resulting in better papers). Table IV lists the most prolific session chairs and discussants.

We reviewed program annual retention rates (the percentage of authors on the program one year returning for the following year). A strong retention rate indicates participants enjoyed the conference and found it to be a valuable activity. A strong retention rate also facilitates steady, solid organizational growth. Figure II illustrates retention rates for the past 20 years.

Table II (first section)
Topics of Papers Presented and Number of Participants, Sessions, and Papers
1987-2007

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Corporate Finance	3	8	5	4	6	11	11	7	16	13	6	4
Investments	5	5	7	8	6	12	10	8	13	14	20	18
Institutions & Mrkts	2	6	3	3	4	8	7	10	10	6	8	15
Real Estate	2	0	0	0	1	1	1	9	4	0	1	2
Personal Finance	0	4	4	2	3	3	1	2	2	1	4	2
Financial Education	0	0	1	1	2	2	4	2	4	3	12	8
Insurance	9	4	7	6	10	7	8	4	5	6	3	3
Risk Management	1	3	1	1	1	2	0	1	0	1	2	4
General Interest	1	2	0	1	0	0	2	2	0	1	2	0
Total Papers	23	32	28	26	33	46	44	45	54	45	58	56
Paper w/ Global Issue ¹		2		4	3	5	8	14	9	9	10	17
Participants ²	40	50	37	35	70	102	105	66	97	89	99	94
Number of Authors ³	38	49	36	37	48	90	74	69	90	82	102	101
Avg. No. of Authors	1.7	1.5	1.3	1.4	1.5	2.0	1.7	1.5	1.7	1.8	1.8	1.8
Sessions	8	10	9	8	10	15	15	15	18	15	20	19

¹Papers were first classified into one of nine financial categories and then we indicated if the paper also involved a global issue.

²Participants include unique authors, discussants and chairs.

³Authors are the number of nonunique authors on the papers.

Table II (second section)
Topics of Papers Presented and Number of Participants, Sessions, and Papers
1987-2007

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total	%
Corporate Finance	7	7	3	3	6	6	22	18	25	191	17%
Investments	21	16	16	22	20	23	27	35	39	345	31%
Institutions and Markets	8	7	12	9	9	10	15	12	8	172	15%
Real Estate	3	0	2	8	6	6	7	5	5	63	6%
Personal Finance	1	2	2	5	0	7	11	2	4	62	6%
Financial Education	4	4	10	5	10	6	8	14	13	113	10%
Insurance	4	2	0	0	2	3	5	7	3	98	9%
Risk Management	1	3	1	3	1	0	1	3	1	31	3%
General Interest	0	3	2	2	3	0	4	4	14	43	4%
Total Papers	49	44	48	57	57	61	100	100	112	1118	100%
Paper had a Global Issue ¹	12	13	8	17	19	16	21	23	26	236	21%
											Means
Participants ²	71	73	77	81	94	92	153	160	155	1840	87.6
Number of Authors ³	82	78	83	96	101	104	173	184	212	1929	91.9
Avg. No. of Authors	1.7	1.8	1.7	1.7	1.8	1.7	1.7	1.8	1.9		1.7
Sessions	16	15	16	18	18	18	33	31	32	359	17.1

There was an average of 53.3 papers presented each year.

¹Papers were first classified into one of nine financial categories and then we indicated if the paper also involved a global issue.

²Participants include unique authors, discussants and chairs.

³Authors are the number of nonunique authors on the papers.

Table III
Most Productive Authors
Total and Adjusted Papers, 1987-2007

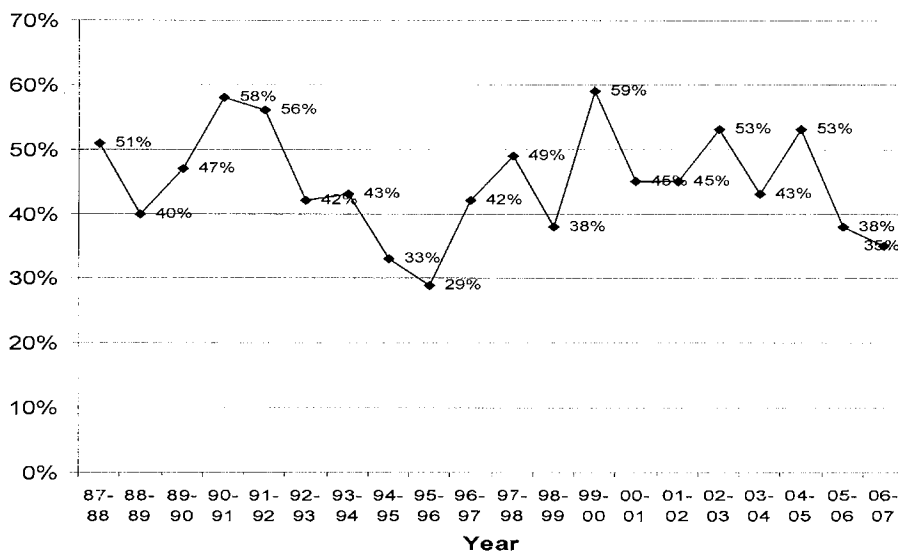
	Name of Author	Total		Name of Author	Adjusted
1.	Bowdidge, John S.	60	1.	Bowdidge, John S.	27.9
2.	Swales, Jr., George S.	44	2.	Swales, Jr., George S.	19.4
3.	Balik, Robert J.	28	3.	Balik, Robert J.	19.2
4.	Mehran, Jamshid	25	4.	Krueger, Thomas M.	18.0
5.	Krueger, Thomas M.	24	5.	Hoque, Monzurul	17.2
	Johnson, Don T.	24	6.	Kohli, Raj K.	16.8
	Hoque, Monzurul	24	7.	Mehran, Jamshid	15.7
8.	Patton, John E.	23	8.	Bahr, Kevin M.	13.5
9.	Kohli, Raj K.	20	9.	Tyree, Donald A.	13.0
10.	Kenny, Peppi M.	19		Naidu, G. N.	13.0
11.	Chang, Edward C.	18		Bhandari, Shyam B.	13.0
12.	Tripp, James D.	17	12.	Lee, Jeong W.	12.0
13.	Naidu, G. N.	16	13.	Johnson, Don T.	11.3
	Bahr, Kevin M.	16	14.	Swanton, Donald W.	11.0
	Crepas, Kenneth J.	16	15.	Pope, Ralph A.	10.7
16.	Pope, Ralph A.	15	16.	Ary, Eddie	10.0
	Ghosh, Asim	15	17.	Gu, Anthony Yanxiang	9.5
	Consler, John	15	18.	Nelson, Walt A.	9.3
19.	Tyree, Donald A.	14	19.	Patton, John E.	8.5
	Ragan, Kent P.	14	20.	Consler, John	8.3
	Lee, Jeong W.	14		Byler, Ezra U.	8.3
22.	Gu, Anthony Yanxiang	13	22.	Crepas, Kenneth J.	8.0
	Bhandari, Shyam B.	13	23.	Kenny, Peppi M.	7.8
24.	Ary, Eddie	12	24.	Ragan, Kent P.	7.8
	Samant, Ajay	12	25.	Mangla, Inayat U.	7.7
	Hasan, Tanweer	12	26.	Ghosh, Asim	7.5
27.	Swanton, Donald W.	11	27.	Philpot, James	7.1
	Mangla, Inayat U.	11	28.	Tripp, James D.	6.8
	Philpot, James	11	29.	Chang, Edward C.	6.8
	Nelson, Walt A.	11	30.	Samant, Ajay	5.7
31.	Boldin, Robert J.	10	31.	Martin, Donald D.	5.5
	Ramjee, Balasubramani	10		Gahala, Charles L.	5.5
	Edwards, Edward A.	10	33.	Moini, A. H.	5.3
	Adamson, Stanley R.	10		Islam, Mazhar M.	5.3
	Byler, Ezra U.	10	35.	Liu, Weiping	5.2
	Ebeid, Fred J.	10			

Table IV
Frequency of Participation
Discussants and Chairs, 1987-2007

Discussants		Count	Chairs		Count
1.	Bowdidge, John S.	20	1.	Naidu, G. N.	13
2.	Kenny, Peppi M.	18	2.	Robinson, Michael L.	11
	Balik, Robert J.	18	3.	Potter, Roger E.	9
4.	Kohli, Raj K.	15		Balik, Robert J.	9
5.	Krueger, Thomas M.	14	5.	Swanda, John R.	8
6.	Nelson, Walt A.	13	6.	Ebeid, Fred J.	7
	Consler, John	13		Crepas, Kenneth J.	7
8.	Swales Jr., George S.	12	8.	Sabbaghi, Asghar	6
9.	Swanton, Donald W.	11		Bhandari, Shyam B.	6
	Lee, Jeong W.	11		Consler, John	6
	Johnson, Don T.	11		Joray, Paul A.	6
12.	Verma, Shailendra	10		Byler, Ezra U.	6
	Pope, Ralph A.	10	13.	Tripp, James D.	5
	Bahr, Kevin M.	10		Swanton, Donald W.	5
	Boldin, Robert J.	10		Bowdidge, John S.	5
	Hoque, Monzurul	10		Hoque, Monzurul	5
17.	Samant, Ajay	9		Bahr, Kevin M.	5
	Bhandari, Shyam B.	9		Krishnamoorthy, Anand	5
	Ragan, Kent P.	9	19.	Hasan, Tanweer	4
20.	Varjavand, Reza	8		Kohli, Raj K.	4
	Tripp, James D.	8		Kenny, Peppi M.	4
	Chang, Edward C.	8		Krueger, Thomas M.	4
	Robinson, Michael L.	8		Lee, Jeong W.	4
	Hasan, Tanweer	8		Mangla, Inayat U.	4
	Ary, Eddie	8		Mohr, Coenraad	4
	Naidu, G. N.	8		Rassuli, Ali	4
27.	Chishty, Muhammad R. K.	7		Ary, Eddie	4
	Mangla, Inayat U.	7		Nelson, Walt A.	4
				Pope, Ralph A.	4

The average annual author retention rate was 45%. However, this rate varied from a low of 29% in 1996 to a high of 59% in 2000. To test if retention rates were related to program size (as measured by the number of unique authors on the program), we used a regression model, $\text{Retention Rate} = \alpha + \beta(\text{program size ratio}) + \varepsilon$, where "retention rate" is the percentage of authors on one year's program who return the following year and the program size ratio defined as (this year's program's unique authors)/(last year's program's unique authors). The model had an F-value of 3.66 ($p \leq .10$), and an r^2 value of .17, indicating that 17% of the program's retention rate could be attributed to program size.

Figure II
Retention Rates of Authors



One possible explanation for the fluctuating retention rates is that business cycles affect institutional funding, and thus support for professional travel. For example, during the early 1990's recession and aftermath, faculty had limited budgets for repeat travel, accounting for low retention in that time period. Another possible explanation is that competing spring associational meetings such as Midwest Finance Association or Southwestern Finance Association (which meet at rotating sites) occasionally meet at locations holding special travel interest for participants. In these years, the Academy's retention levels may decrease.

We find the fluctuation in annual author retention somewhat puzzling. Sometimes only one of the authors on a paper attends the meeting and the nonattending author is less likely to be on the program again the next year. We attempted to measure the year-to-year retention rates for registrants as we suspected the retention rate for registrants would be higher than the rate for authors. However, we were unable to locate the records necessary to measure the retention rates for registrants.

Employer Affiliations

As expected, the large majority of authors (97.1%) were affiliated with universities, and 65.6% of the authors are affiliated with AACSB-International-accredited schools (see Table V). The Academy's annual meeting has seen representation from 387 unique organizations. The top five universities are Missouri State University, formerly Southwest Missouri State University (236 authors, 111.7 adjusted papers), Western Illinois University (142 authors, 64.1 adjusted papers), Western Michigan University (78 authors, 50 adjusted papers), Illinois State University (73 authors, 46.5 adjusted papers), and Indiana University – South Bend (60 authors, 41.8

adjusted papers). A list of top employers is listed in Table VI. The top five universities accounted for 589, or 30.6% of the authors on the papers presented. Further, the top five universities accounted for 281 adjusted papers, or 24.8% of the total papers presented. Finally, the top five universities had representatives on 496 unadjusted papers, or 25.7% of the total papers. Interestingly, four of the top five universities are the institutions associated with the founding members of the Academy.

Table V
Authors and Accreditation Status, 1987-2007

Employer Category	Authors	Percent
AACSB Schools	1027	63.7%
Non-AACSB Schools	539	33.4%
Non-School Affiliated	47	2.9%
Total	1613	100.0%

As with most conferences, the Academy was founded by professors from a small number of institutions. Thus, in the conference's early years most papers were from a limited number of universities. As the Academy grew, authors represented a larger number of institutions, bringing considerable diversity to the conference.

We use the Herfindahl Index to measure the degree of concentration of employers at the Academy. This index is calculated by squaring the market share of each firm in the market and then summing the results. A market where one firm has 100 percent of the market would have a Herfindahl score of 10,000; a market with 1000 firms, each with a tiny market share, would have an index score approaching zero. The lower the Herfindahl score the less concentration and control there is by a few firms and the greater the diversity.

We treat each employing institution as a firm. We measured the share of papers presented at the conference from each institution and then calculated a yearly Herfindahl score. The initial year of the conference had a Herfindahl score of 709; the highest index score of 898 occurred in 1990, the fourth year. By 1998 the concentration score had fallen to 354, a 60% reduction since 1990. The lowest level of concentration was in 2006, with a Herfindahl score of 312. Over the past four years the Herfindahl score has averaged 389, twice being under 400. The results are displayed in Figure IV. A simple regression model of the years and Herfindahl scores ($\text{Herfindahl Score} = \alpha + \beta\text{year} + \epsilon$) revealed that years and concentration levels are negatively correlated (at $p \leq .01$). Over time, there has been a marked increase in the number of paper presentations coming from a diverse group of institutions.

The Academy changed its name in 2000 in part to better reflect its desire and success in appealing to participants beyond the Midwestern United States. Removing the regionality from the organization's name reflects the organization's draw of participants from throughout the U.S. and beyond. Further, the new name and scope improved the Academy's prestige among its own members and outsiders.

Table VI
Employers With Largest Number of Listed
Authors and Adjusted Papers, 1987-2007

Employers	Authors	Adj. Papers	Employers	Authors	Adj. Papers
Missouri State	236	111.7	Indiana State	22	18.5
Western Illinois	142	64.1	Mississippi State	20	9.2
Western Michigan	78	50.0	Millikin	20	12.3
Illinois State	73	46.5	Northeastern Illinois	19	9.5
Indiana-South Bend	60	41.8	Saint Louis	19	15.7
Wisconsin-LaCrosse	49	31.0	Youngstown State	18	8.7
Saint Xavier	34	24.7	James Madison	18	5.8
Wisconsin-Whitewater	31	22.8	State U of New York	17	11.5
Roosevelt	31	20.7	Southeast Missouri State	15	9.0
Le Moyne College	30	19.2	Illinois Wesleyan	14	9.3
Central Missouri State	29	17.3	Indiana U of Pennsylvania	14	6.5
Northern Kentucky	28	9.3	Bradley	13	13.0
Cal. State-Sacramento	27	16.7	Wisconsin-Green Bay	13	8.3
Wisconsin-Stevens Point	26	18.0	Saint Joseph's	12	8.2
Ouachita Baptist	26	17.5	Truman State	12	6.2
North Dakota	23	17.0	Wisconsin-Platteville	12	8.0

One measure of the increasing geographic reach of the Academy is the distance the presenters are willing to travel to attend the conference. We identified the direct mileage between the employer of each author at the annual meeting and Chicago. We then calculated the mean distance for all presenters, with the exception of the international presenters, for each year of the conference. The results are displayed in Figure IV. The mean distance traveled by domestic presenters has increased over time. In the first year of the conference, the mean distance traveled by authors was 288 miles. The third year, 1989, saw the shortest distance traveled with the mean trip being only 238 miles. However, the mean distance traveled quickly escalated, rising by 118% when it reached the historic high of 519 miles in 2006. A simple regression model of the years and mean travel distances ($\text{Mean Mileage} = \alpha + \beta\text{year} + \epsilon$) revealed that year and distance are positively correlated (at $p \leq .01$), supporting the contention that the Academy is attracting authors from a much larger geographic area.

Another indicator of the growing geographic reach of the Academy is the number of states and countries represented by authors on the program. As shown in Table VII, forty states have been represented by authors on the Academy program over the years. The top five states account for 61.3% of the authors. These states were Illinois (21.9%), Missouri (17.2%), Wisconsin (9.3%), Indiana (6.7%), and Michigan (6.2%). While these states accounted for over half the authors over the life of the conference, as the conference has broadened its geographic reach, these states' share of the total has fallen noticeably. Ebeid and Johnson (2003) looked at the first 16 years of the organization and found that these same five states accounted for 67.1% of the authors. During the most recent five years, their share of the total was only 57.4%, a drop of nearly 10 percentage points. The reduction of market share for these states has been due almost

entirely to the growth in attendees from other states, not a reduction in members from these five states.

Table VII
Home Location of Conference Authors
States and Countries, 1987-2007

State	Freq	%	State	Freq	%	State	Freq	%
Alabama	11	0.6	Maine	2	0.1	Oklahoma	1	0.1
Arkansas	47	2.4	Maryland	12	0.6	Oregon	3	0.2
California	56	2.9	Mass.	8	0.4	Pennsylvania	53	2.8
Colorado	10	0.5	Michigan	120	6.2	Rhode Island	4	0.2
Conn.	4	0.2	Minnesota	25	1.3	S Carolina	7	0.4
Delaware	1	0.1	Mississippi	20	1.0	S Dakota	4	0.2
Florida	15	0.8	Missouri	332	17.2	Tennessee	10	0.5
Georgia	18	1.0	Montana	2	0.1	Texas	34	1.8
Idaho	2	0.1	Nebraska	10	0.5	Virginia	25	1.3
Illinois	423	22.0	Nevada	7	0.4	Washington	2	0.1
Indiana	129	6.7	New Jersey	12	0.6	Wisconsin	180	9.3
Iowa	18	0.9	New York	67	3.5	Wyoming	1	0.1
Kansas	4	0.2	N Carolina	8	0.4	International	40	2.1
Kentucky	48	2.5	N Dakota	28	1.5	Unknown	75	3.8
Louisiana	21	1.1	Ohio	30	1.6	Total	1929	100.0*

*may not total to 100% due to rounding

Figure III
Concentration of Employers

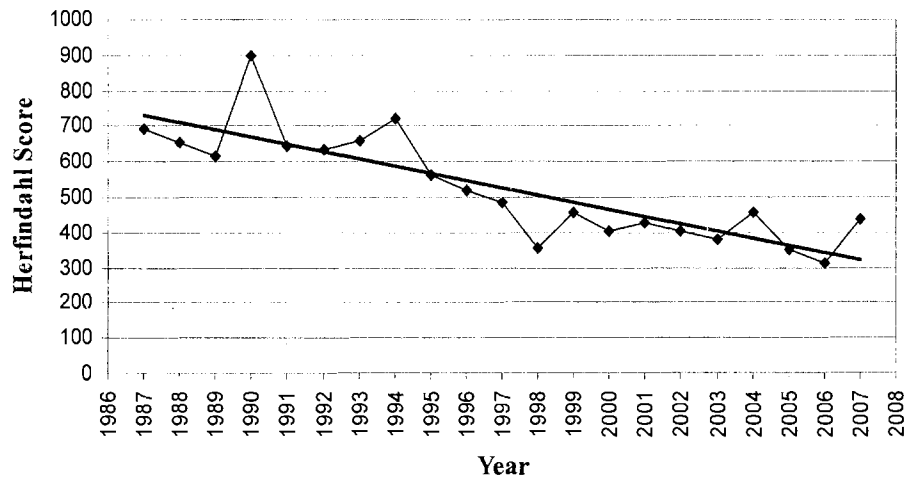
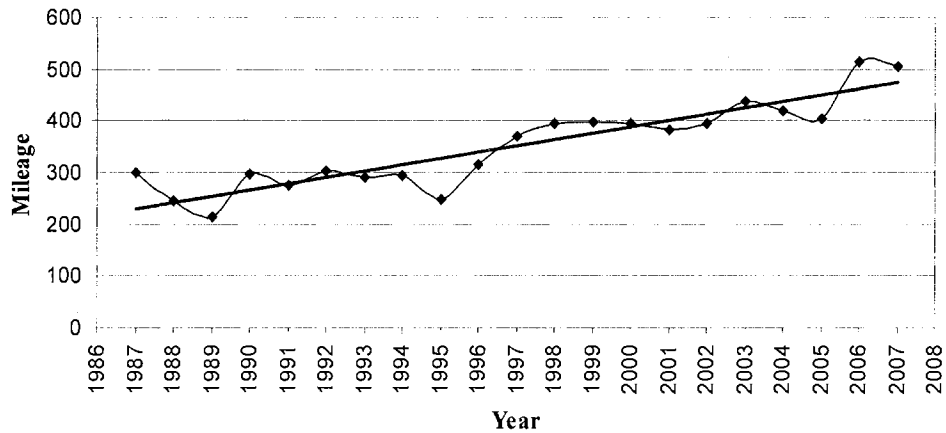


Figure IV
Distance of Presenters



Future Directions for the Academy

The Academy has had a wonderful two decades, having grown and provided considerable value to its members. However, in our opinion, the Academy has reached a point where its members and leadership need to make some important decisions about what kind of organization it will be in the future.

The size of the conference has increased substantially, from 23 papers initially to 112 papers in 2007. This growth entails extra effort in marketing and programming the conference, in the form of added reviewing of papers, session scheduling and mailing list management. In recent years, the Academy has added a conference luncheon, best paper awards, teaching competition, newsletter, and other features, further requiring hours of labor by its leaders and members.

Probably the most important feature of the Academy to this point has been the creation of the *Journal of the Academy of Finance*. The *Journal* provides a valuable publication opportunity for our members, and we should work to promote and improve the *Journal*. One option for improving the *Journal* is to make it more widely available, beginning with full text coverage on the Academy's website. Members should encourage their universities' libraries to subscribe, as that helps the *Journal* financially and provides additional legitimacy; members may even consider donating their copies to their universities' libraries if the libraries are reluctant to subscribe in these times of very tight budgets. Longer term, the Academy should seek to have the *Journal* included in one or more of the online indices such as *ABI/INFORM* or *Business Source Premier*.

Growth: Quantity versus Quality.

An argument is sometimes made that the Academy should attempt to increase the quality of its offerings even though that may result in fewer papers on the program. In general, we reject this Quantity-Quality argument, Academy officers always strive for the best program possible, accepting only research that is interesting, meaningful and well done.

A greater quantity of papers can in and of itself lead to a better quality meeting. One strategy to increase the average quality of papers is to establish a higher rejection rate and, if the reviews are conducted properly, the remaining papers should have a higher average quality. But, submissions must reach some critical mass before the Academy can begin rejecting large numbers of them. For example, the Financial Management Association some years has 1200 submissions and accepts fewer than 500 (approximately a 40% acceptance rate). Midwest Finance in 2006 reported 271 submissions and 192 acceptances (71% acceptance rate). We are not sure where the critical mass in terms of quantity is for the Academy, but it is probably higher than our current level. Also, efforts for more thorough review require more time than MBAA program schedules allow.

Improved best paper awards may add incentive increased submissions. Having several best paper awards (and the distinguished paper award), induces authors to submit better work to the meeting. If each award caused just 5 people to write better in hopes of winning the award in their areas, then 10 awards means 50 better papers and thus an increase in the average paper quality.

Organizational Structure and Function.

The Academy is functioning with much the same organizational structure it had 21 years ago. We suggest some modest changes in the structure and functionality of the Academy's leadership that may lead to growth and improvement:

Executive Director. Most organizations (MBAA, the Marketing Management Association, and the North American Management Society, for example) have such a position. Currently, the success of the annual meeting, and thus the health of the Academy, depends heavily on the competency and attitude of the Program Chair, with subsequent meetings depending on a successful transition to a new Program Chair. An Executive Director would provide continuity, year to year. The Executive Director will keep track of the conference work timetable, developing a continuing base of expert knowledge. The Executor Director would keep permanent records of the Academy, including all programs, meeting minutes, registration lists, copies of the treasurer's report, copies of flyers and calls for papers, language used on award plaques, and so forth. Presently, the Academy lacks a good records systems. The Executive Director would not be a policy setting position nor would this position have authority to compel any other officer to act.

Board of Directors as Strategic Planners. The Board of Directors needs to take an active role in the direction of the Academy. This is a behavioral, rather than a structural change recommendation. The Board, under the leadership of the President, needs to set goals and

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specific targets for the organization. Now, it is typically the Program Chair who comes up with ideas for the year. The Board needs to decide where it wants the Academy to be long term and develop a list of steps to get there. These goals and plans would involve deciding what would best benefit our membership and how we want to be viewed by potential members when they are choosing from among many academic organizations. The Board could then task those goals to various officers within the organization, probably most often the positions of Program Chair and President. Marketing Management, a sister MBAA organization, for example, has a list of goals set by its Board. Each year, the President selects one of the Board's goals as his/her project for the year and thus over time the organization is moved towards its long term strategic goals.

We must reiterate, that while the workhorse in the organization is the Program Chair, it is the Board who functions as the heart of the Academy. The organization will never grow and become what it has the potential to be unless the Board steps up and exerts the necessary influence and guidance. Very importantly, they need to be discussing plans and issues prior to the annual meeting so that most of the topics at the Board meeting have already been raised and if not solved, at least discussed prior to the actual meeting. The Program Chair usually has all s/he can handle dealing with the tactical issues of marketing the conference and putting together the program for the year. Someone must think and plan strategically and as a practical matter that would be the duty of the Board, President and possibly the Executive Director.

President, Program Chair and Secretary. The Executive Officers of the Academy need to work together to move the organization forward. They need to coordinate and communicate with each other. Further, it is essential that they begin preparing for the next year's program prior to the current year's meeting. All calls for papers, mailing lists and much of the program's special events should be planned by the Secretary prior to the current year's meeting. The Secretary (who is the rising Program Chair) should present his/her preliminary plan to the Board for the upcoming year. Advanced planning will allow the new Program Chair to "hit the ground running" immediately following the annual meeting.

We also encourage the officers and Board to develop a Program Chair's Manual. Without a Manual, the new Program Chair is reinventing the wheel every year. Currently, the handoff of materials from one Program Chair to the next is haphazard, sometimes handled in a timely and professional manner and sometimes not. A Program Chair's Manual would contain information such as the deadlines for various activities, copies of calls for papers, submission forms, and so forth. It would also contain "lessons learned" sections that each program chair would add during their year of service. For example, one "lesson learned" might be: "Be sure the submission form includes a way for someone to indicate if one of the authors is a student or otherwise you will use the student as a session chair and/or discussant because you are unaware of their student status."

Industry Relations Officer.

The Academy should consider appointing an Industry Relations Officer to establish contacts and relationships between the Academy and the Business and Governmental communities in Chicago and elsewhere. It may also be practical (but not a requirement) to look for someone from the Chicago metropolitan area for this position. A person tasked specifically to this duty

may be more successful at establishing relationships. We suggest a two-year appointment with possible renewal for the position.

Possible Future Activities

In this section, we highlight some possible activities that the Academy might pursue to the benefit of our members:

1. Establish ties with businesses and other organizations located in Chicago. Being a financial center, Chicago offers many opportunities including tours, guest speakers and potential industry sponsorships.
2. Establish arrangements with additional publication outlets, particularly those with global interests. Multiple publishing outlets available will attract additional people to the conference.
3. Establish a plan for special sessions and panels, hopefully utilizing the resources in Chicago.
4. Develop each of the specialty fields, perhaps targeting and promoting one each year for enlargement. By rotating through the subfields over a period of a few years, hopefully the overall program will grow in all areas.
5. Secure larger and permanent funding for the teaching competition, similar to Hormel's \$2,000 funding of the Marketing competition at MBAA.
6. Secure industry/publisher funding for the Distinguished Paper Award and for the Best Paper Awards.
7. Establish a life-time contributor award, recognizing and rewarding a person's contribution to the finance field and the person's contribution to the Academy.
8. Establish an Outstanding Administrator Award for a department chair or dean who provided outstanding contributions or support to the Academy.
9. Establish an achievement award for achievements in industry. It is common practice in some organizations to give such an award and then invite the award winner as the luncheon speaker.
10. Register Academy sessions with groups such as the CFP Board, to count as continuing education for their designations. This will benefit members who hold such designations, and may attract increased registration and participation from practicing professionals.
11. Explore marketing the conference to professors in the Departments of Family and Consumer Sciences. These departments increasingly focus on financial topics from a consumer perspective, and hire faculty with finance and economic doctorates.
12. Develop a membership informational database, including members interests in research and teaching, consulting interests, professional designations, and so forth.
13. Always be on the look out for ways to improve the organization. In particular, we should be aggressive in watching other organizations and copying what works.

These suggestions are only a partial list of possible activities we might undertake in the future. While the list may appear daunting, it is important to recognize that improvements may be made gradually and sequentially. The Academy can with much confidence pursue a new goal, achieve it and make it a permanent part of the organization and the conference program,

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then pursue other goals and add permanently add them. The outcome is an improved organization benefiting its members, our students, the financial discipline and the community.

Conclusions

In summary, the Academy of Finance has experienced significant growth and improvement within the past several years. As always, the Academy continues to serve the professional development needs of its members by providing opportunities for networking, fellowship, education, presentation, and publication. Such exchange of ideas is crucial to our success in the field.

The Academy no doubt has a bright future, yet with recent participation at historic high levels, the Academy is at a significant juncture. There are many potential areas for improvement of the Academy, its administration, its programs, its publications, and its services. We have offered several in this paper as a starting point for future discussion and possible action, as desired by the Academy leadership and members.

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Finance Students and Their Knowledge of the Euro: A Comparison of Students at Two Universities

Ralph A. Pope and Thomas S. Howe

Abstract

This study investigates what Finance majors and MBA students know about the Euro. The purpose of this research is to compare the results of students from two very different universities.

Introduction

The implementation of the Euro in 1999—a currency that rivals the dollar and the world's second most important reserve currency—has had a major impact on the international currency market. From its initial price on January 1, 1999, of one Euro = \$1.17, the Euro lost value rapidly. By October of 2000, one Euro was approximately \$0.82 at its lowest point. Since that time, the Euro strengthened, surpassing the \$1.34 mark. When this survey was administered, one Euro was between approximately \$1.25 and \$1.28.

The GDP of the 12 countries in the Eurozone (the European Monetary Union) equals that of the United States. In 2007, the first of the ten newest countries in the European Union (which now consists of 25 nations) should start using the Euro. The country is expected to be Slovenia. Also, in 2007, Bulgaria and Romania are expected to enter the E.U. Then, with 27 members, expansion will be on hold until the E. U. attempts to determine how to deal with an enlarged monetary union.

Other attempts have been made by several blocs of countries to adopt a single currency. All have failed without the structure of a fully integrated political union (as Germany in the 1800s and the United States). The first attempt by the E.U. to adopt a Constitution has failed. It will take several years for an E.U. Constitution to be accepted by all 27 member nations. If the Euro is successful, it will be the largest and uniquely successful undertaking of this kind in history.

Objective of the Study

The objective of this study is to investigate what business students (primarily upper division Finance students) know about the Euro.

The U.S. dollar has been the dominant currency in the world since World War II. The Euro now rivals the U.S. dollar in international currency markets and in the international political arena. Finance students must become better informed about this rival currency, one which may

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have the potential to eventually become the dominant currency in the world. Professors of Finance and other business disciplines should know the depth of the knowledge that their students exhibit with respect to this rival currency.

The survey is being given to both undergraduate finance students (the second course in Financial Management) and graduate students (the MBA Finance course). Altogether, 240 students have participated in this study in the Fall of 2006.

This research was previously undertaken in California in 2005 and presented at the 2006 Academy of Finance. Two universities are now used in order to find if there is a significant difference in two groups of students, which are actually proxies for students in two different parts of the country. This is discussed more below under "Research Design in Brief." Some of the wording of the instrument has been changed since the last survey.

Content of Study

Some of the areas that will be explored consist of what is the Euro; where is the Eurozone geographically located at the present time; how many countries use the Euro at the present time. Students are also being asked what was the approximate price of the Euro with respect to the dollar at the time the survey instrument was administered.

This study also explores the student's knowledge of other monetary questions. For example, students were asked whether nations that use the Euro must also give up the use of their own currencies, such as the French franc, the mark, etc. Students were asked if the nations that use the Euro must also give up the use of their own monetary policy as an economic tool. They are also asked the purpose of the European Central Bank.

Some of the classification variables used in this project are the student's major (if appropriate), the student's grade point average (GPA) and whether the student is an undergraduate student or a graduate student, what is the student's gender, and, of most importance to this study, the University the student is attending.

Research Design in Brief

Data is being analyzed primarily by using Chi Squares and ANOVAs (Analysis of Variance). The survey instrument (which is included in Appendix A) consists of 14 questions and statements. Further analysis was done with the current data set.

The questionnaire was being administered at two regional universities: California State University, Sacramento, and Illinois State University in Normal, Illinois. California State University in Sacramento (CSUS) is a multicultural university in northern California. Illinois State University is located in central Illinois with the majority of students coming from the Chicago area. ISU would not be called multicultural in the same sense as CSUS. A breakdown of the student bodies of the two Colleges of Business by ethnicities can be seen in Appendix B.

Undergraduate Responses at ISU and CSUS

The first analysis of questions and statements deals with ascertaining whether there is an association between the responses of undergraduates taking finance courses at ISU and CSUS with respect to the Euro and Eurozone or whether there is a lack of association between the responses at the two universities.

The first question (number VI in the Appendix) asks "What is the Euro?" The answers were arranged as: 2 = a new currency in several countries in Europe, often called the Eurozone; and 1 = All Other Responses.

[Table I]

As can be seen in Table I, 89% of the undergraduates responding answered the question correctly. However, the χ^2 suggests that there is little difference between the responses of ISU and CSUS undergraduates.

The second statement (VII in the Appendix) queries the location of the central bank for the Eurozone. The answers to be analyzed were 2 = Germany and 1 = All Others. The results are shown in Table II.

[Table II]

Although only 20% of the students answered correctly, the results suggest that there is a considerable disparity between the responses of the undergraduates at ISU and CSUS.

The next statement deals with the approximate value of the Euro (number VIII in the Appendix). The responses were:

- Correct =
- 1) 1 Euro = \$1.50
 - 2) 1 Euro = \$1.40
 - 3) 1 Euro = \$1.30
 - 4) 1 Euro = \$1.20
 - 5) 1 Euro = \$1.10
 - 6) 1 Euro = \$1.00
 - 7) I have no idea

Since the value of the Euro at the time of the survey was \$1.25 to \$1.28, responses number 3 and 4 were both deemed correct.

[Table III]

Again, the results indicate that there is a significant association between the correct answer and the university attended. 57.50% of ISU students answered correctly, while only 41.03% of CSUS undergraduates selected the correct answer. This is seen in Table III.

The fourth statement (number X in the Appendix) analyzed is “Nations that use the Euro as currency gave up the use of their country’s currency, such as the French franc, the mark, etc.” The responses were True and False (“False” also includes “I don’t know”).

[Table IV]

As seen in Table IV, there is no evidence of association between the variables. Approximate the same percentage of the undergraduates at ISU and CSUS answered the statement correctly.

The fifth statement (number XII in the Appendix) was “Nations that use the Euro as its currency gave up the use of their own monetary policy as an economic tool.” The answers were True and False (which includes “I do not know”). This is seen in Table V.

[Table V]

Again, there is no evidence of association between the variable. Approximately 50% of the undergraduates at each university answered the statement correctly.

The sixth statement (number XIII in the Appendix) was “How many countries are currently using the Euro?” The answers to select were:

- | | | |
|---------|---|------------------|
| Correct | → | 1) 6 |
| | | 2) 8 |
| | | 3) 12 |
| | | 4) 15 |
| | | 5) 20 |
| | | 6) I do not know |

The results are shown in Table VI.

[Table VI]

There is no evidence of a difference between respondents at the two universities. Seventy-eight percent of undergraduates answered the question incorrectly.

Graduate Student Responses at ISU and CSUS

The second analysis of questions and statements deals with ascertaining whether there is an association between the responses of graduate students at ISU and CSUS, or whether there is a lack of association between the two universities. The same six statements are analyzed. Again, Chi-Square was used to analyze the responses, as seen in Table VII.

[Table VII]

Please note that two cells have fewer than five observations. However, 79 of the 82 respondents answered correctly in approximately the same proportions.

Table VIII demonstrates the students' knowledge of the location of the European Central Bank.

[Table VIII]

There is some evidence that shows an association between the universities and the responses.

Students were asked what was the current value of the Euro when the survey was given.

As shown in the multiple choice format in the Appendix, either \$1.20 or \$1.30 is deemed to be correct. Responses are in Table IX.

[Table IX]

As illustrated in Table IX, the Chi-Square suggests that there is no evidence of association between the variables. The majority of graduate students at both ISU and CSUS responded incorrectly.

Statement 4 asks whether nations that use the Euro give up the use of their own national currencies. The results are shown in Table X.

[Table X]

There is no evidence to suggest association between the variables. This is shown in Table X with a $\chi^2 = .302$ and $p = .582$.

Statement 5 is shown in Table XI.

[Table XI]

There is limited evidence of some association between the variables. CSUS graduate students responded correctly to Statement 5 at approximately 64%, while ISU students selected the correct answer 45% of the time. This is shown in Table XI.

Students were asked how many countries were using the Euro when the survey was given. This is illustrated in Table XII.

[Table XII]

The responses suggest that there is no relationship between the variables. Graduate students at both ISU and CSUS responded incorrectly at least two-thirds of the time, as shown in Table XII.

Student Responses with Backgrounds in IF or IB

Responses were further analyzed according to whether the students were currently taking or have previously taken a course in International Finance (IF) or International Business (IB). This analysis was applied to all 240 respondents. The six statements are listed as they have been previously presented. The data was analyzed using the Test of Two Proportions. A total of 58 students have previously taken a course in IF or IB.

[Table XIII]

Except for Statement 3, there is evidence that a background in IF or IB enhances the probability of favorable responses. The results are presented in Table XIII.

Student Survey Results and the Value of the Euro

Several ANOVAs were run to ascertain the value of the Euro for those responding to the appropriate questions. When this survey was administered, 1 Euro = \$1.25 to \$1.28, as previously mentioned.

In this survey, two questions specifically focus on the values of the Euro:

The first one is Statement 3 (Number VIII in the Appendix).

The second is "What is your estimate of the value of the Euro: 1 Euro = \$_____." (Please enter a figure if you have **any idea** of the Euro's value. If not, please leave it blank. Many students left this blank.

An ANOVA was run to calculate the value undergraduate students place on the Euro, by university.

[Table XIV]

ISU students estimated that the value of the Euro was approximately \$1.25; CSUS students valued the Euro at \$1.34. This is statistically significant. ISU students more accurately estimated the value of the Euro.

The next ANOVA pertained to graduate students.

[Table XV]

As seen in Table XV, the different means for graduate students are not statistically significant.

The following ANOVA dealt with all responding students at the two universities.

[Table XVI]

The results are significant at the .086 level of significance, as illustrated in Table XVI.

The next ANOVA was to determine whether there was a statistical difference between the females and males in the survey.

[Table XVII]

As can be seen above, the differences are not statistically significant.

The last calculation dealt with analyzing the GPAs of the students responding to Statement 2. The results of this ANOVA are stated below.

[Table XVIII]

Those students that answered Statement 2 correctly have higher GPAs at a statistically significant level than those who selected "All Others."

Conclusion

The results suggest that there are a few differences between the finance undergraduate students at ISU and CSUS with respect to the specific questions presented to them. The ISU undergraduates selected Germany as the location of the European Central Bank twice as often as CSUS students. However, that percentage was only 25% (vs. 11.39% for CSUS students). ISU undergraduates were also more likely to correctly select an approximate value for the Euro than CSUS students when using the multiple choice format.

Almost all the graduate students at both universities knew "What is the Euro?" Graduate students at CSUS were more likely to know the location of the ECB. Also, there is limited evidence that CSUS students were more likely to respond correctly that nations that use the Euro give up their own monetary authority as an economic tool.

There is evidence to suggest that students that took or have been concurrently taking an IF or IB course along with the second course in Finance or the graduate MBA course are more likely to have a favorable, or correct, response than those without an IF or IB background.

Undergraduate students at ISU were closer to the appropriate dollar range (\$1.25 to \$1.28) at \$1.2478 than undergraduates at CSUS (\$1.3431). With respect to **all** students at the two universities, ISU again did better (\$1.2885) than CSUS students (\$1.3382).

Considering everything, it is the opinion of these authors that ISU students performed slightly better than students at CSUS.

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Table I
What is the Euro?

Undergraduates		Responses (Statement 1)	
		1 (Incorrect)	2 (Correct)
ISU	Number	10	70
	% of Row	12.50%	87.50%
	% of Tabulation	6.29%	44.03%
CSUS	Number	8	71
	% of Row	10.13%	89.87%
	% of Tabulation	5.03%	44.65%
Chi-Square = .223, P-Value = .637			

Table II
The Location of the European Central Bank

Undergraduates		Responses (Statement 2)	
		All Others	Germany
ISU	Number	60	20
	% of Row	75%	25%
	% of Tabulation	37.74%	12.58%
CSUS	Number	70	9
	% of Row	88.61%	11.39%
	% of Tabulation	44.03%	5.66%
Chi-Square = 4.936, P-Value = .026			

Table III
Value of the Euro

		Responses (Statement 3)	
		Incorrect	Correct
ISU	Number	34	46
	% of Row	42.50%	57.50%
	% of Tabulation	21.52%	29.11%
CSUS	Number	46	32
	% of Row	58.97%	41.03%
	% of Tabulation	29.11%	20.25%
Chi-Square = 4.288, P-Value = .038			

Table IV
Abandoning Home Country Currency

Undergraduates		Responses (Statement 4)		
		True	False	All
ISU	Count	59	21	80
	% of Row	73.75%	26.25%	100%
	% of Tabulation	37.11%	13.21%	50.31%
CSUS	Count	54	25	79
	% of Row	68.35%	31.65%	100%
	% of Tabulation	33.96%	15.72%	49.69%
Chi-Square = .563, P-Value = .453				

Table V
Giving Up a Country's Monetary Policy

Undergraduate University		Responses (Statement 5)		
		True	False	All
ISU	Count	41	38	79
	% of Row	51.90%	48.10%	100%
	% of Tabulation	25.95%	24.05%	50%
CSUS	Count	39	40	79
	% of Row	49.37%	50.63%	100%
	% of Tabulation	24.68%	25.32%	50%
Chi-Square = .101, P-Value = .750				

Table VI
Number of Countries in the Eurozone

		Responses (Statement 6)		
		12 Countries	All Others	All
ISU	Count	19	61	80
	% of Row	23.75%	76.25%	100%
	% of Tabulation	11.95%	38.36%	50.31%
CSUS	Count	16	63	79
	% of Row	20.25%	79.75%	100%
	% of Tabulation	10.06%	39.62%	49.69%
Chi-Square = .283, P-Value = .595				

Table VII
Statement 1 (What is the Euro?)

		Responses		
		Incorrect	Correct	All
ISU	Count % of Row	3 6.12%	46 93.88%	49 100%
CSUS	Count % of Row	0 0	33 100%	33 100%
Chi-Square = 2.097, P-Value = .148				

Table VIII
Statement 2 (The Location of the Central Bank in the Zone)

		Responses		
		Incorrect	Germany (Correct)	All
ISU	Count % of Row	37 77.08%	11 22.92%	48 100%
CSUS	Count % of Row	19 57.58%	14 42.42%	33 100%
Chi-Square = 3.488, P-Value = .062				

Table IX
Statement 3 (The Current Value of the Euro)

		Responses		
		Incorrect	Correct	All
ISU	Count % of Row	28 57.14%	21 42.86%	49 100%
CSUS	Count % of Row	18 54.55%	15 45.45%	33 100%
Chi-Square = .054, P-Value = .816				

Table X
Statement 4
(Nations that Use the Euro as Currency Gave Up the Use of their County's Currency,)

Graduate Students		Responses		
		True	False	All
ISU	Count % of Row	36 73.47%	13 26.53%	49 100%
CSUS	Count % of Row	26 78.79%	7 21.21%	33 100%
Chi-Square = .302, P-Value = .582				

Table XI
Statement 5
(Nations that Use the Euro as Currency Gave Up the Use of their Own Monetary Policy as an Economic Tool)

Graduate Students		Responses		
		True	False	All
ISU	Count % of Row	22 44.90%	27 55.19%	49 100%
CSUS	Count % of Row	21 63.64%	12 36.36%	33 100%
	All	43	39	82
Chi-Square = 2.776, P-Value = .096				

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Table XII
Statement 6 (How Many Countries are Using the Euro?)

Graduate Students		Responses		
		Correct (12 Countries)	Incorrect	All
ISU	Count % of Row	14 28.57%	35 71.43%	49 100%
CSUS	Count % of Row	11 33.33%	22 66.67%	33 100%

Chi-Square = .211, P-Value = .646

Table XIII
Background in IF or IB

	Chi-Square	P-Value
Statement 1	2.693	P = .101
Statement 2	4.524	P = .033
Statement 3	.030	P = .861
Statement 4	2.794	P = .095
Statement 5	9.391	P = .002
Statement 6	5.123	P = .024

Table XIV
Undergraduate Students: Dollars per Euro

University	Number of Undergraduates	\$ Per Euro	
ISU	58	\$1.2478	F = 8.86
CSUS	51	\$1.3431	P = .004

Table XV
Graduate Students: Dollars per Euro

University	Number of Graduate Students	\$ Per Euro	
ISU	39	\$1.3490	F = .16
CSUS	22	\$1.3268	P = .692

Table XVI
All Students

University	N	\$ Per Euro	
ISU	97	\$1.2885	F = 2.99
CSUS	73	\$1.3382	P = .086

Table XVII
Females/Males

Gender	N	\$ Per Euro	
Female	60	\$1.3267	F = .75
Male	110	\$1.3006	P = .387

Table XVIII
GPA's of Students with Incorrect and Correct Responses

Responses	N	GPA	
All Others	124	3.2646	F = 5.72
\$1.20 or \$1.30	111	3.3864	P = .018

APPENDIX

STUDENT SURVEY OF THE EURO

- I. What university are you attending?
- 1) ISU
 - 2) CSUS
- II. Are you classified as an undergraduate or graduate student?
- 1) Undergraduate student
 - 2) Graduate student
- III. What is your approximate GPA? _____
- IV. Are you a _____?
- 1) Female
 - 2) Male
- V. Were you born in the United States?
- 3) Yes
 - 4) No
- VI. What is the Euro?
- 1) A new currency in Russia
 - 2) A new currency in several countries in Europe, often called the Eurozone
 - 3) A new currency that includes Europe and Asia
 - 4) I do not know
- VII. The central bank for the Eurozone is in:
- 1) France
 - 2) Germany
 - 3) United Kingdom
 - 4) Italy
 - 5) I do not know
- VIII. The current value of the Euro is approximately:
- 1) 1 Euro = \$1.50
 - 2) 1 Euro = \$1.40
 - 3) 1 Euro = \$1.30
 - 4) 1 Euro = \$1.20
 - 5) 1 Euro = \$1.10
 - 6) 1 Euro = \$1.00
 - 7) I have no idea
- These two questions were analyzed in this research project. However, nothing statistically was found and there was nothing to report.

- IX. What is your estimate of the value of the Euro: 1 Euro = \$_____ (Please enter a figure if you have **any idea** of the Euro's value. If not, please leave it blank.)
- X. Nations that use the Euro as currency gave up the use of their country's currency, such as the French franc, the mark, etc.
- 1) True
 - 2) False
 - 3) I do not know
- XI. What is your major?
- 1) Finance (undergraduate)
 - 2) Other (undergraduate)
 - 3) MBA (or other graduate degree)
- XII. Nations that use the Euro as its currency gave up the use of their own monetary policy as an economic tool.
- 1) True
 - 2) False
 - 3) I do not know
- XIII. How many countries are currently using the Euro?
- 1) 6
 - 2) 8
 - 3) 12
 - 4) 15
 - 5) 20
 - 6) I do not know
- XIV. Have you previously or are you currently taking courses in International Finance or International Business?
- 1) Yes
 - 2) No

A New Look at the Equity Premium Puzzle

Jeremy M. Alexander¹, Thomas P. Kochanek², and Don T. Johnson, PhD³

Abstract

The equity premium puzzle is based on the common observation that in order for stock returns to be much higher than those offered by government bonds in the United States, investors must ultimately have incredibly high risk aversion. This situation is not unique to the United States, as it can be found elsewhere in other industrialized nations. The equity premium puzzle has intrigued many modern finance researchers and much effort has been expended in the pursuit of its root cause. Several theories have been developed exploring possible explanations, but a definitive solution remains undiscovered. In order to evaluate possible sources of further research, we have surveyed financial professionals and find they offer unique insights into possibly solving the equity premium puzzle.

Introduction

The survey instrument used in this research can provide further support of existing theories and shed light on what steps may be next in the search for a final solution to this puzzle. In the United States, where the majority of respondents reside, the risk premium of equity has hovered, on average, around 6% though varying extensively between longer periods of time (e.g. by decade). This variation over long periods of time is what does not fit with traditional views of risk or modern economic and financial models. Given the research presented in this article and the views expressed by professionals most familiar with the topic, it may be possible to infer views that may drive this gap size or shape the fundamentals of the puzzle itself.

This article presents the results of a survey of 116 finance professors regarding their assumptions and opinions of the equity premium puzzle. The survey (presented in Appendix A) was activated online on March, 1st and was available until March 15th 2007. During that period a slight crash occurred in the U.S. stock markets. However, all indices were able to recoup at least partially, as can be seen today.

Additionally, some earlier research by Fama and French in 2001, Shiller in 2000 and Welch in 2001 may have affected investor's opinions about the equity premium. Welch investigated that the consensus of "finance professional's" outlook concerning the equity premium was higher than the premium actually was. Thus, with a market downfall that may have resulted in finance professors being more pessimistic, we investigated further the comments made by Welch. In addition, we posed questions that may have further implications regarding other theories.

The true value of the equity risk premium is often at the center of constant discussion among academics and researchers. The value of the equity risk premium is the degree to

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which risky assets, or stocks, are expected to outperform relatively risk-free assets, such as bonds. Generally, there has been very little consensus concerning the value of the equity risk premium because of the role that varying, unobservable agent expectations play in shaping market portfolio and risk-free returns. The true value of the equity risk premium contends as “one of the most important but elusive quantities in finance” (Pastor & Stambaugh 2001). This is noted as several plausible theories that attempt to explain the quantity are explored.

Literature Review

Research has been conducted to find historical, yet varying, views on the true value of the equity risk premium. These studies have evaluated the phenomenon mostly in the United States but have also touched on other countries as well. The value of the equity premium in the U.S. has ranged from 4.3% on average from 1870 to 1998 (Shiller 1989) and 5.8% during the entirety of the 20th century (Dimson 2000) to 6% during the 1889 to 1978 period (Mehra & Prescott 1985) to even between 8.2% and 8.6% in 1995 (Brealey & Myers 1996). Alternatively, in Germany, Canada, France, Japan, and the United Kingdom, the equity premium has been measured as low as 3% (Claus & Thomas 2001) and as moderately-high as 4.6% in Canada, 7.7% in France, and 4.9% in the United Kingdom for the entirety of the 20th century (Dimson 2000).

The first method used to describe the source of the equity premium involves the use of utility in consumer consumption patterns. Research has been conducted that depicts utility received by a consumer today is an elastic function of current consumption as well as future utility (Epstein & Zin 1989, 1991). The authors determined that covariance with market return and consumer consumption growth help to resolve systematic risk, or the varying returns on any two assets. Epstein and Zin conclude that investors achieve the higher rate of return on risky assets because of their effect on consumption growth as well as the covariance described above.

Additionally, research describing habit formation as a possible explanation for the equity premium puzzle has been proposed (Constantinides 1990). Similar to the work of Epstein and Zin, Constantinides contends that utility, in monetary terms, is actually a decreasing function of consumption in previous periods. This means that it takes more for a consumer to be happy today if he were to consume more yesterday. This research concluded with the thought that should one’s demand for savings increase, the immediate effect would be a lowering of relatively risk-free yields, such as government bonds, notes, and bills.

One of the more prominent arguments for this type of explanation involved referencing psychological preferences in financial decision-making. The research depicted agents as having displayed loss aversion in their financial decision-making and consequent results (Benartzi & Thaler 1995). This simply implies that investors show significantly more hurt when faced with losses than more pleasure when faced with gains. Loss-aversion, then, can be used to explain a switch to relatively risk-free investments during periods of potentially weak risky investment performance. Consequently, the research can be followed to describe a now-required rise in risky investment returns in order to attract agents.

The most common explanation put forth by researchers involves the basic risk reward tradeoff. A study performed suggests, as is commonly taught, that the equity premium exists in conjunction with risk aversion on the part of investors (Mehra & Prescott 1985). Simply stated, this suggests that an investor’s avoidance of risk is positively correlated with his or her

desire to invest in relatively risk-free assets. Similarly, research has also been conducted that concludes that stocks deserve higher returns because one will not invest without appropriate compensation for assets that are “far more risky” than government issues (Abel 1991).

Stock returns have also been modeled as leveraged claims against the firms invested in (Benninga & Protopapadakis 1990). These authors also suggest that, in order to adequately measure the equity premium, investors must possess a high amount of risk aversion. Further research follows these ideas and states that average returns of stocks covary more with consumption growth than do relatively risk-free assets (Kocherlakota 1996). This risk-aversion argument supports risk as the primary factor needing consideration when determining the equity risk premium.

Thus far, possible explanations haven't focused much on the lower end of the premium spread, or the risk-free rate. Prominent research was conducted that suggested the equity risk premium has much to do with changing real returns of bonds during times of inflation (Siegel 1998). Siegel also concludes that stock returns will move with prices that also rise and will act as an effective hedge to inflation. In support of this, additional research described rising inflation as a determinant in increasing long-term interest rates and lower bond prices (Buckley 1999). Thus, relatively risk-free assets will return much less during inflationary times when compared to risky investments.

Several additional arguments exist for use in explaining the equity premium. Research has been done concerning limited market participation and its effect on the equity premium puzzle (Polkovnichenko 2002). It is derived from this research that those individuals who have a low level of income choose to not participate in the equity (more risky when compared to bonds) market. This lacking participation, it is concluded, results in limited sharing of risk over investment opportunities but fails to explain the equity premium puzzle. In further research, three-quarters of United States households were classified as non-stockholders, attributing themselves to the idea of limited market participation (Mankiw & Zeldes 1991).

Finally, the trading cost model has been presented as another solution to the derivation of the equity risk premium. Authors suggest that the higher costs associated with trading risky assets versus relatively risk-free assets exist due to the existence of transaction costs (Heaton & Lucas 1996). It is believed that these costs are one of the major causes of the relatively high historical equity premium over the risk-free rate (Fisher 1994). To compliment this, it has also been suggested that illiquidity, coupled with transaction costs, cause relatively risk-free assets to be overly invested in when compared to other, more risky, assets (Swan 2001).

Data and Methods

This paper revisits earlier results by also considering expected performance of diverse stock indices coupled with different investment strategies. Our survey received 116 responses from finance professors in North America. Given the backgrounds of respondents as financial professionals, a certain amount of reliability in responses can be assumed. The survey includes 20 questions which were divided into three sections. The first section dealt with investment strategies and accounted for eight questions. Section two discussed the equity premium puzzle, consisting of seven questions. And in the last section the respondent was asked to answer five questions concerning demographics. The survey is shown in Figure

I. We used www.surveymonkey.com to host the survey online. The link to the survey was <http://www.surveymonkey.com/s.asp?u=127943376178> and was only accessible to the finance professors that we contacted via e-mail during the timeframe described earlier.

We sent our email, which can be seen as Figure II, including the link required to access the survey to roughly 2,000 professors from universities in North America (U.S. and Canada exclusively). Thus, the response rate accounts for 5.8% percent. All of the respondents answered the questions appropriately so that we need not exclude any of the respondents. On March, 15th the survey was closed and the results were downloaded to a Microsoft Excel spreadsheet available directly from Survey Monkey's user interface.

Some of the results needed to be "cleaned" in such a way that various answers were formatted appropriately so that responses were uniform. Cleaned results were then converted into yet another Microsoft Excel spreadsheet. For example, a typical case which required "cleaning" was professor estimates of the three leading U.S. indices' developments. Some respondents answered with a percentage increase of the indices while others answered with an index point increase. These heterogeneous responses were standardized into point-based expectations. Percentage increases were based on a DJIA level of 12,400, an S&P 500 level of 1,400, and a NASDAQ level of 2,500.

After the answers were converted into the new Microsoft Excel spreadsheet, we ran partial regressions among all variables using SPSS, where variables correspond with the questions posted on the survey. This was done to disclose both correlations among the variables and correlations between the variables, all the while seeking general information regarding the equity premium puzzle. Since some of the questions implicated similar meanings we reduced some of our variables to be inclusive. Cases of this included respondents answering Question 10 with either Daily updates or Daily updates coupled with desktop tracking. These two answers were considered similar.

The survey was anonymous. That is, solely the Microsoft Excel spreadsheet and its contents from www.surveymonkey.com were downloaded and analyzed. This spreadsheet included the summary of all answers posed in the questionnaire and nothing else. We had no access to any personal information of any type aside from what was provided us by participants in the original survey.

Results

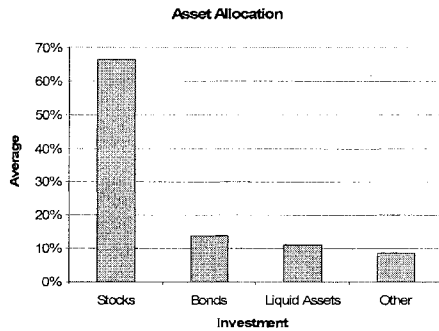
The answers we were seeking that revolved around the equity premium puzzle were limited in scope. Obviously, when receiving 116 responses from a base of 2,000 possible response candidates, our research was not as conclusive as we would have liked. We sought to gather enough information to validate previous theories concerning a large equity premium occurring during times of bullish markets. The markets, however, hiccupped slightly during the time of this survey after experiencing relatively sizable gains. The DJIA had even recently topped 12,000 and had captured several record-breaking values.

By measuring investment strategies couple with assumptions concerning the equity premium, stock returns, and T-Bill returns we also hoped to garner more insight into the actual varied sizes of the equity premium during similar economic times. By measuring expectations and assumptions from the "top" down, that is from the more educated and familiar, we looked for ways to compliment previous theories that have attempted to explain

fully the equity premium puzzle. Again, our response rate was a limitation. We did, however, gather interesting secondary-data from the respondents of the survey.

One measure that we have been able to derive from our survey is that of asset allocation in actively managed investment portfolios. Percentage allocation was measured in four categories: stocks, bonds, liquid assets (e.g. treasury bills), and other (e.g. real estate). On average, respondents reported allocations of stocks at 66.47%, bonds at 13.79%, liquid assets at 11.19%, and other investments at 8.60%. Asset allocation can be viewed below.

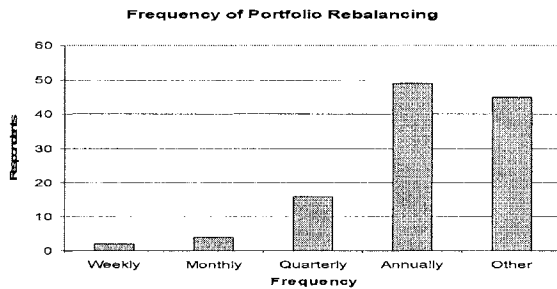
Figure I



To compliment this, on average, respondents expected a 19.79% increase in the point value of the DJIA, a 21.68% increase in the point value of the S&P 500 and an 18.36% increase in the point value of the NASDAQ. Given recent sentiment and expectations that stock indices will continue to exhibit strong performance, it is likely that these investors are demonstrating low risk aversion during times of bull markets.

The survey also measured the frequency to which respondents balanced and rebalanced their investment portfolios to match their respective asset allocations. Frequencies were categorized into five groups. These included: weekly, monthly, quarterly, annually, and other (e.g. never, seldom). Of the 116 respondents, only 2 rebalanced weekly, 4 monthly, 16 quarterly, 49 annually, and 45 other. These results are summarized below.

Figure II

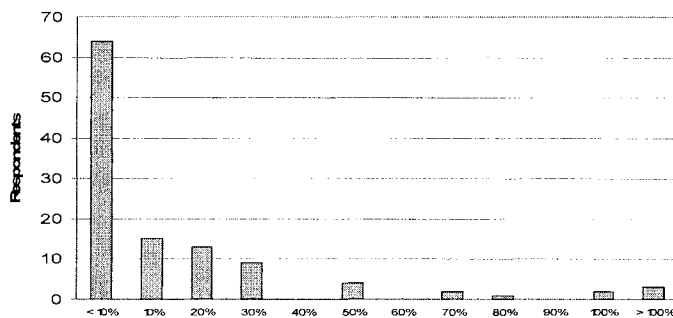


These results imply long-term investment strategies amongst collegiate finance faculty. Additionally, long-term strategies provide little opportunity for rebalancing should the equity premium change rapidly; it would take at least an entire year for most of these

respondents to react. To compliment this, the survey also measured the extent to which respondents were turning over their portfolios.

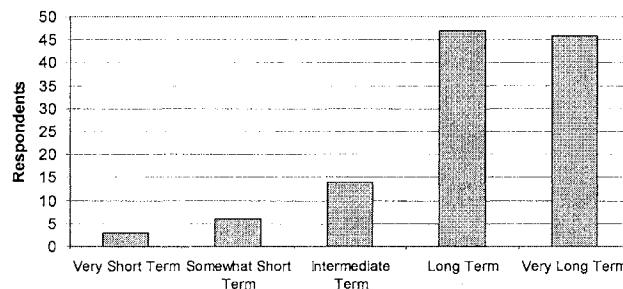
Portfolio turnover was measured from less than 10% to over 100% with 10% intervals (e.g. < 10%, 10%, 20%, etc.). Overwhelmingly, 64 respondents responded with less than 10% portfolio turnover. Also, 15 responded with 10% turnover, 13 with 20%, 9 with 30%, 4 with 50%, 2 with 70%, 1 with 80%, 2 with 100%, and 3 with greater than 100%. Again, this implies a long-term investment horizon. The results of this question are summarized below.

Figure III
Portfolio Turnover



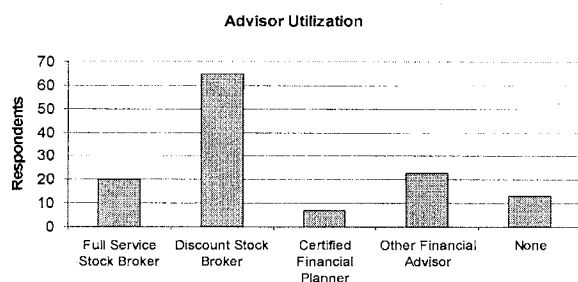
The survey also measured investment horizon. And, as expected, the term for most respondents was long to very long. Horizon was categorized as either very short-term, somewhat short-term, intermediate-term, long-term, and very long-term. Long-term and very long-term comprised 93 of the responses (47 long-term and 46 very long-term), while 14 invested at the intermediate horizon, 6 at the somewhat short horizon, and 3 at the very short horizon. The results are summarized below in Figure IV.

Figure IV
Investment Horizon



So, who is it that is so long-term oriented in their investment allocation, turnover, and horizon? We asked the 116 respondents who were in charge of their portfolios. The survey included choices of full-service stock brokers; 17.24% of respondents, discount stock brokers; 56.03%, certified financial planners; 6.03%, other financial advisor (e.g. yourself); 19.83%, and none; 11.21%. Results are summarized below in Figure V.

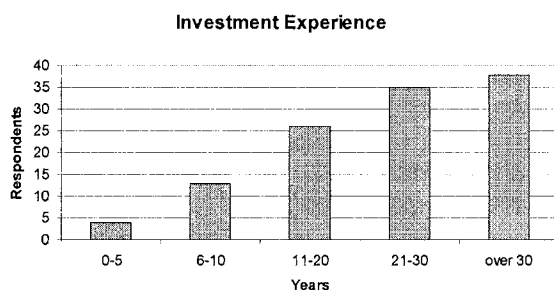
Figure V



The above data implies that the majority of collegiate finance faculty is not actively managing their own portfolios, but instead hire outside individuals or firms to do so in their stead. It is assumed that investor-generated guidelines have been provided to these outside portfolio managers. Without this assumption, whatever links may be found between now outside-oriented portfolio balance, allocation, and horizon with the respondent's personal outlook, assumptions, and expectations would be in question. Further research is needed to survey to what extent these guidelines exist.

The survey also asked its participants the extent to which they were experienced in the Investments field. We were able to gather this by measuring the number of years spent investing. These results were used to qualify the data gathered in other parts of the survey. Experience was based on five time-frames: 0-5 years, 6-10, 11-20, 21-30, and over 30. There were 99 respondents (85.34%) with over 10 years of investment experience, with 26 in the 11-20 year bracket, 35 in the 21-30 bracket, and 38 in the over 30 bracket. Results are summarized below in Figure VI.

Figure VI



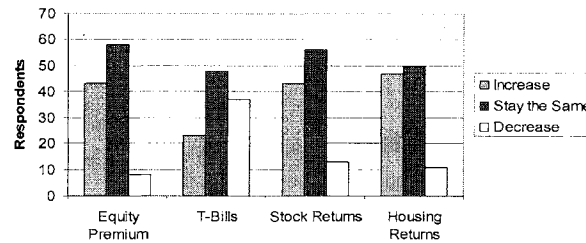
The main thrust of this survey was to test information regarding the equity premium. However, since our results were limited, we were unable to obtain information that can be concretely used to compliment existing theories. We did, however, gather some data that is of interest. Particularly, there were 79.1% of respondents that were aware of the equity risk premium puzzle, while 20.9% were not. In addition, 90.6% of 116 respondents believed the equity premium to range from 3-7%, a sizable span, during the next 30 years.

We also sought to gather data on expectations regarding the equity premium, stocks, T-Bills, and housing. Stock returns represent the upper portion of the equity premium spread, while T-Bills typically represent the lower end. The survey asked for 30-year expectations, given the performance of all variables over the previous 30 years. Most respondents believed

little change would occur with all variables, closely followed by an increase with all variables. The only exception occurs with T-Bills, where more respondents believed that returns would decrease rather than increase. Results are summarized below in Figure VII.

Figure VII

Expectations



The above data implies investors are geared to continue working in bullish markets. If stock returns are high and will continue to increase, it is likely that these investors will choose to put money into these risky assets rather than the relatively risk-free. This leads to the assumption that the equity risk premium will always rise during bull markets as more people invest with lower risk aversion. We would suspect the opposite during bear markets.

We also measured partial correlations against all variables. We found very little that was of major significance. We did, however, find a few items that were deserving of attention. For example, the longer an individual's investment horizon, the more aware they were of the existence of an equity premium puzzle. This was in accord with what we were expecting to find. However, we also found a few partial correlations that were strange, but still significant. For example, the higher an investor's experience, the less likely they were aware of the equity premium puzzle. In addition, we found that the higher an investor's outlook for each of the major U.S. indices, the less aware they were of the equity premium puzzle. Finally, and most interesting, is the positive correlation between lack of a target asset allocation and equity premium puzzle awareness. Perhaps this implies reliance on the equity premium on the investor's part.

Conclusion

Given the nature of this research's survey results used in explaining the anomaly found in equity pricing, the findings presented would be more consistent with technical methods of market analysis as opposed to fundamental. But what theories have been complimented? An argument could be made for many of the presented theories; however, it will require further research to come to any concrete conclusions. Suggestions for further research involve the investigation of trading costs in one's choice to invest at a long-term horizon, the inclusion of low income-level finance faculty and the amount to which they participate in the financial markets, and to what level are faculty risk-averse when faced with a recent history of poor, rather than decent, stock returns.

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Appendix A
Survey Instrument

A-1: Survey Cover Letter

Dear Finance Professor:

We want to know where you think the stock market is headed. Given your education and experience you should be a true expert on this topic!

This is a very short survey which should take only 2-4 minutes to complete. The responses are anonymous. To complete the survey, please click here:
<http://www.surveymonkey.com/s.asp?u=127943376178>

We are MBA students and we will present the results of this survey at an academic conference later this semester. We certainly appreciate your time and attention.

Thank you again!

Thomas Kochanek
MBA Student

Jeremy Alexander
MBA Student

A2: Survey Questionnaire

1. Which of the following do you utilize? Check all that apply!
 - a. Full Service Stock Broker
 - b. Discount Stock Broker
 - c. Certified Financial Planner
 - d. Other Financial Advisor (please specify)
2. What percent of your portfolio do you turn over each year?
< 10, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, > 100
3. What is your asset allocation (in percent)?
Stocks: _____ Liquid Assets: _____
Bonds: _____ Other: _____
4. Do you have an asset allocation target among stocks, bonds, and cash?
 - a. Yes
 - b. No
5. How often do you rebalance your portfolio?
 - a. Weekly
 - b. Monthly
 - c. Quarterly
 - d. Annually
 - e. Other (please specify):
6. How dedicated are you in rebalancing your asset allocation?
 - a. Occasionally
 - b. Somewhat Dedicated
 - c. Very Dedicated
7. Is your investment strategy more long term or short term?
 - a. Very Short Term
 - b. Somewhat Short Term
 - c. Intermediate Term
 - d. Long Term
 - e. Very Long Term
8. For how many years have you been investing?
 - a. 0-5
 - b. 6-10
 - c. 11-20
 - d. 21-30
 - e. Over 30
9. Are you aware of the Equity Premium Puzzle?
 - a. Yes
 - b. No
10. How closely do you track your investments?
 - a. Daily
 - b. Daily (w/Auto-Update)
 - c. Quarterly
 - d. Monthly
 - e. Quarterly

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- c. Weekly f. Yearly
11. For the coming year, how would you describe your outlook for the stock market?
(Bear) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (Bull)
 12. During the next 30 years, what do you believe the Equity Premium will be?
0%, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, >10%
 13. During the next 30 years, what do you believe will be the annual compounded rate of return for the S&P 500?
 14. Where will the averages of these major stock indices be in 3 years?
DJIA: _____ S&P 500: _____ NASDAQ: _____
 15. Compared with the past 30 years, do you believe that over the next 30 years:

	Increase	Decrease	Stay the Same
The Equity Premium Will	_____	_____	_____
T-Bill Rates Will	_____	_____	_____
Stock Returns Will	_____	_____	_____
Housing Returns Will	_____	_____	_____
 16. Gender:
 - a. Male b. Female
 17. Age:
 - a. Under 30 d. 51-60
 - b. 30-40 e. 61-65
 - c. 41-50 f. Over 65
 18. Household Income:
 - a. Under \$75,000 d. \$150,001-\$200,000
 - b. \$75,000-\$100,000 e. Over \$200,000
 - c. \$100,001-\$150,000
 19. Marital Status:
 - a. Married b. Unmarried c. Long-Term Relationship
 20. Which area do you teach most often?
 - a. Corporate Finance d. Real Estate
 - b. Investments e. Insurance
 - c. Institutions f. Multiple Areas

Market Reactions to Jim Cramer's *Mad Money* Lightning Round

John J. Neumann* and Peppi M. Kenny**

Abstract

Numerous empirical studies examine investment advisory services and find statistically significant abnormal returns around publication or broadcast of investment recommendations. From Jim Cramer's *Mad Money* broadcast, the opportunity is presented to examine another source of investment recommendations through his *Lightning Round* segment. This research finds companies which were recommended buys by Mr. Cramer during the *Lightning Round* consistently have abnormal stock movement before and after the on-air mention, however investors' reactions to the recommendations do not create an exploitable trading strategy. Stocks with bearish recommendations are found to experience even less reaction.

Introduction

The abundance of investment advice available from internet websites, magazines, mutual fund company literature, financial advisors, radio programs, and television shows provides a daunting landscape of information and guidance which individuals must usually navigate on their own. A relatively new player on that field is the nightly *Mad Money* program, which airs on CNBC each evening at 6 p.m. and is hosted by charismatic personality, Jim Cramer. On the show, Mr. Cramer discusses both his own investment ideas as well as those put forth by viewers who call the program during its *Lightning Round* segment. In an earlier paper (2007), the authors analyze the host-originated stock recommendations and find statistical evidence using stock return and share volume event analysis that investors react to his buy recommendations more strongly than to his sells. Further, they identify that the average raw return measured over the first trading day after a recommendation has aired is contained almost entirely in the difference between the close on the show's air date and the next day's open prices. In this paper, we examine the bullish and bearish sentiments offered by the host on stocks about which viewers ask for counsel.

Studies which examine investment advice conveyed via different media contribute to the ongoing effort to understand the impact of individual investor activity on asset prices and market volatility. In addition, they offer insights as to whether the market is efficient to the entrance of these recommendations into the store of public information. The literature has been assembled with analyses of brokerage stock rating reports by Ho and Harris (1998) and of the publication of newspaper or magazine

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columns by Mathur and Waheed (1995), Liu, Smith, and Syed (1990), Beneish (1991), Liu, Smith, and Syed (1992), Bauman, Datta, and Iskandar-Datta (1995), and Sarkar and Jordan (2000). Special features such as the *Wall Street Journal's* dartboard contest is examined as a potential source of actionable investing strategy by Pruitt, Van Ness and Van Ness (2000), Albert and Smaby (1996), Metcalf and Malkiel (1994), and Barber and Loeffler (1993). Hirschey, Richardson, and Scholz (2000) venture onto the internet to investment recommendations presented by the internet site *The Motley Fool*, while Dewally (2003) tracks two on-line investment newsgroup sites. A number of authors use different sample periods in their research on the *Wall Street Week* show hosted by Louis Rukeyser. Beltz and Jennings (1997) analyze 801 recommendations from the 1990-1992 time period and find transient positive price and volume reactions in stocks that are suggested as buys. Over an earlier 1983-1984 timeframe, Pari (1987) also finds abnormal (excess over benchmark) performance during the trading day after a broadcast in which stock purchases were recommended. The results in Griffin, Jones, and Zmijewski (1995) agree with these two studies.

The remainder of this paper is organized as follows. We discuss the data and analysis methodology followed by the event study results and our conclusion.

Data and Methodology

We obtain *Mad Money Lightning Round* stock mentions during shows aired nightly between 10/17/2005 and 12/23/2005 from TheStreet.com. Descriptive statistics on these mentions are shown in Tables I and II. A total of 711 companies account for 1339 mentions during the sample period, with 809 of these mentions being of bullish sentiment and 530 of bearish sentiment. In addition, 264 companies comprise 892 (mostly bullish) of the 1339 mentions, while the other 447 companies were the subject of one *Lightning Round* query, with more than half of those receiving bearish sentiment. Among these 264 companies mentioned by viewers on multiple broadcasts, Mr. Cramer's sentiment was consistently bullish or bearish for 192 firms, with one change in sentiment noted for 60 companies and more than one change observed for the remaining 12 firms. Interestingly, the highest consistency ratio is seen among the companies which produced the most viewer call-ins – sentiments offered for 18 of the 20 companies which received more than six mentions on shows between October 17 and December 23 were consistently bullish or bearish.

Our initial event study tests examine the bullish and bearish sentiment samples separately, and include all one-mention stocks plus the first mention of companies for which multiples exist, so long as the next subsequent mention is at least four days removed from the initial one to keep the [0,+3] event window clean. This criterion, along with our requirement of 40 days of historical returns to calculate estimation period parameters, results in 42 of the 711 companies to be removed from the sample. Table III contains the breakdown of the remaining 669 observations by show date. Descriptive statistics in Table IV reveal that the majority of these stock mentions are in the manufacturing (27.8%) and construction (16.3%) industries based on their CRSP SIC codes on the date of their mention in a *Lightning Round*.

We employ the standard event study methodology outlined by Brown and Warner (1980, 1985) and used by many of the studies cited previously. Daily returns, opening prices, and volume data for the sample are taken from the CRSP daily files via Wharton Research Data Services. Event day 0 is the date of airing of a show, which is initially televised at 6 p.m. in the east. Guided by the hypothesis that viewers to some extent call the show about stocks that have been in the news recently, we seek to analyze short event windows preceding event day 0 in addition to windows following it, during which any reaction might be detected. We include day 0 in the pre-event intervals because by the time the show is broadcast at 6pm a full business day's news is completed for investors to digest. Abnormal returns are determined in three ways, relative to a market model prediction, to the CRSP value-weighted index, and to a stock's recent historical mean:

$$AR_{i,eventday(t)} = R_{i,t} - [\hat{\alpha}_i + \hat{\beta}_i * R_{mkt,t}] \quad (1)$$

$$AR_{i,eventday(t)} = R_{i,t} - [R_{mkt,t}] \quad \text{"mkt" is CRSP value-weighted index} \quad (2)$$

$$AR_{i,eventday(t)} = R_{i,t} - [\bar{R}_i]. \quad (3)$$

Market model parameters and stock return means are estimated using daily returns from eleven days (two full business weeks) prior to event day 0 to a maximum of 186 days preceding the event day, or about eight months time. A minimum of 40 days is required for a recommendation to be included in the final tests, but only 23 of the 669 final sample observations have less than the full estimation period of 175 daily returns. The bearish sample of 354 observations has an average beta and market capitalization of 1.27 and \$9.135 billion, respectively, while the bullish sample averages are 1.21 and \$14.92 billion.

Results

A. Bullish Mentions

We report the results of event study analysis of the sample of 315 *Lightning Round* bullish sentiments in Table V. Average abnormal returns relative to the market model, CRSP value-weighted index, stocks' recent means, as well as raw returns are reported for single event days -10, -1, 0, +1. Analysis of event windows covering periods [-4,0] and [-2,0] leading up to and including the broadcast event dates and the [0,+1], [0,+2], [0,+10] and [0,+20] windows following the *Lightning Round* mentions are also exhibited in the table. We note here that while the [0,+3] window is clean of second (or more) mentions, the longer event windows out to 10 and 20 days are not. However, the results we report are not qualitatively different from those based on sub-samples of 172 bullish and 272 bearish one-time only mentions, so we conclude that any subsequent mentions of a stock are not qualitatively altering the results.

Table V documents consistent evidence of abnormal stock movements both in the days before and after a *Lightning Round* mention. Market-model adjusted returns of 0.41% over the [0,+1] event window are significant at the 1% level. CRSP index-adjusted returns are 0.70% over that same window and significant at the 0.1% level, as is

the 0.83% performance measured relative to the stocks' recent period means. Abnormal or adjusted returns over the [0,+1] and [0,+2] windows are almost identical, indicating that the bulk of the effect is on the two event days 0 and +1. Not surprisingly, the significant event window [0,+1] average raw return of 1.07% in the rightmost columns of Table V is higher than all of the average adjusted returns. That these returns are all positive suggests that investors may be acting on the bullish sentiments offered about these stocks by purchasing shares in the day or two following their discussion in the *Lightning Round*.

Interestingly, event windows encompassing the three and five day intervals preceding and including the *Lightning Round* mentions also show significant abnormal returns. For the [-2,0] and [-4,0] windows respectively, market-model adjusted returns are 0.40% (significant at 1%) and 0.35% (significant at 5%), CRSP index-adjusted returns are 0.83% and 1.00% with both significant at 0.1%, and returns adjusted by the stocks' estimation period means are 1.03% and 1.21%, also both significant at the 0.1% level. These findings are consistent with the idea that viewers call into the show about stocks that have been upwardly active in recent days and likely are seeking advice or interpretation regarding this activity. The average abnormal return on the single event day 0 is a prominent piece of each cumulative relative (and raw) return in the windows of interest both preceding and following the broadcast day.

Figures 1A through 1D depict cumulative returns over the [-10,20] window, from one day prior to our estimation period to twenty days beyond the event day 0 broadcast date. Figure 1A, 1B, and 1C show abnormal returns relative to the market model, CRSP value-weighted index, and stocks' estimation period means, respectively, while raw returns are in Figure 1D. Figures 1B, 1C, and 1D all reflect the general upward movement of the stock market during the time period from which our *Lightning Round* sample was taken. That the market model-adjusted returns trend downward in Figure 1A is likely a byproduct of the volatile market during the first nine months of 2005 which roughly coincides with the period during which the β parameter is estimated. This suggests that the best measures to reference for interpretation are those relative to the CRSP value-weighted index as an effective proxy for the market indices. The S&P500 rose by 7.385% (as measured by SPiDeRs) between 10/17/2005 and 12/23/2005, while the CRSP index return during that same time period was 7.73%.

The sum of the evidence in Table V and the cumulative return plots suggest that viewers who call the *Mad Money* show during its *Lightning Round* segment ask about stocks whose price has moved for some reason within the recent past. There is significant pre-event abnormal return relative to the CRSP index in the week leading up to event day 0 that is not all attributed to event day 0. Further, they do not seem to act very forcefully on the bullish mentions they hear and so do not create the conditions for an exploitable trading strategy for other investors. To the contrary, while the post-event index abnormal return on event day +1 is significant, it is small (+0.27%), and most of the return over event window [0,+1] is on event day 0, which is the day the show airs in the east after market hours. Longer horizon post-event holding periods extending ten and twenty days beyond the broadcast dates show no significant excess return over the CRSP index.

B. Bearish Mentions

Our examination of *Lightning Round* bearish sentiments is summarized in Table VI and Figures 2A, 2B, 2C, and 2D. Average abnormal and raw returns and generalized sign z-statistics are reported for the same event days and event windows as before. With these stocks as well, the cumulative return plots reflect the generally upward movement of the stock market over our sample period. An examination of the abnormal returns on event day +1 and over the [0,+1] and [0,+2] event windows indicates even less evidence of on-average investor reaction to bearish mentions on the show than we observe within the bullish sample. Only the cumulative event period abnormal returns relative to the market model -- -0.48% and -0.72% over the [0,+1] and [0,+2] windows, respectively -- are significant, and the significant single event day +1 abnormal return is -0.27%. Many of the abnormal returns produced with the other specifications are expectedly negative but lack significance.

Any number of reasons might explain the slight difference in the reactions' evidence between the bullish and bearish stocks. Investors could call about stocks they are thinking of buying but do not own, and so a bearish sentiment does not move them to act. Investors who call about stocks they do own may suffer from loss regret and resist selling despite the advice they seek out and receive from the TV show. Viewers may also be unmoved by the rationale presented for the bearish sentiment, although that reluctance may also be colored to some extent by loss regret. Or perhaps it is more simply explained by the fact that a bullish sentiment has appeal and can prompt action for all viewers, whereas a bearish sentiment has meaning only to those who already hold the stock or have ideas about buying it.

In contrast to our bullish sentiment findings, there is little suggestion that investors are calling the show about stocks which have recently declined. Cumulative average abnormal returns over the [-4,0] and more compact [-2,0] event windows preceding the broadcast event date 0 are negative relative to the market model and positive relative to the CRSP index, and lack significance in both cases. However, mean-adjusted and raw returns are significant over those intervals. Returns relative to the stocks' estimation period means are 0.42% and 0.29%, both significant at the 5% level. Raw returns significant at the 1% level are 0.81% and 0.53% for the two event periods, respectively. The average mean-adjusted (0.31%) and raw returns (0.39%) for event day -1 are highly significant as well. This significance of the stocks' own measures without significance of the market-based metrics suggests that investors' phone inquiries are prompted by a perceived shift in the stocks' recent performance without regard to whether this activity is a systematic move due to the general trend of the market. This contrasts with the bullish sentiment stocks, for which the pre-event window abnormal returns are significant when adjusted for both stock-specific and index measures, suggesting that the price moves are either market-related, firm-specific, or both.

Conclusion

In this study, we follow up our earlier work with *Mad Money* stock recommendations originated by Jim Cramer to analyze the bullish and bearish sentiments offered on stocks during the *Lightning Round* segment of the program while viewers call in about stocks in which they are interested. We find slight evidence of market reaction due to investors acting on the bullish sentiments but no evidence that they act on the bearish mentions other than the significant excess returns relative to the CRSP index over the longer-horizon [1,+20] post-event window. More interestingly, we detect that viewers on average tend to call the show about stocks which have experienced recent price moves. Our results suggest that these movements could be market-related or stock-specific for the bullish mentions but that investors do not distinguish market from firm-specific price changes among the stocks which receive bearish mentions. These last two facts are not altogether surprising, though, given that “50% of the calls come from college kids” (Jim Cramer, on *Imus in the Morning*, February 6, 2007).

Table I. Descriptive Statistics for “Mad Money Lightning Round” Stock Mentions: 10/17/2005 to 12/23/2005

	Total	Bullish Sentiment	Bearish Sentiment
Total # of Different Companies	711	809	530
Companies with One Mention	447	174	273
Companies with Multiple Mentions	264	635	257
Companies with Minimum 40 Days Estimation Period Returns and at Least 4 Days Between a 1st and 2nd Mention	669	315	354
Average β		1.21	1.27
Average Market Capitalization on 10th Trading Day Prior to Mention		\$14.917B	\$9.135B
Minimum Market Capitalization		\$167.92M	\$121.92M
Maximum Market Capitalization		\$261.75B	\$371.12B

Table II. Bullish or Bearish Sentiment Consistency among Companies with Multiple “Lightning Round” Mentions over the 10/17 to 12/23/2005 Sample Period

	Total	Consistent Sentiment	1 Change in Sentiment	2 Changes in Sentiment	> 2 Changes in Sentiment
Companies with Multiple Lightning Round Mentions	264	192 (72.7%)	60	7	5
with 2 Mentions	127	99 (77.9%)	28		
with 3 Mentions	56	37 (66.1%)	15	4	
with 4 Mentions	26	16 (61.5%)	8	2	
with 5 Mentions	24	16 (66.7%)	5		3
with 6 Mentions	11	6 (54.5%)	4		1
with More than 6 Mentions	20	18 (90.0%)		1	1

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Table III. Lightning Round Stock Mentions by *Mad Money* Air Date and Sentiment

Show Date	Bullish Sentiment	Bearish Sentiment
2005 10 17	13	17
2005 10 18	9	10
2005 10 19	20	9
2005 10 20	9	17
2005 10 21	11	7
2005 10 24	14 - 1 = 13	9
2005 10 25	4	10
2005 10 26	3	9
2005 10 27	9 - 1 = 8	5
2005 10 28	7	16
2005 10 31	8	17
2005 11 01	3	8
2005 11 02	9	8
2005 11 03	11	3
2005 11 04	10	8
2005 11 07	3	4
2005 11 08	1	11
2005 11 09	6	12
2005 11 10	11	8
2005 11 11	14	7
2005 11 14	7	5-1 = 4
2005 11 15	6	3
2005 11 16	6	9
2005 11 17	8	7
2005 11 18	9	8
2005 11 21	6 - 1 = 5	11 - 1 = 10
2005 11 22	2	7
2005 11 23	5	7
2005 11 28	5	8 - 1 = 7
2005 11 29	5	4
2005 11 30	2	6
2005 12 01	4	6
2005 12 02	4	4
2005 12 05	6	10
2005 12 06	4	2
2005 12 07	2	9
2005 12 08	7	9
2005 12 09	7	5
2005 12 12	3	5
2005 12 13	3	5
2005 12 14	10	2
2005 12 15	5	3
2005 12 16	8	7 - 1 = 6
2005 12 19	2	2
2005 12 20	4	12
2005 12 21	3	3
2005 12 22	5	1
2005 12 23	5	3
Total	318 - 3 = 315	358 - 4 = 354

Table IV. Industry Descriptive Statistics for Sample of N = 315 Bullish and N = 354 Bearish Lightning Round Sentiments

SIC Code	Description	Bullish		Bearish	
		Total	% of Total	Total	% of Total
0000	Forestry, Fishing	0	0%	1	0.3%
1000	Mining	29	9.2%	25	7.1%
2000	Construction	43	13.7%	66	18.6%
3000	Manufacturing	86	27.3%	100	28.2%
4000	Transportation	24	7.6%	41	11.6%
5000	Retail Trade	45	14.3%	37	10.5%
6000	Finance, Insurance	42	13.3%	26	7.3%
7000	Services	31	9.8%	49	13.8%
8000	Services	15	4.8%	9	2.5%
9000	Public Admin.	0	0%	0	0%
Total		315	100%	354	100%

Table V. Event Study Analysis on Bullish Recommendations. (*, **, and * indicate significance of the Patel Z-score or Generalized Sign Test at the .05, .01, and .001 levels, respectively. N = 315 is a sample of all first mentions of a stock during a *Lightning Round*.)**

Event Day(s)	Market Model-Adjusted Abnormal Returns		CRSP Value Weighted Index-Adjusted Abnormal Returns		Mean-Adjusted Abnormal Returns		Raw Returns	
	Average Return	Percent Positive	Average Return	Percent Positive	Average Return	Percent Positive	Average Return	Percent Positive
-10	0.22%**	54.6%**	0.32%**	56.2%**	0.17%	52.7%	0.29%**	56.2%*
-1	0.01%	46.0%	0.10%	47.3%	0.13%*	51.4%	0.25%**	54.6%
0	0.22%**	53.7%*	0.43%***	57.8%**	0.60%***	58.1%***	0.72%***	61.9%***
+1	0.19%	50.8%	0.27%*	51.7%	0.23%*	52.4%	0.35%**	54.3%
(-4,0)	0.35%*	54.9%**	1.00%***	58.1%**	1.21%***	64.1%***	1.81%***	66.7%***
(-2,0)	0.40%**	53.0%*	0.83%***	55.9%*	1.03%***	61.3%***	1.39%***	61.9%***
(0,+1)	0.41%**	52.7%*	0.70%***	58.1%**	0.83%***	57.8%***	1.07%***	62.2%***
(0,+2)	0.30%*	53.0%*	0.68%***	55.6%*	0.84%***	59.4%***	1.21%***	62.9%***
(1,+10)	-0.57%*	46.0%	0.60%	54.6%*	1.19%***	56.5%**	2.39%***	65.1%***
(1,+20)	-1.48%***	45.1%	0.80%	54.0%	1.60%***	62.9%***	4.01%***	73.0%***

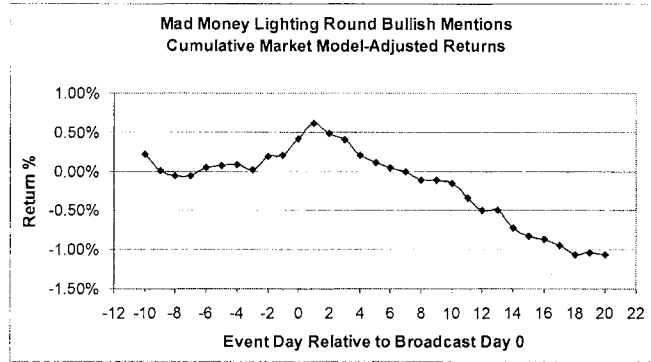
Table VI. Event Study Analysis on Bearish Recommendations. (*, **, and *** indicate significance of the Patel Z-score or Generalized Sign Test at the .05, .01, and .001 levels, respectively. N = 354 is a sample of all first mentions of a stock during a *Lightning Round*.)

Event Day(s)	Market Model-Adjusted Abnormal Returns		CRSP Value Weighted Index-Adjusted Abnormal Returns		Mean-Adjusted Abnormal Returns		Raw Returns	
	Average Return	Percent Positive	Average Return	Percent Positive	Average Return	Percent Positive	Average Return	Percent Positive
-10	0.02%	49.4%	0.10%	50.0%	0.05%	52.8%*	0.12%	53.5%
-1	0.11%	51.7%	0.17%	50.3%	0.31%**	54.0%*	0.39%***	56.0%**
0	-0.21%	44.4%	-0.07%	46.9%	0.03%	52.0%	0.11%	52.0%
+1	-0.27%*	42.3%*	-0.16%	44.3%	-0.06%	48.3%	0.02%	48.6%
(-4,0)	-0.29%	48.6%	0.10%	50.0%	0.42%*	55.4%**	0.81%**	58.5%***
(-2,0)	-0.23%	48.3%	0.03%	48.9%	0.29%*	52.3%	0.53%**	56.2%**
(0,+1)	-0.48%**	43.5%	-0.24%	45.8%	-0.03%	51.4%	0.13%	53.4%*
(0,+2)	-0.72%**	44.3%	-0.39%	46.7%	0.00%	52.8%*	0.23%*	55.4%**
(1,+10)	-0.28%	48.0%	0.62%	54.5%*	1.75%***	63.3%***	2.53%***	64.7%***
(1,+20)	-0.35%	50.3%	1.21%*	55.4%**	2.91%***	65.0%***	4.45%***	70.9%***

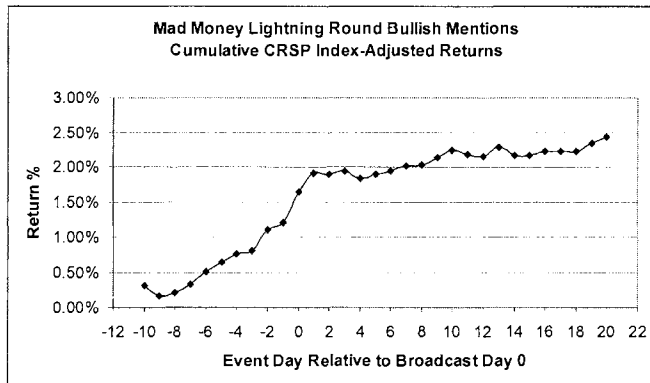
and .001 levels, respectively. N = 354 is a sample of all first mentions of a stock during a *Lightning Round*.)

Figure 1. Cumulative Return Plots for N = 315 "Mad Money Lightning Round" Bullish Mentions, 10/17/2005 to 12/23/2005

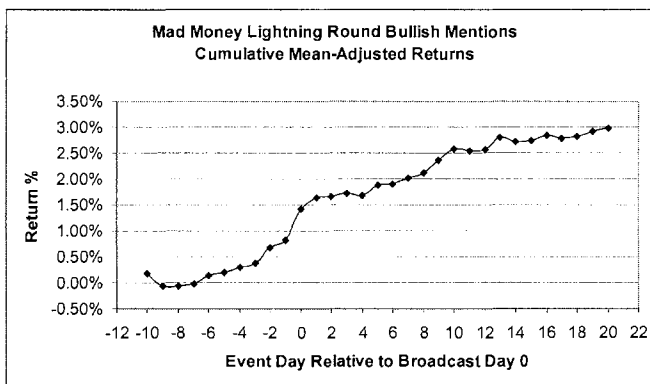
A. Abnormal Returns in Excess of Market Model Expectation.



B. Abnormal Returns in Excess of CRSP Value-Weighted Index



C. Abnormal Returns in Excess of Estimation Period Stock Means



D. Raw Returns

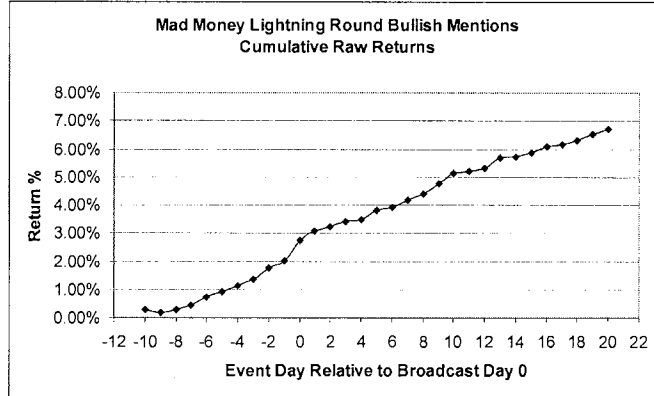
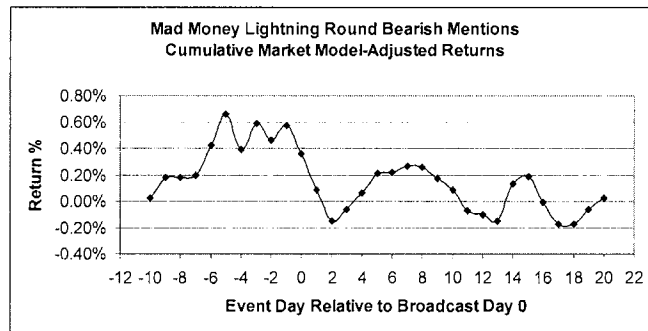
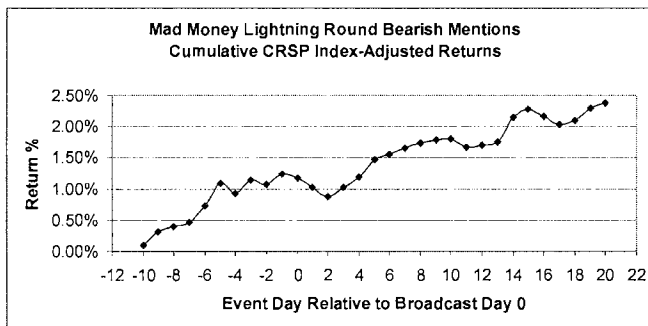


Figure 2. Cumulative Return Plots for N = 354 “Mad Money Lightning Round” Bearish Mentions, 10/17/2005 to 12/23/2005

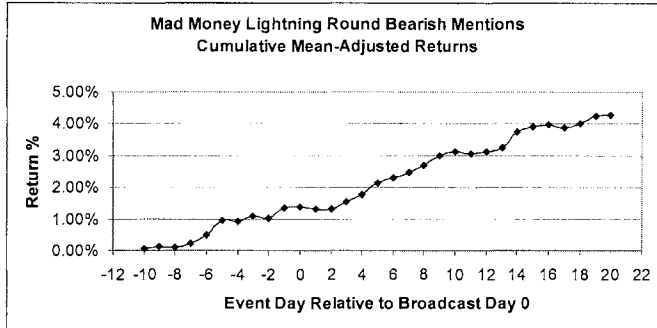
A. Abnormal Returns in Excess of Market Model Expectation



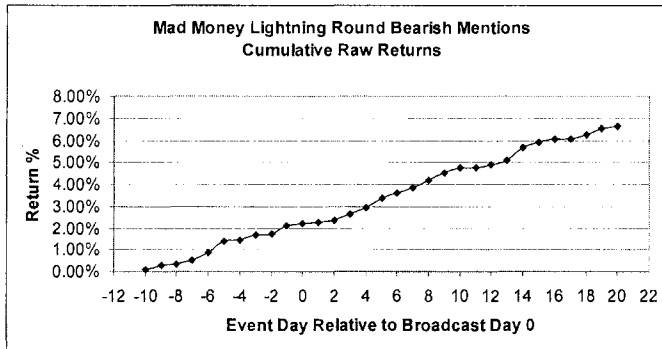
B. Abnormal Returns in Excess of the CRSP Value-Weighted Index



C. Abnormal Returns in Excess of Estimation Period Stock Means



D. Raw Returns



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Interest Rate Sensitivity of Financial Institutions by Liquidity Risk: Evidence from U.S. Property/Liability Insurers

Jin Park and Byeongyong Paul Choi

Abstract

Attempts to understand the impact of interest rate changes on common stock returns have resulted in numerous studies in finance literature, and significant interest rate sensitivity by stocks of financial institutions has been reported. This paper extends the extant literature by investigating US property-liability (P/L) insurer's stock returns with respect to changes in different termed interest rates and to liquidity risk of the stocks. First, returns on property-liability insurers stocks are influenced by changes in interest rates, but the direction shifts as the insurance market condition changes. This is true for every portfolio we studied, albeit at different magnitudes. Second, trading volume also plays a role in stock returns to interest rate changes.

Introduction

Attempts to understand the impact of interest rate changes on common stock returns have resulted in numerous studies in finance literature. After Stone (1974) postulates that return on a security should be endogenous to not only market returns, but also bond returns, numerous studies directly and indirectly show the validity of Stone's argument of interest rate sensitivity of stocks to interest rate changes. To further understand the impact of interest changes on stock returns, studies investigate the relationship between interest rate sensitivity and maturity composition of a firm's assets (Flannery & James 1984a), interest rate sensitivity of firms in different industry (Martin & Keown 1977; and Sweeney & Warga 1986), and interest rate sensitivity of firms by size (Elyasiani & Mansur 1998, 2004; and Park & Choi 2006), to name a few. In addition, a volatility of stock returns, especially using GARCH models, plays a significant role in a stock return study (Elyasiani & Mansur 1998, 2004). Although there is consensus that stock returns of financial instructions are sensitive to interest rate changes, consensus is yet to be reached on the direction and of the effect of short-term and long-term interest rates on stock returns. Park and Choi (2006) find that P/L insurer stocks exhibit different sensitivities to different interest rates at different time periods.

Another important issue in a stock return study includes whether or not the stock trading volume is a useful piece of information in understanding the impact of interest rate changes. The benefit of investigating the impact with respect to trading volume brings dynamic context into the analysis. It is well accepted that liquidity can affect the stock returns. The presence of many traders of a stock (actively traded stock) seems to present challenges and competitiveness to capture excess returns, if any, with useful information, while inadequate number of traders for a stock (inactively traded stock) may provide a better chance to capture excess returns, if any, with useful information. It is well documented that there is an inverse relation between stock returns and trading activity (Chordia et al. 2001 and Brennan et al. 1998).

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Following Stone (1974), this study investigates the impact of interest rate changes on property-liability insurers' stock returns given the liquidity level, proxied by trading volume. In addition, the study further scrutinizes whether or not the magnitude and direction of the impacts are dependent on the maturity of an interest rate. We find that property-liability insurers are influenced by changes in interest rates, but the direction shifts as the insurance market condition changes. This is true for every portfolio we studied, albeit at different magnitudes. The remainder of paper is organized as follow. Next, we review relevant literature, followed by the description of the empirical models and the data. We then discuss the empirical findings, and the final section concludes.

Literature Review

Numerous studies have focused on the impact of interest rate changes on stock returns among different industries, especially after Stone postulates the two-index model. Stone (1974) extended the single market-index model of the return-generating process into a two-index model so as to quantify the concept of systematic IRR. Studies have incorporated various debt market indexes to proxy IRR, such as the Solomon Brother Index (Lloyd & Shick 1977) and Treasury security rates (i.e., Bae 1990; Choi et al. 1992). In addition, Stone's two-index model is frequently augmented with additional explanatory factor such as foreign exchange rate risk (Choi et al. 1992) or two separate debt indexes for short-term and long-term debt (Lynge & Zumwalt 1980; Park & Choi 2006). Under other econometric specifications, stock returns exhibit sensitivity to interest rate changes. (i.e., GARCH-M model by Elyasiani & Mansur 1998). In addition, using Stone's model, Park and Choi (2006) find considerable, but time varying, interest rate sensitivity of property-liability insurer stock returns, and similar time varying interest rate sensitivity by banks is also documented by Akella and Chen (1990). Brewer III et al. (2007) find greater interest rate sensitivity of life insurer stocks than property-liability stocks.

The magnitude of the impact of interest rate changes and the direction of the impact are far from consensus. The magnitude of interest rate sensitivity of stock returns to long-term interest rate changes are reported to be different from that of short-term interest rate changes. For example, Akella and Chen (1990) find that bank stock returns are sensitive to long-term interest rate changes, but not to short-term interest rate changes, while Benink and Wolff (2000) reports a negative sensitivity of bank stock returns to both long- and short-term interest rate changes. Thus, this matter is more of an empirical issue to investigate how and what extent changes of long- and short-term interest rates have an impact on stock returns.

It's not spurring to find that not all stocks are impacted by changes in interest rates after controlling for the market effect. Besides, stock returns of financial institutions such as commercial banks (i.e., Martin & Keown 1977; Sweeney & Warga 1986), utility companies, life insurance companies (Brewer III et al. 2007), and property casualty insurance companies (Park & Choi 2006) are found to be more interest sensitive than firms in other industry.

According to the market efficiency theory, the expected values of factors, such as expected interest rate changes, should be already reflected in asset values; that is, asset returns should be affected by unanticipated changes in factors such as unanticipated interest rate changes. Among others, Akella and Chen (1990) and Choi et al. (1992), Flannery and James (1984a),

Benink and Wolff (2000) conduct the analyses using unanticipated interest rate changes to incorporate the market efficiency theory, but findings are mixed. Flannery and James (1984a & 1984b), and Bae (1990) document no significant difference in the impact of interest rate changes between actual and unanticipated interest rate changes.

Chordia and Swaminathan (2000) report that high volume stocks tend to react promptly to market-wide information and thus trading volume plays an important role in the dissemination of information to the market. The importance of trading activity-related variables in the cross-sectional analysis of expected stock returns is also documented (Chordia et al. 2001). In addition, Blume et al. (1994) demonstrate that both past returns and trading volume are informative in estimating stock returns. Testing an emerging market, Gebka (2005) provides evidence that the direction of trading volume changes contains information. Lee and Rui (2002) also document that, in a dynamic environment like a stock market, trading volume conveys information of price changes. Although many previous studies use change in trading volume as a factor affecting prices or returns, Lee and Rui (2002) find that trading volume does not Granger-cause stock market returns in three different stock markets studied, including US.

Empirical Model and Data

The sensitivity of P/L insurer stock returns to interest rate changes¹, following Stone's argument, specifies the following return generating process:

$$\text{Model 1: } R_{jt} = \alpha_j + \beta_{Mj} R_{Mt} + \beta_{Ij} R_{It} + \varepsilon_{jt},$$

where R_{jt} is the return on the j th portfolio at time t , and R_{Mt} is the market return at time t . R_{It} is the return on interest rate indexes, and ε_{jt} is the error term. The α_j , β_{Mj} , and β_{Ij} are constant characteristics of portfolio j and the parameters to be estimated. In Model 1, β_{Mj} and β_{Ij} represent systematic equity risk and systematic interest-rate risk, respectively. This study focuses specifically on the β_{Ij} , which presents the effect of nominal interest rate changes on the stock return.

Multicollinearity between R_{Mt} and R_{It} in Model 1 exists and an orthogonalizing procedure between them is suggested. However, a theoretical justification for "what causes what" is not clear. That is, if an orthogonalization scheme is to regress R_{Mt} on R_{It} , the estimate of β_{Mj} will be the same, but the estimate of β_{Ij} will be changed. For a reverse orthogonalization scheme, the estimate of β_{Ij} is the same, but the estimate of β_{Mj} will be changed. Although Giliberto (1985) and Akella and Chen (1990) note that an appropriate model depends on *a priori* specification of the true return generating process, Kane and Unal (1988) find that the parameter space spanned is the same regardless of whether or not the indices are orthogonalized. To eliminate the multicollinearity between interest rate indices and market returns, we adopt an orthogonalization scheme such that R_{Mt} is regressed on R_{It} as $R_{Mt} = a + bR_{It} + \delta_t$, where a and b are parameters to be

¹ The P/L insurance industry assets distributions for the year 2006 are U.S. government and municipal securities (39.0%), corporate and foreign bonds (20.4%), corporate equities (17.0%) and other miscellaneous assets (23.6%), according to Insurance Information Institute.

estimated and δ_t is a residual, which is serially uncorrelated to R_{jt} . The substitution of this scheme into Model 1, the following return generating model, Model 2, is specified:

$$\text{Model 2: } R_{jt} = \gamma_j + \beta_{Mj} \delta_{Mt} + \lambda_{lj} R_{lt} + \varepsilon_{jt},$$

where $\gamma_j = \alpha_j + a\beta_{Mj}$ and $\lambda_{lj} = b\beta_{Mj} + \beta_{lj}$.

To investigate the impact of unanticipated interest rate changes on P/L insurer stock returns, this study estimates unanticipated interest rate changes using ARIMA specifications.² The forecast errors of the ARIMA processes, UR_{lt} , are adopted as a proxy for the unanticipated interest rate changes. The return generating model with the unanticipated interest rate changes to be estimated is as follow:

$$\text{Model 3: } R_{jt} = \omega_j + \beta_{Mj} R_{Mt} + \beta_{lj} UR_{lt} + \eta_{jt},$$

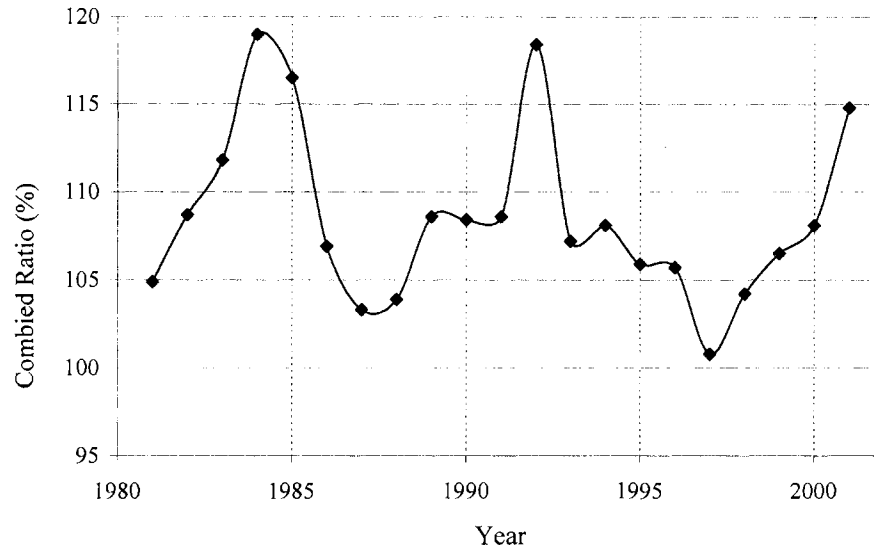
where η_{jt} is the error term.

Starting 94 property-liability insurers retrieved from the Center for Research in Security Prices (CRSP), this study ends up having a sample of 37 insurers for years between 1992 and 1996 period and a sample of 39 insurers for the years between 1997 and 2001. Two sets of sample insurers meet the following two selection criteria: (1) Insurers must belong to SIC 6331: Property and Casualty Insurance in the CRSP data file; and (2) Insurers must have continuous data over the either sample period.

The time period this study investigates, between 1992 and 2001, represents the insurance industry's full business cycle, so called underwriting cycle. The combined ratio is commonly used to indicate the profitability of the insurer's operations by combining the loss ratio with expense ratio. Thus, the higher the ratio, the lower the operating profitability is. As illustrated in Figure 1, between 1992 and 1996, the P/L industry has experienced increasing underwriting profit, followed by the period between 1997 and 2001 with decreasing underwriting profit.

Friday-ending weekly returns are calculated as $(P_t - P_{t-1}) / P_{t-1}$, where P_t is Friday-ending insurer's stock price at time t . Same methods are used to obtain market returns using S&P 500 index as a proxy for market and interest rate changes using Treasury indices. In order to focus on the effect of interest rate changes on the P/L insurers' stocks, the unit of analysis is a portfolio of stocks instead of an individual stock. The insurers are grouped into two portfolios depending on the trading volume. Unlike studies that have documented or tried to document roles of trading volume on correlating stock returns, this study focus on how stocks with different level of trading activity are associated with interest rate sensitivity. For the purpose of this study, creating a portfolio by trading activity can be simply done based on the number of trading shares. The percentage of outstanding shares traded can be used as well. The use of portfolios in lieu of individual stocks alleviates, if not completely removes, idiosyncratic behaviors of an individual

² See Appendix 1 of Park and Choi (2006) for ARIMA model specifications used to estimate the unanticipated interest rate changes.

Figure 1. Aggregated Stock Property-Liability Insurer's Combined Ratios for Years 1981 - 2001

stock. This study uses equally weighted average returns of portfolios, and the number of observations is 261 weeks for the first period and one less week for the second period due to the market closing after the terrorist attack on September 11, 2001.

The market returns and various Treasury rate indexes are obtained from the CRSP file and the *Federal Reserve Bulletin*, respectively. To investigate differences in the sensitivity with respect to different termed interest rates, this study tests six different maturities – 3-month, 1-year, 3-year, 7-year, 10-year, and 30-year Treasury security rates.

Discussion of Findings

The descriptive statistics of sample insurers in two different time periods are reported in Table 1, which shows that regardless of the industry's condition, the portfolio of inactive-traded insurers considerably outperforms its counterpart (0.21% vs. 0.32% in the first time period and 0.07% vs. 0.18% in the second time period), which is consistent with Chordia et al. (2001) and Brennan et al. (1998). Surprisingly, when the industry's operating profit deteriorates (Panel B), the return volatility of the portfolio of inactive-traded insurers is less than its counterpart (3.31% vs. 2.30%). There is a significant difference in trading activity between two sub-sample periods such that actively traded stocks become more active when the industry's operating profit deteriorates (from 130,791 shares to 507,231 shares) while inactive-traded stocks are rather stable (from 11,767 shares to 15,784 shares).

Table 1. Descriptive Statistics of Portfolios of Property-Liability Insurer Stocks

Portfolio	No. of Insurers	Weekly return (%)		Daily trading volume (shares)		Market value (in \$1,000,000)	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
<u>Panel A. 1992 – 1996 Time Period</u>							
Actively-traded Insurers	19	0.2100	1.6740	130,791	127,665	4,110.4	8,227.9
Inactively-traded Insurers	18	0.3262	1.7180	11,767	9,318	2,133.9	6,352.6
Total Insurers	37	0.2665	1.4219	72,888	108,754	3,148.8	7,342.3
<u>Panel B. 1997 – 2001 Time Period</u>							
Actively-traded Insurers	20	0.0717	3.3132	507,231	726,491	13,161.8	34,334.2
Inactively-traded Insurers	19	0.1809	2.2971	15,784	11,643	4,805.6	18,663.3
Total Insurers	39	0.1249	2.5259	267,808	570,865	9,090.8	27,790.6

In each time period, the portfolio of Inactively-traded (Actively-traded) insurers is comprised of insurers of which daily trading volume is less (greater) than the median.

When it comes to interest rate sensitivities of the portfolios of insurers stocks, the finding suggests that P/L insurers' stocks are influenced in a different direction depending on the industry's operating profits. However, this study finds little difference in results from different econometric model specifications. Tables 2 through 4 present coefficient estimates of interest rate indices for three return generating models specified in the previous section. Regardless of portfolio specification by trading activity, interest rate indices used, or econometric model specifications, negative interest rate sensitivities are found during 1992 – 1996 time period, while the sign of coefficient estimates is opposite during 1997 – 2001 time period. This is consistent with Park & Choi (2006) in terms of directions of the sensitivities and also with Akella and Chen (1990) who reports the time varying interest rate sensitivity of bank stocks.

When multicollinearity between market returns and interest rate changes is removed (Model 2), the explanatory power of the model (R^2 is not reported) and the statistical significance of coefficient estimates of interest rate changes substantially improves (Table 3 vs. Tables 2 and 4). However, as are reported by Flannery and James (1984a) and Bae (1990), this study also finds that the observed changes in interest rates are as good a factor as the unanticipated changes in an interest rate (Table 2 vs. Table 4).

Since the reported coefficients in tables are very consistent in terms of the direction and the statistical significance, further discussion is limited to Table 3. It is noted from Table 3 that insurers' stocks are more negatively (positively) sensitive to changes in long-term (short-term) interest rates than short-term (long-term) when the industry's underwriting experience is improving (deteriorating). For example, the reported interest rate coefficient estimates of actively-traded portfolio decrease in absolute value from -0.477 for 30-year T-Bond to -0.156 for 3-month T-Bills. This is the same for the coefficient estimates of inactively-traded portfolio as

Table 2. Estimates of Interest Rate Sensitivity for Portfolios of Property-Liability Insurer Stocks
Model 1: $R_{jt} = \alpha_j + \beta_{Mj} R_{Mt} + \beta_{lj} R_{lt} + \varepsilon_{jt}$

Interest rate index	Portfolio Classification (1992 – 1996)			Portfolio Classification (1997 – 2001)		
	Inactive	Active	Total	Inactive	Active	Total
3 - month	-0.058 (0.053)	-0.118 *** (0.044)	-0.088 ** (0.039)	0.208*** (0.045)	0.150** (0.062)	0.179*** (0.046)
1 - year	-0.086 * (0.048)	-0.109 *** (0.040)	-0.098 *** (0.035)	0.173*** (0.050)	0.127* (0.067)	0.149*** (0.050)
3 - year	-0.075 (0.046)	-0.125 *** (0.038)	-0.101 *** (0.034)	0.149*** (0.052)	0.112 (0.070)	0.130** (0.052)
7 - year	-0.097 * (0.057)	-0.162 *** (0.047)	-0.131 *** (0.041)	0.103 (0.065)	0.070 (0.086)	0.086 (0.064)
10 - year	-0.117 * (0.063)	-0.198 *** (0.052)	-0.159 *** (0.046)	0.086 (0.068)	0.062 (0.090)	0.074 (0.068)
30 - year	-0.153 * (0.081)	-0.250 *** (0.067)	-0.203 *** (0.059)	0.019 (0.085)	0.013 (0.112)	0.016 (0.085)
Insurers in portfolio	18	19	37	19	20	39
Observations	261	261	261	260	260	260

***, **, and * indicates statistical significance at 1, 5, and 10 percent levels, respectively, and standard errors in parenthesis.

Table 3. Estimates of Interest Rate Sensitivity for Portfolios of Property-Liability Insurer Stocks
With Orthogonalized Market Returns, Model 2: $R_{jt} = \gamma_j + \beta_{Mj} \delta_{Mt} + \lambda_{lj} R_{lt} + \varepsilon_{jt}$

Interest rate index	Portfolio Classification (1992 – 1996)			Portfolio Classification (1997 – 2001)		
	Inactive	Active	Total	Inactive	Active	Total
3 - month	-0.078 (0.053)	-0.156 *** (0.044)	-0.118 *** (0.039)	0.287*** (0.044)	0.309*** (0.060)	0.298*** (0.044)
1 - year	-0.128 *** (0.047)	-0.188 *** (0.039)	-0.158 *** (0.035)	0.261*** (0.049)	0.300*** (0.065)	0.281*** (0.049)
3 - year	-0.119 *** (0.045)	-0.208 *** (0.037)	-0.165 *** (0.033)	0.236*** (0.051)	0.281*** (0.068)	0.259*** (0.051)
7 - year	-0.165 *** (0.055)	-0.291 *** (0.045)	-0.230 *** (0.040)	0.169*** (0.064)	0.192** (0.085)	0.181*** (0.064)
10 - year	-0.195 *** (0.061)	-0.344 *** (0.050)	-0.272 *** (0.044)	0.152** (0.068)	0.183** (0.089)	0.168** (0.067)
30 - year	-0.258 *** (0.078)	-0.447 *** (0.064)	-0.355 *** (0.057)	0.033 (0.085)	0.039 (0.112)	0.036 (0.085)
Insurers in portfolio	18	19	37	19	20	39
Observations	261	261	261	260	260	260

Table 4. Estimates of Interest Rate Sensitivity for Portfolios of Property-Liability Insurer Stocks With Unexpected Interest Rate Changes, Model 3: $R_{jt} = \alpha_j + \beta_{Mjt} R_{Mt} + \beta_{Ijt} UR_{It} + \eta_{jt}$

Interest rate index	Portfolio Classification (1992 – 1996)			Portfolio Classification (1997 – 2001)		
	Inactive	Active	Total	Inactive	Active	Total
3 - month	-0.046 (0.054)	-0.109 ** (0.045)	-0.079 ** (0.040)	0.212*** (0.042)	0.171*** (0.057)	0.191*** (0.042)
1 - year	-0.100 ** (0.051)	-0.111 *** (0.042)	-0.106 *** (0.037)	0.203*** (0.049)	0.180*** (0.066)	0.191*** (0.049)
3 - year	-0.083 * (0.048)	-0.121 *** (0.040)	-0.102 *** (0.035)	0.167*** (0.053)	0.144** (0.071)	0.155*** (0.053)
7 - year	-0.100 * (0.058)	-0.147 *** (0.048)	-0.124 *** (0.043)	0.108 (0.067)	0.075 (0.088)	0.091 (0.066)
10 - year	-0.124 * (0.065)	-0.181 *** (0.054)	-0.153 *** (0.048)	0.081 (0.071)	0.051 (0.093)	0.065 (0.070)
30 - year	-0.154 * (0.084)	-0.219 *** (0.069)	-0.188 *** (0.061)	-0.008 (0.088)	-0.040 (0.117)	-0.025 (0.088)
Insurers in portfolio	18	19	37	19	20	39
Observations	261	261	261	260	260	260

***, **, and * indicates statistical significance at 1, 5, and 10 percent levels, respectively, and standard errors in parenthesis.

well. However the magnitude changes during the second time period from insignificant 0.039 to 0.309 for same portfolio category. This finding suggest that insurers may changes their balance sheet and/or off-balance sheet components, including asset and liability portfolios to reflect their changes in operating profits, causing a change in a maturity gap between their assets and liabilities. It has been postulated that the maturity gap between interest rate sensitive assets and liabilities is the source of interest rate sensitivity (Flannery & James 1984b; Kwan 1991).

The systematic difference in interest rate sensitivity between portfolios by trading volume is also noted from the table. In either time period, changes in interest rates have a greater impact on the portfolio of actively-traded insurers than its counterpart. Interest rate sensitivities of the portfolio of actively-traded insurers (inactively-traded insurers) range between -0.447 (-0.258) to changes in 30-year T-Bonds rate in 1992 – 1996 time period and 0.309 (0.287) to changes in 3-month T-Bills rate in 1997 – 2001 time period.

Conclusions

Using sample of US property/liability insurers stock returns during the time period of 1992 to 2001, this study reports several significant findings. First, this study finds greater mean return for inactively-traded stocks than actively-traded stocks. Second, P/L insurers' stock returns are sensitive to changes in interest rates, but time varying. Considering the fact that there has not been a regulatory change during the time period studied, which may affect or explain the

apparent time varying sensitivity, we attribute the time varying interest rate sensitivity to the change in the industry's operating performance (see Figure 1), and we suspect that insurers adjust their asset-liability composition to react to the industry's (or individual insurer's) performance operating. Third, the capital market seems to regard the liquidity risk of insurers, in addition to the industry's business cycle. Stocks of actively traded insurers are affected greatly and widely by changes in interest rates. Finally, the sensitivity also differs drastically depending on the interest rate maturity.

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Analyzing The Value of Proprietary Claims Under Uncertainty: A Real Options Approach

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Abstract

This paper develops and implements a general framework for evaluating proprietary claims generated by patents based on a real options approach. Our model considers both demand and competitive uncertainty as endogenous variables in the valuation process, and recognizes the interaction between the proprietary claim and the deferral and abandonment options embedded in an investment project. We find that the acquisition of a patent enhances the value of the deferral option, but reduces the value of the abandonment option as a consequence of reduced competitive uncertainty. Although we illustrate our approach with a product launch of a new technology in the automotive industry, our model applies just as easily to any capital budgeting problem where proprietary rights play an important role.

Introduction

Given that project cash flows fluctuate over time and are a function of demand and competitive factors, most investment decisions are dynamic, rather than static, “now or never” decisions implied by conventional discounted cash flow (DCF) analysis. In fact, traditional DCF analysis can lead to erroneous accept/reject decisions. It is now widely accepted that most investment decisions are analogous to buying options, giving the buyer the right but not the obligation to go ahead with the project. A real option is a right (with no obligation) to take specific future investment actions contingent on how uncertain conditions regarding project output price and demand evolve over time. A real options approach to capital budgeting analysis recognizes that a manager has the freedom to defer work on the project, expand or scale it back, shut down the project temporarily, or abandon it permanently. A large body of literature has developed over the past twenty years demonstrating the important role of real options in a firm’s optimal investment strategies (Brennan and Schwartz 1985, McDonald and Siegel 1986, Ingersoll and Ross 1992, Dixit and Pindyck 1994). It is logical, therefore, that the real options approach should also play a significant role in analyzing the value of a firm’s investment in a patent. Patents create entry barriers for competitors up to a pre-determined future time, and hence may be regarded as proprietary claims on the underlying product. The evaluation of such claims is a challenging problem because their effect on the real investment is not directly observable, and therefore hard to quantify. The goal of this paper is to present a real options framework for valuing proprietary claims under uncertain market and demand conditions, wherein the uncertainty is endogenous to the evaluation process. We also examine the value of the deferral and abandonment options resulting from patenting decisions on the net present value of investments under uncertain market and demand conditions. The following relevant considerations, often overlooked or considered in piecemeal fashion, are addressed cohesively in our paper.

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First, the value of the patent is contingent upon the degree of demand and competitive uncertainty. The possible action by rival firms and potential entrants has a significant bearing on the opportunity cost of not imposing patent induced entry barriers, and is thus reflected in the patent value. The impact of competitive interaction on real investments has already been studied by several authors (Kulatilaka and Perotti 1998, and Reiss 1998), who recommend that the market structure be incorporated into the valuation model. Similarly, the product life cycle dynamics can enhance or diminish the benefits of the entry barrier provided by the patent. Several authors attempt to capture demand uncertainty by allowing for complex asset return dynamics driven, for instance, by jump-diffusion type stochastic differential equations (Angelis 2000, Pennings and Lint 1997, Willner 1995) or by Markov processes with switching parameters (Bollen 1998, 1999).

Second, a patent creates a proprietary claim over the new technology, giving its owner flexibility over new investments associated with the project. Firms holding a patent may still need to undertake further research and development to make the product ready for market, as well as expensive marketing and advertising to promote a new product (Blundell, Griffith, and Van Reenen 1999). However, since patents give their holders the exclusive rights to the new technology, they have the option to wait before making these sunk cost investments (Bloom and Van Reenen 2002). Thus, by providing a firm with a right to defer investment in a project, a patent also has a deferral value in addition to the proprietary value it confers on its owner.

Third, investing in a patent may affect the value of other real options embedded in the investment. Assume, for instance, that the firm has the right to abandon the project for a specified salvage value. It is possible that the new product is not embraced by the market, and cash flows turn out to be lower than anticipated, or alternatively, costs may turn out to be higher than expected. In either case, these catastrophic events could trigger the exercise of the abandonment option, whose value is substantial when demand and/or competitive uncertainty is large (Schwartz and Moon 2003). It is clear that investing in the patent diminishes the worth of the abandonment option because it reduces the demand and/or competitive risk.

In the following sections, we develop a market model and illustrate a methodology for computing the present value of real investments within our theoretical setting. We employ the explicit finite difference method for valuing proprietary claims as real options. Given the difficulty of obtaining a closed form expression for the project net present value, we derive an algorithm to evaluate it recursively. Next, we illustrate the valuation of proprietary claims within our framework with the help of a hypothetical example of the launch of an automobile based on a new technology. Finally, we offer some concluding observations from our example.

The Market Model

Since the net present value of investment in a project depends upon the demand for the underlying output, we begin by specifying the demand function. Let Y_t denote the demand for the output of the real investment. Also, let us assume that Y_t solves the following diffusion type stochastic differential equation with random coefficients:

$$dY_t = Y_t(\mu(S_t)dt + \sigma(S_t)dW_t) \quad S_t = 0, 1, \dots, N \quad (1)$$

S_t is continuous time Markov chain taking values in the state space $\{0, 1, 2, \dots, N\}$. Our market model permits migration to different states or market regimes that describe the random evolution of the environmental variables affecting the value of the real investment. These inter-state

migrations are governed by the continuous time Markov chain, S_t . Each state is assigned the vector $\{\mu_i, \sigma_i, \theta_i\}$, where μ_i and σ_i respectively denote state i drift in demand growth and volatility coefficients in (1) and θ_i is a percentage profit mark-up parameter related to the market competitive structure prevailing in state i . States $\{0, 1, 2, \dots, M\}$ are described by specified drift, volatility and mark-up levels associated with distinct phases of demand evolution, when the technology is protected by the patent. Similarly, states $\{M+1, M+2, \dots, N\}$ are described by drift, volatility and mark-up levels associated with each stage of demand evolution when the market is deregulated. The absorbing state N is a “bankruptcy” state that determines the random time when the project’s useful life comes to an end. Once the chain visits state N , the cash flows generated by the real investment become zero. Let the price of the real asset output be defined as:

$$\rho_i(Y_t, S_t) = \psi(Y_t, \theta_i) \quad S_t = 0, 1, \dots, N \quad (2)$$

for some known function $\psi(\cdot, \cdot)$. Equation (2) is intuitively appealing, since pricing policies are contingent both upon production levels, which affect marginal costs and revenues, and market competitive structure, which affects the price elasticity of demand.

The probabilistic behavior of the Markov chain, S_t , is entirely characterized by its infinitesimal generator, which takes the form of an $N \times N$ matrix:

$$A(u) = [\lambda_{ij}(u)] \quad (3)$$

whose values, λ_{ij} , are the transition rates from state i to state j for $i \neq j$ and $\lambda_{ii} = -\sum_{j \neq i} \lambda_{ij}$.

Given an initial probability vector, $P(S_0)$, the time t probability distribution of the chain, $P(S_t)$ is easily computed as the solution to the Chapman Kolmogorov equations:

$$P(S_t) = P(S_0) \exp(A(u)t) \quad (4)$$

We hypothesize that the generator’s structure is a function of a parameter, u , which denotes the patenting strategy adopted by the firm. For simplicity, we shall assume that the firm can adopt a finite number of patenting strategies, and that there is a one to one correspondence between the form of the generator and the action taken by the firm. Let us use the following example to make this construction clear. Assume that a firm has the possibility of acquiring a patent for a finite time period, say five years, at a specified cost. The firm has thus two strategic possibilities (that is, u takes one of two distinct values), namely:

- a. acquire the patent and impose an entry barrier for the next five years; or
- b. do not acquire the patent and allow competition to enter the market immediately

Under case (a), the transition rates to competitive regimes are zero for the first five years of the life of the investment, whereas under case (b), the transition rates assume specified positive values for the entire life of the investment.

In the next section, we illustrate a methodology for evaluating real investments in our framework. We regard the real investment as a contingent claim paying a stream of cash flows, which depend upon the evolution of the underlying market. In this framework, the project value is the expectation of the future discounted cash flows generated by the investment. A critical feature in real options theory is the choice of an appropriate discount rate. The value of a real asset is, in fact, contingent upon the evolution of non traded state variables, such as demand, prices, or costs, thus making it difficult to justify risk neutral valuation. In the practice of capital budgeting, it is common to carry out all discounting operations at a risk adjusted rate, where,

risk adjustment, or premium, is determined by the risk preferences of the project stakeholders. We assume that the risk adjusted rate is given by the Capital Asset Pricing Model (CAPM):

$$\kappa = r + \beta(r_m - r) \tag{5}$$

where r is the risk-free rate, r_m is the market return and β is the risk-adjusted beta for the project.

Project Valuation Methodology

Let $f(Y_t, t | S_t)$ denote the time t instantaneous cash flow function, conditional upon the state visited by the Markov chain in the time interval $[t, t + \delta t]$, henceforth referred to as an instantaneous move. The present value of the project $\pi(Y_t, t)$ is computed as:

$$\pi(Y_t, t) = E^{Y_t, t} \left[\int_t^T f(Y_s, s | S_s) \exp(-\kappa(s - t)) ds \right] \tag{6}$$

where $E^{Y_t, t}[\cdot]$ stands for actuarial expectation conditional on the time t value of the process Y_t and T is the random useful life of the investment. Since $f(Y_t, t | S_t)$ is a diffusion function with random coefficients and the upper bound of integration is a random time, this expectation is hard to compute in closed form; hence we develop an algorithm to compute (6) recursively.

Before developing our methodology, however, we need some preliminary results. Let Y_t be the solution to the stochastic differential equation in (1) and define the following function:

$$C(Y_t, t | S_t = i) = E^{Y_t, t} [e^{-\kappa(\delta t)} (\varphi(Y_{t+\delta t}, t + \delta t)) | S_t = i] \tag{7}$$

as the expectation of $\varphi(Y_{t+\delta t}, t + \delta t)$, conditional on Y_t , and on the state visited by S_t in an instantaneous move for some known function $\varphi(\cdot, \cdot)$. Note that $C(Y_t, t | S_t = i)$ is conditionally Markovian with respect to the information generated by both the macroeconomic factor Y_t and the latent Markov chain, S_t . This implies that its value depends on the evolution of Y_t and S_t based only on their current level. By the Feynman-Kac formula, $C(Y_t, t | S_t = i)$ satisfies the following partial differential equation:

$$\frac{\partial C}{\partial t} + \frac{1}{2} \sigma_t^2 Y^2 \frac{\partial^2 C}{\partial Y^2} + \mu_t Y \frac{\partial C}{\partial Y} - \kappa C = 0 \tag{8}$$

with terminal condition given by

$$C(Y_{t+\delta t}, t + \delta t | S_t = i) = \varphi(Y_{t+\delta t}, t + \delta t)$$

Although the coefficients of the above partial differential equation are random, inasmuch as they depend on the state of the Markov chain in the interval $[t, t + \delta t]$, one can safely assume they are constant in the infinitesimal. The probability of the chain jumping more than once in such time interval is, in fact $o(\delta t)$, signifying an inferior order of magnitude, and thus negligible. We use the above results to derive the following backward recursive relation for computing the time t present value of the project.

Proposition 1: under dynamic market conditions described by (1), given the instantaneous cash flow function $f(Y, t)$, the expectation in (6) can be computed recursively as follows:

$$\pi(Y, t) = \sum_{i=0}^N (f(Y, t | S_t = i) + C(Y, t | S_t = i))P(S_t = i) \quad (9)$$

where

- a) $C(Y, t | S_t = i)$ satisfies (8) with terminal conditions $C(Y_{t+\delta}, t + \delta) = \pi(Y_{t+\delta}, t + \delta)$
- b) $P(S_t = i)$ denotes the probability of the chain visiting state i in $[t, t + \delta]$ as in (4)
- c) the starting point for the recursion is the time T terminal condition $\pi(Y_T, T) = f(Y_T, T)$

The proof of Proposition 1 is provided in the Appendix.

Implementation Outline

In this section we outline the steps for computing (6). Let the domain $\{Y, t\}$ be a two-dimensional mesh, where Y_m^k denotes the gridpoints with time coordinate k ($k \in [0, 1, \dots, T]$) and Y coordinate m ($m \in [0, 1, \dots, M]$). Let δY be the size of the step in the Y direction and δt be the time-step size. Discretizing and rearranging (4) as in the implicit finite difference scheme:

$$C_m^{k+1}[i] = \left[-\frac{\delta}{\delta Y^2} \frac{1}{2} \sigma_i^2 Y_m^{k2} - \frac{1}{2} \frac{\delta}{\delta Y} \mu_i Y_m^k \right] C_{m+1}^k + \left[1 + 2 \left(\frac{\delta}{\delta S^2} \frac{1}{2} \sigma_i^2 Y_m^{k2} \right) + \delta(+\kappa) \right] C_m^k + \left[-\frac{\delta}{\delta S^2} \frac{1}{2} \sigma_i^2 Y_m^{k2} + \frac{1}{2} \frac{\delta}{\delta S} \mu_i Y_m^k \right] C_{m-1}^k \quad (10)$$

Equation (10) is valid for $0 < m < M$. The notation $C_m^{k+1}[i]$ indicates that the equation coefficients are $\{\mu_i, \sigma_i\}$, e.g. $S_{(k-1)\delta t} = i$.

If C_m^{k+1} are known for all m , then, the difference equation (10) yields a linear system of $M-1$ equations with $M-1$ unknowns. Given boundary conditions, $C_0^k = g(k\delta t)$ and $C_M^k = h(k\delta t)$ provide the values of C_0^k and C_M^k , reducing the problem to a tridiagonal system of M equations in M unknowns, which is easily solved using standard methods. With this in mind, the implementation of the algorithm becomes straightforward. For clarity of exposition we present it in successive steps: Let T be the first time when the probability of being in the “bankruptcy” state is one, where T can be found using (4). This choice of T ensures that the expectation in (7) is taken over all possible stopping times. The final vector of grid-points

$$C_m^T = \pi(m\delta Y, T\delta t) = \sum_{i=1}^N f(m\delta Y, T\delta t | S_T = i)P(S_T = i) \text{ is known for every } m.$$

- 1) Compute $C_m^{T-1}[i]$ solving the linear system (9) for each i
- 2) Compute $\pi(m\delta Y, (T-1)\delta t) = \sum_{i=0}^N (f(m\delta Y, (T-1)\delta t | S_t = i) + C_m^{T-1}[i])P(S_{(T-1)\delta t} = i)$ using

Proposition 1

- 3) Set $C_m^{T-1} = \pi(m\delta Y, (T-1)\delta t)$
- 4) Repeat steps (1) to (3) until the 0 time step is reached.

Our finite difference model therefore uses a set of discrete time difference equations and solves these difference equations using a “rollback” process. Given the choice of discretization scheme, the algorithm inherits the error order and stability properties of the relative finite difference scheme. We opted for the implicit finite difference approach as opposed to the binomial, trinomial or other lattice based discrete time approximations of the continuous time model

because the finite difference approach maintains good stability properties and is easily implemented (Balsara et al, 2005).

Evaluation of Proprietary Claims using a Hypothetical Example

In this section, we illustrate how proprietary claims are evaluated within the context of our proposed framework. Since we endogenize the uncertainty driving the value of the proprietary claim in the evaluation of the project investment, we are able to quantify the effect of acquiring the patent on the project net present value (NPV) as the difference between the project NPV with and without patent protection. Next, we evaluate the effect of the patent on the manager's right to defer and/or abandon the project. To illustrate our model, we discuss our methodology in relation to a hypothetical example. In particular, we analyze the market launch of an automobile based on new technology, as for example, a hybrid car which uses both gasoline and electricity.

1. Investment Timing

At time $t = 0$, car manufacturer XYZ is preparing a business plan for the introductory phase of a hybrid vehicle. This is a breakthrough technology, with a high degree of uncertainty surrounding its acceptance by the market. Also, other car manufacturers are developing similar technologies, and their entry in the hybrid car market poses a serious competitive threat to XYZ. Management believes that first entrant advantage will be a crucial factor, but is uncertain as to whether to immediately commit to the investment, or defer it to some later time τ , when demand conditions are clearer. However, the firm can purchase a patent for an instantaneous fee $\alpha(t)$ to protect its investment up to a future date T_k , $k = 1, 2, 3, K$, where T_k are fixed deadlines specified by sector regulations. The patent provides two distinct economic benefits to company XYZ:

- a. It gives XYZ a proprietary claim to the technology for the hybrid automobile, by creating entry barriers for its competitors.
- b. It allows XYZ to enter the market when demand conditions are favorable, thus providing the firm with the right to defer commercialization of the new technology.

We make the following simplifying assumptions regarding the entry strategy of the firm XYZ:

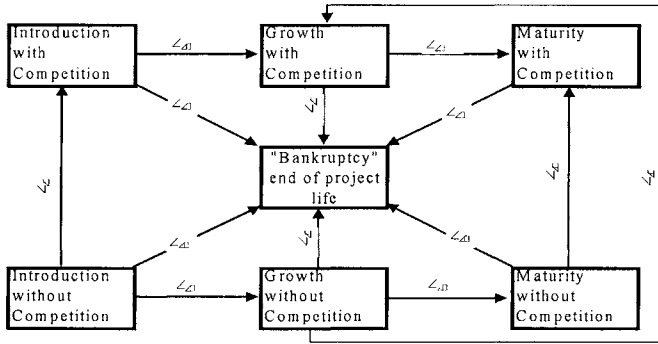
- 1) The entry time τ takes values in the finite set $\Lambda = \{0, t_0, t_1, t_2, \dots, t_n\} \cup \{\infty\}$ with $t_n < T_k$. This notation indicates that the entry time is either less than or equal to t_n , or the firm will defer the capital outlay indefinitely. If the firm decides not to buy the patent, it will enter the market immediately, e.g. $T_k = 0$ implies $\tau = 0$.
- 2) At the time of entry, the firm incurs a lump-sum capital outlay, $X(t)$, that includes the cost of converting some of its manufacturing plants to hybrid production technologies, plus marketing and launch expenditures. Plant conversion time is assumed to be zero, so that production starts as soon as the entry decision is made. At any time after the launch, the firm can abandon the project and resell its manufacturing equipment for a salvage value $K(t)$.

2. Demand Dynamics

Let the demand for XYZ hybrid vehicles, Y_t , evolve as in (1), with $N=7$ states. States $\{1\}$, $\{2\}$, and $\{3\}$, which we refer to as "monopoly" regimes, correspond to the introduction, growth, and maturity phases of the product life cycle when the market is protected by the patent

agreement. States {4}, {5} and {6}, denoted as “competitive” regimes, are the corresponding phases of the product life cycle in a deregulated market with no patent protection. Once the Markov chain visits the absorbing state {7}, the investment ceases to produce cashflows. Figure 1 presents a schematic representation of the interaction between the different states. To each state is associated the corresponding vector $\{\mu_i, \sigma_i, \theta_i\}$, where μ_i and σ_i denote drift and diffusion coefficients of the demand process and θ_i is the percentage mark-up on marginal costs in each market regime. We claim that in “monopoly” regimes, the parameters μ_i and θ_i are at least as high as their counterparts in “competitive” regimes, while the inverse relation holds for the volatility coefficients. For instance, state {1} corresponds to “introduction in monopoly regime” while state {4} models “introduction in competitive regime” and the market parameters are as follows: $\mu_1 \geq \mu_4$, $\theta_1 \geq \theta_4$, $\sigma_1 \leq \sigma_4$.

Figure 1. Structure of the Markov Chain



The infinitesimal generator of the Markov chain assumes different structures according to the patenting policy adopted by the firm. Recall from section 1 that the parameter u expresses the choice of the patent’s expiration date, T_k . It is easy to see that the chain’s infinitesimal generator $A(u)$ can take different forms, each corresponding to a different patent expiration date alternative. Before the patent expires, the transition rates to the “competitive” states are equal to zero, because the market is legally protected from new entrants while, after T_k , the market is deregulated and competitive threats must be included in the model. Therefore,

$$\begin{aligned}
 \text{If } t \leq T_k \quad A^- &= \begin{bmatrix} -\sum \lambda_{1j} & \lambda_{12} & 0 & 0 & 0 & 0 & \lambda_{17} \\ 0 & -\sum \lambda_{2j} & \lambda_{23} & 0 & 0 & 0 & \lambda_{27} \\ 0 & 0 & -\sum \lambda_{3j} & 0 & 0 & 0 & \lambda_{37} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\
 \text{If } t > T_k \quad A^- &= \begin{bmatrix} -\sum \lambda_{1j} & \lambda_{12} & 0 & \lambda_{14} & 0 & 0 & \lambda_{17} \\ 0 & -\sum \lambda_{2j} & \lambda_{23} & 0 & \lambda_{25} & 0 & \lambda_{27} \\ 0 & 0 & -\sum \lambda_{3j} & 0 & 0 & \lambda_{36} & \lambda_{37} \\ 0 & 0 & 0 & -\sum \lambda_{4j} & \lambda_{45} & 0 & \lambda_{47} \\ 0 & 0 & 0 & 0 & -\sum \lambda_{5j} & \lambda_{56} & \lambda_{57} \\ 0 & 0 & 0 & 0 & 0 & -\sum \lambda_{6j} & \lambda_{67} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}
 \end{aligned}$$

This structure allows the chain to migrate within “monopoly” regimes only, while the market is guarded by the patent (e.g “introduction” to “growth”). Patent risks such as the issuing of similar patents or attacks for invalidity can be easily incorporated in the evaluation by letting the rates to competitive states take positive values before the expiration of the proprietary claim, or by increasing the rates to the “bankruptcy” regime. After the patent has expired, the chain is allowed to migrate to “competitive” states (e.g. “growth” to “growth with competitive threat”). Furthermore, S_t can only migrate to successive phases of the product life cycle ($\{1\}$ to $\{2\}$, and $\{2\}$ to $\{3\}$), and once state $\{4\}$ is reached, we are left with the possibility of migrating to states $\{5\}$ and $\{6\}$ only, because once the market is open to competition, it is not possible to regress to the “monopoly” regime. The bankruptcy state is accessible from each other state. The initial marginal probability vector is $P(S_0) = [1,0,0,0,0,0,0]^T$, because the market for product XYZ is currently at the introduction phase.

3. Valuation of the proprietary claim

Let the instantaneous cash flow function be defined as:

$$f(Y_t, t | S_t = i) = (Y_t \rho(\theta_t, Y_t) - OC(Y_t) - FC(t)) I_{\{t \geq \tau, S_t \neq 7\}} \tag{11}$$

where ρ , OC and FC denote respectively unit price, operating and fixed cost functions and

$$I_{\{t \geq \tau, S_t \neq 7\}} = \begin{cases} 1 & \text{if } t \geq \tau \text{ and } S_t \neq 7 \\ 0 & \text{otherwise} \end{cases}$$

denotes the indicator function. Equation (11) states that the cash flows produced by the investment are zero if the firm has not yet entered the market or the project reaches the “bankruptcy” state.

By (5), the time t present value of the project is:

$$\pi(Y_t, t) = E^{Y_t, t} \left[\int_t^T f(Y_s, s | S_s) \exp(-\kappa(s - t)) ds \right]$$

To compute the above, we apply *Proposition 1*, with the additional constraint, $\pi(Y_t, t) \geq K(t)$. If, at any time, the salvage value of the equipment exceeds the project value, the firm will exercise the option to abandon the project, hence the salvage value becomes the lower bound for the present value of the investment. Note that the distribution of the Markov chain $P(S_t = i)$ is computed with the generator matrix A^- up to the patent expiry T_k and with the generator matrix A^+ thereafter. Thus,

$$P(S_t = i) = P(S_0) \exp(A^- t) I_{\{t \leq T_k\}} + P(S_{T_k}) \exp(A^+ t) I_{\{t > T_k\}} \tag{12}$$

where the marginal probability vector of the Markov chain at the patent’s expiry date $P(S_{T_k})$ is computed using (4):

$$P(S_{T_k}) = P(S_0) \exp(A^- T_k)$$

Terminal and boundary conditions are respectively:

$$C(Y_T, T) = f(Y_T, T) \quad (13)$$

and

$$\begin{cases} C(Y_{\max}, t) = \left(\int_t^T f(Y_{\max}, s) e^{-\kappa(T-s)} ds \right) \\ C(0, t) = K(t) I_{\{t \geq \tau\}} \end{cases} \quad (14)$$

where Y_{\max} denotes company XYZ maximum production capacity. We assume that capacity is fixed throughout the project duration. The current net present value of the project is computed as:

$$NPV(\tau, T_k^*) = \sup_{t_n \in \Lambda} E^{y,0} [e^{-\kappa t_n} (\pi(Y_{t_n}, t_n) - X(t_n))^+] - \alpha(T_k^*) \quad (15)$$

where $\tau \in \Lambda = \{t_1, \dots, t_n\}$ and T_k^* are patent cost, optimal entry time and patent duration, respectively. Expression (15) is intuitively clear. Since the stream of cash flows will begin only after the firm introduces the hybrid vehicle in the market, the current NPV of the project is the expectation, conditional upon today's information, of the optimal entry time NPV discounted to the present time minus the patent cost. We make the following three remarks. First, the NPV computed in (15) comprises the value of the options to defer production and to abandon the venture. Secondly, the project NPV (net of patent fees) has a lower boundary of zero, because negative NPV projects are not undertaken. Finally, (15) is calculated by choosing the maximum value of $NPV(t_n, T_k)$, with $t_n \in \Lambda = \{t_1, \dots, t_n\}$ and $T_k \in \{T_1, T_2, \dots, T_k\}$, at each demand level.

The formulae for computing the value of the proprietary claim, the deferral option and the abandonment option are given below:

$$\begin{aligned} V_{pc} &= NPV(\tau, T_k^*) - NPV(0,0) \\ V_{do} &= NPV(\tau, T_k^*) - NPV(0, T_k^*) \\ V_{ao} &= NPV(\tau, T_k^*) - NPV(\tau, T_k^*)_{wao} \end{aligned} \quad (16)$$

where V_{pc} , V_{do} and V_{ao} denote the value of the proprietary claim, the values of the deferral and abandonment options respectively, and $NPV(\tau, T_k^*)_{wao}$ is computed without imposing the constraint $\pi(Y_t, t) \geq K(t)$.

4. Numerical Implementation

In this section we present a numerical implementation of the example previously formulated. The explicit forms for demand and cost functions and the parameters of the market model are summarized in the following Exhibits 1, 2, and 3:

Exhibit 1. Functional Forms for Product Launch Model

Unit Cost	Operating	$OC(Y_t) = c_1 + c_2 Y_t$
Unit Price		$\rho(Y_t, \theta_t) = OC(Y_t)(1 + \theta_t)$

Salvage Value of the plant	$K(t) = Ke^{-\kappa t}$
Profit function	$f(Y_t, t S_t = i) = (Y_t \rho - OC(Y_t) - FC(t)) I_{\{t \geq \tau, S_t \neq 7\}}$

We make the following explanatory comments:

- a. The marginal cost function reflects the standard assumption that marginal costs increase with quantity produced.
- b. The instantaneous cash-flow is proportional to the time step used in the calculations. In our example, we use a 20 day time-step, within which the unit demand can vary between zero and the maximum production capacity per time-step. Since we assume that production capacity is fixed, firm XYZ is not able to meet demand in excess of its maximum capacity level.

Exhibit 2. Cost and Demand Model Parameters

Cost Parameters (x \$ 1000)			Demand Parameters			Market states					
Launch Outlay	X	100,000	Inst. Demand Range (units/dt)	Y	0-3000						
Unit Variable Cost	c_1	8.5									
Marginal Cost Increase	c_2	0.001									
Yearly Fixed Cost	F	25,000	Risk Adj. Drift Regimes	μ	0	0.4	0.01	-0.05	0.15	-0.065	
Yearly Patent Fee	α	1,500	Volatility Regimes	σ	0.35	0.2	0.15	0.35	0.2	0.15	
			Mark-up (%)	θ	0.4	0.6	0.25	0.2	0.3	0.125	
			Time Parameters								
Other Parameters			Time Step Size								
Initial Salvage Value	K	100,000	Project Useful Life(yrs)	T	7						
Depreciation Rate	k	0.5	Patent Durations (yrs)	T_k	0,3,5						
Risk Adjusted Rate	κ	0.2	Set of entry times (yrs)	A	{0,5;Tk}						

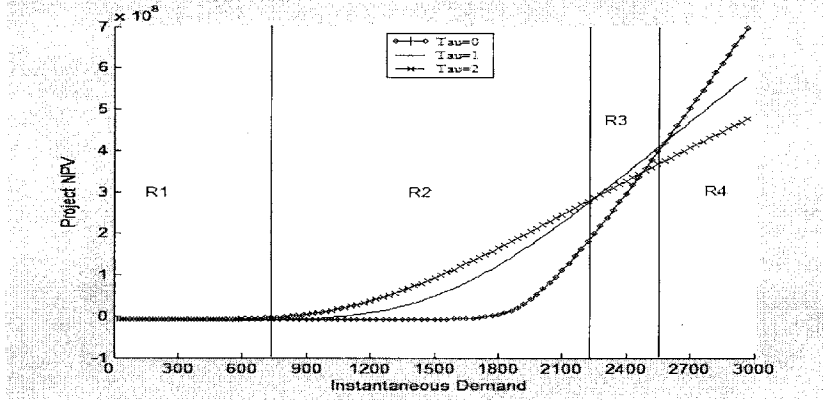
Exhibit 3. Transition Rates between Market Regimes

Before Patent Expiry								After Patent Expiry							
State	1	2	3	4	5	6	7	State	1	2	3	4	5	6	7
1	-0.31	0.3	0	0	0	0	0.01	1	-0.31	0.3	0.075	0	0	0	0.01
2	0	-0.085	0.075	0	0	0	0.01	2	0	-0.885	0.075	0	0.8	0	0.01
3	0	0	-0.15	0	0	0	0.15	3	0	0	-0.4	0	0	0.25	0.15
4	0	0	0	0	0	0	0	4	0	0	0	-0.31	0.3	0	0.01
5	0	0	0	0	0	0	0	5	0	0	0	0	-0.085	0.075	0.01
6	0	0	0	0	0	0	0	6	0	0	0	0	0	-0.15	0.15
7	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0

In the following paragraphs, we analyze the interaction between current demand conditions and project NPV, paying special attention to the value of the options embedded in the patents on the project technology. Figure 2 illustrates the NPV of the project if investment were to occur today, 1 year from today, or 2 years from today, assuming that the life of the patent is five years. The figure shows four distinct exercise regions, *R1* through *R4*. If the current or instantaneous demand level is low enough to fall in region *R1*, it is not opportune to proceed with the investment now or at any time in the future. In regions *R2* and *R3*, the optimal entry times are years 2 and 1 respectively, whereas in region *R4*, it is best to proceed with the investment immediately. At moderately low demand levels, given by region *R2*, it makes sense to adopt a “wait and see” strategy for two years, whereas at moderately high demand levels, given by region *R3*, it makes sense to invest after a minimal delay of one year, since the cash flows foregone by deferring production greater than one year more than offset the benefits. At high

demand levels, given by region $R4$, it makes sense to go ahead with the project investment immediately.

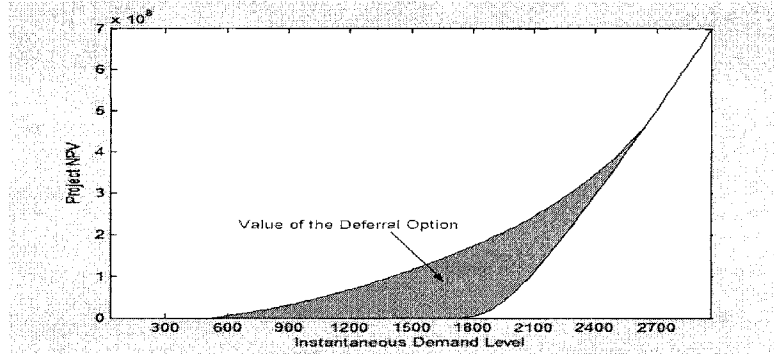
Figure 2. NPV of a patent protected investment at different entry times



5. The Value of the Deferral Option

Assume that after XYZ developed the hybrid car, it realized that it is still relatively expensive to manufacture the car with the new technology, and that, given these high manufacturing costs, the market for such a car is quite small right now. However, this does not mean that the rights to the new hybrid technology have no value. They have value since XYZ may be able to improve on this technology in the future, making the hybrid car manufacturing process more efficient and less expensive in years to come. Moreover, gasoline prices may increase dramatically in future, increasing the demand for fuel-efficient hybrid vehicles. In sum, the patent provides XYZ with the ability to delay the hybrid car project in the hope that technological and market conditions might change in the future, making the project more profitable. Hence the patent lends further value to the project. However, as is clear from Figure 3, the value of this deferral option is dynamic rather than fixed and is dependent on the current demand for the hybrid automobile. Figure 3 illustrates the value of the option to defer production, given that the optimal entry strategy is chosen in the set Λ (from Exhibit 2) and the patent duration is five years. The optimal exercise strategy is computed by choosing the entry time that maximizes NPV at each demand level. The deferral option value is represented by the width of the shaded region, representing the difference in NPVs for any given demand level, with and without the patent. Notice that the option to defer has a significant effect on the investment NPV at moderate current demand levels. This follows from the choice of parameters at the introduction phase of the product life cycle, $\mu_1 = 0, \sigma_1 = .35$, signifying zero growth and high demand uncertainty, in Exhibit 2. These market conditions obviously warrant a “wait and see” strategy at moderate demand levels. The negative NPV at very low demand levels makes it inappropriate to pursue the project at any time in the future, rendering moot the option to defer. Similarly, when demand is high enough to make an immediate profit, it is pointless to defer investment in the project, once again rendering ineffective the deferral option.

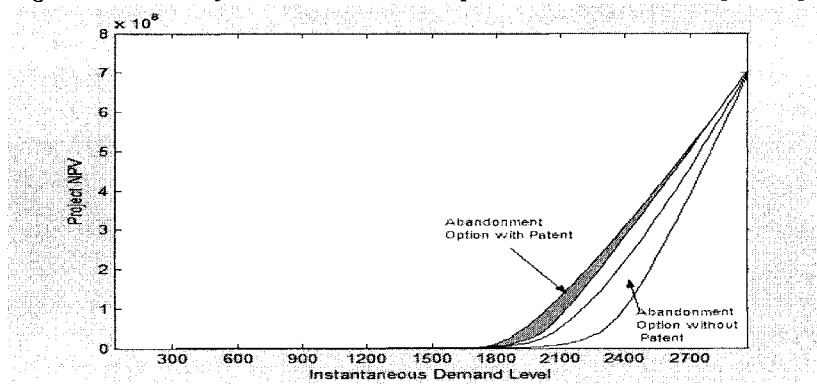
Figure 3. Value of the Deferral Option



5. The Value of the Abandonment Option

Let us now examine the option to abandon the project, given a set of adverse market conditions. Assume, for example, that the cost of gas has fallen dramatically a few years after the hybrid technology was introduced, while manufacturing costs remain high for the hybrid car. XYZ now wishes to abandon the hybrid car project and sell the technology, including any patent rights it might have acquired. In effect, the original hybrid car project might not be profitable, but the technology that has been developed could be valuable. This is categorized as the value of the abandonment option. Figure 4 illustrates the value of the option to abandon the project for salvage value in the presence of patent protection and without the benefit of patent protection. For sake of comparison, we assume that the investment is made today and the patent duration is five years. The value of the abandonment option is the difference in NPVs with and without the abandonment option, assuming patent protection exists and then assuming that we do not have the benefit of patent protection. This is represented by the width of the shaded areas at given demand levels.

Figure 4. Value of the Abandonment Option with and without patent protection



Observe that the option to abandon is worthless at low demand levels because under these conditions, the firm would either defer the investment or not invest at all. Similarly, the option to

abandon is negligible at high demand levels, given the high profitability of the project at high demand levels. The option to abandon is clearly more valuable in the absence of patent protection, when the absence of entry barriers increases the competitive uncertainty present in the market. Patent protection reduces competitive uncertainty and therefore reduces the value of the abandonment option. Although this result makes intuitive sense, it is not easily quantifiable using standard real options approaches because these do not take into account the effects of competitive interaction and product life cycle.

Conclusion

Evaluating proprietary claims is a challenging problem, because their impact on the real investment is often unobservable and thus hard to quantify. In particular, the value of a patent is contingent on several factors concerning demand evolution and market structure. In this paper, we present an evaluation approach which addresses the fact that the value of the patent depends on the degree of demand and competitive uncertainty. Moreover, a sound approach must recognize that a patent creates a set of real options, and concurrently affects the value of other real options embedded in the investment. The main contribution of this paper is to formulate a general framework for pricing proprietary claims that allows us to model demand and competitive uncertainty as endogenous variables in the evaluation process and illustrates the interaction between the patent and managerial decision making. The impact of competitive and demand uncertainty is replicated by specifying a theoretical framework where the demand process evolves as a diffusion process modulated by a continuous time controlled Markov chain, and the market is allowed to migrate to regimes of different competitive intensity. A recursive algorithm, with stability and error order properties analogous to the implicit finite difference scheme, is developed for computing the net present value of the project. Finally, our model for evaluating patents is developed with the help of a hypothetical example which shows the interaction between a patent and managerial decision making. We show that the patent increases the value of the deferral option, especially at moderate demand levels. However, the existence of patent protection reduces the competitive uncertainty of the project, thereby reducing the value of the abandonment option inherent in the project.

Appendix

Proof of Proposition 1

Let $\pi(Y_T, T) = f(Y_T, T)$ be the instantaneous cash flow at the project's terminal date T . By (7), $C(Y_{T-\delta t}, T - \delta t | S_t = i) = E^{Y_{T-\delta t}, T-\delta t} [e^{-\kappa(\delta t)} (f(Y_T, T)) | S_{T-\delta t} = i]$, is the discounted, time T expected instantaneous cash flow. Thus

$$\begin{aligned} \pi(T - \delta t, Y_{T-\delta t} | S_{T-\delta t} = i) &= E^{Y_{T-\delta t}, T-\delta t} \left[\int_{T-\delta t}^T f(Y_s, s | S_s) \exp(-\kappa(s - T + \delta t)) ds | S_{T-\delta t} = i \right] \\ &= E^{Y_{T-\delta t}, T-\delta t} [(f(Y_{T-\delta t}, T - \delta t | S_{T-\delta t}) + f(Y_T, T) \exp(-\kappa\delta t)) | S_{T-\delta t} = i] \\ &= f(Y_{T-\delta t}, T - \delta t | S_{T-\delta t} = i) + E^{Y_{T-\delta t}, T-\delta t} [f(Y_T, T) \exp(-\kappa\delta t) | S_{T-\delta t} = i] \\ &= f(Y_{T-\delta t}, T - \delta t | S_{T-\delta t} = i) + C(Y_{T-\delta t}, T - \delta t | S_{T-\delta t} = i) \end{aligned}$$

At this point $\pi(T - \delta t, Y_{T-\delta t})$ is obtained by unconditioning over the state space $\{0, 1, \dots, N\}$.

$$\begin{aligned} \pi(T - \delta t, Y_{T-\delta t}) &= E[\pi(T - \delta t, Y_{T-\delta t} | S_{T-\delta t} = i)] \\ &= \sum_{i=0}^N (f(Y_{T-\delta t}, T - \delta t | S_{T-\delta t} = i) + C(Y_{T-\delta t}, T - \delta t | S_{T-\delta t} = i)) P(S_{T-\delta t} = i) \end{aligned}$$

where $P(S_{T-\delta t} = i)$ denotes the probability that the Chain visits state i in the time interval $[T - \delta t, T]$.

Thus, (9) holds in the first step of the recursion. To show that it holds in general, it is enough to verify it at the next infinitesimal time-step.

Take $\varphi(Y_{T-2\delta t}, T - 2\delta t) = \pi(Y_{T-2\delta t}, T - 2\delta t)$ as the terminal condition for equation (5), so that

$$\begin{aligned} C(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i) &= E^{Y_{T-2\delta t}, T-2\delta t} [\pi(Y_{T-\delta t}, T - \delta t) | S_{T-2\delta t} = i] \\ \pi(T - 2\delta t, Y_{T-2\delta t} | S_{T-2\delta t} = i) &= E^{Y_{T-2\delta t}, T-2\delta t} \left[\int_{T-2\delta t}^T f(Y_s, s | S_s) \exp(-\kappa(s - T + 2\delta t)) ds | S_{T-2\delta t} = i \right] \\ &= E^{Y_{T-2\delta t}, T-2\delta t} \left[f(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t}) + \int_{T-\delta t}^T f(Y_s, s | S_s) \exp(-\kappa(s - T + \delta t)) ds | S_{T-2\delta t} = i \right] \\ &= f(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i) + E^{Y_{T-2\delta t}, T-2\delta t} \left[E^{Y_{T-\delta t}, T-\delta t} \left[\int_{T-\delta t}^T f(Y_s, s | S_s) \exp(-\kappa(s - T + \delta t)) ds \right] | S_{T-2\delta t} = i \right] \\ &= f(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i) + E^{Y_{T-2\delta t}, T-2\delta t} [\pi(Y_{T-\delta t}, T - \delta t) | S_{T-2\delta t} = i] \\ &= f(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i) + C(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i) \end{aligned}$$

Again, unconditioning over the state space of the Markov Chain

$$\begin{aligned} \pi(T - 2\delta t, Y_{T-2\delta t}) &= E[\pi(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i)] \\ &= \sum_{i=1}^N (f(Y_{T-2\delta t}, T - 2\delta t) + C(Y_{T-2\delta t}, T - 2\delta t | S_{T-2\delta t} = i)) P(S_{T-2\delta t} = i) \end{aligned}$$

which is exactly equation (9).

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An Empirical Study on Value-Based Performance Measures, Stakeholder Satisfaction and Stock Prices

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Abstract

This paper examines the effects of three different types of performance measurements on the Dow Jones Industrial, Transportation, and Utilities company stock prices: traditional accounting based measures, value-added measures, and nonfinancial based measures. The accounting based measures are return on equity and return on assets; the value-added measures are market value-added and economic value-added; the nonfinancial measures are proxies of sales, times-interest-earned, and taxes representing customer and bondholder satisfaction, and government and society.

Using cross-sectional data and regression analysis, the results indicate that all performance measures have the expected relationship with prices. Return on equity has a strong and positive effect on share values. Consumer satisfaction, measured by sales volume, also showed a strong relationship with stock prices. However, the significance of the relationship between bondholder satisfactions measured by the times-interest-earned ratio and prices varied from positive to negative and was insignificant. The effect of taxes paid by corporations as proxy for the government as a stakeholder and corporate social responsibilities on share values was mostly insignificant. Overall, the results show that stock price maximization as the primary goal of a firm may lead to the satisfaction of stockholders and consumers. However the relationship between price maximization strategy and bondholders and society satisfaction require further investigations.

Introduction

The objectives of this study are twofold. First, we examine which financial and value-based measures have the strongest effect on share values so that they can be targeted to improve a firm's performance. Second, we test whether stakeholder satisfaction with a firm's performance leads to higher stock prices. Stakeholders include any party affected by a firm's actions; the ones we consider in our study include shareholders, bondholders, customers, the government and society. The premise is that the integration of performance measures reflecting the satisfaction of these stakeholders is incorporated in the stock price, creating value for the stakeholders.

Value-added measures add value over a period of time when a firm has generated a profit in excess of a firm's true cost of capital. Proponents of value-added measures believe that

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such measures show whether shareholder wealth is being created or destroyed, and they are more in alignment with shareholder satisfaction than traditional accounting measures. Because value-added measures explicitly consider a cost of capital in the valuation process.

To test which financial ratios and value-based measures should firms target to improve their performances, we first investigate the relationship between stock prices and return on equity (ROE), return on total assets (ROA), market value added (MVA), and economic value added (EVA) for all firms in the Dow Jones Industrial, Transportation, and Utilities Indexed for the period 1980-2005. The second objective of this study is to test the relationship between stakeholder satisfaction and share values. It is assumed that return on equity, time-interest-earned ratios, sales, and the amount of taxes paid by corporations as proxies for stockholders, bondholders, consumers, and the government and society's approval of the firms' performances, respectively. In addition, the individual firm's exposure to market risk that may have an adverse effect on maximizing share values, measured by a company's beta risk, is also tested.

The literature review, methodology, data and empirical results, and conclusion follow.

Literature Review

An early attempt to estimate the share values using financial variables was made by Williams (1938), who introduced the dividend discount model. Miller and Modigliani (1961) argued that a firm's value is determined only by its basic earning power and its business risk. The value of the firm depends on the income produced by its assets, not on how this income is split between dividends and retained earnings. Gordon (1962) argued that a firm's value will be maximized by setting a high dividend payout ratio (Bird-in-the-Hand Theory). Graham, Dodd, and Cottle (1962) proposed that a firm's estimated earnings is the most important factor in determining stock prices. Fama (1965) argued that stock price performance resembled a random walk; in a later study (1970), he introduced the theory of the Efficient Markets Hypothesis, challenging the validity of intrinsic valuation models and the use of historical and public information in estimating stock prices. Lee, Myers, and Swaminathan (1999) compared alternative estimates of the share value for 30 stocks in the Dow Jones Industrial Index for the period 1963-1996 and found that traditional valuation methods using multiplier techniques have little predictive power.

Pitman (2003) describes his experience at British bank Lloyds from 1983 to 2001, indicating that the best long-term measure of company performance is one that creates greater value for shareholders. He maintains that using a single governing objective, generating shareholder value, was the key to satisfying other stakeholders, such as employees and customers. In a study on the relationship between stock prices and financial data, Rahgozar (2006) showed that dividend and stock prices have positive relationships and that the dividend irrelevance theory does not hold.

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The belief that the best measures for maximizing shareholder wealth were traditional accounting measures such as growth in annual earnings per share and increases in return on equity was held for many years. Recently, however, the argument has been made that linkage of these conventional accounting measures is not apparent with the value of the company's shares. Earnings do not include risk assessments nor the cost of additional capital invested to finance growth.

Several studies have discussed the use of EVA and other value-based measures; Ittner and Larcker (2001) and Sprinkle (2003), with mixed empirical evidence as to the success of these measures. Stern Stewart & Co., who introduced EVA, have claimed its benefits (1994). Biddle, Bowen, and Wallace (1997) found earnings outperformed EVA in predicting stock price. Recently, Griffith (2006) found that firms using EVA to forecast stock performance would have suffered losses; Ferguson, Rentzler, and Yu (2005) found minimal correlation between EVA and stock values; Kyriazis and Anastassis (2007), found EVA useful as a performance evaluation tool, but not it being correlated with shareholders' value than other financial variables.

Beside the financial factors stated above, studies have shown the influence of nonfinancial variables on share values. Eccles et al. (2001) and others (Maines, Bartov, Fairfield, Hirst, et al., (2002), Pitman, (2003)) have noted that more firms are using nonfinancial performance measures to evaluate firm performance at a variety of levels. Using customer satisfaction indices published by Fortune magazine, Ittner and Larcker (1998a) found that abnormal returns existed surrounding the stock returns following the release of these measures, and later they studied the relationship of nonfinancial measures on stock performance (1998b). Banker et al. (2000) studied the relationship between current nonfinancial measures and future financial variables, testing the predictive power of customer satisfaction measures. They found that customer complaints and returning customers indicated future revenue and profit for the hotel industry. Using regression analysis, Hirschey, Richardson, and Scholz (2001) studied the direct contemporaneous link between the nonfinancial measures of patent quality to research and development expense and market share value and found a positive correlation for both. Said, HassabElnaby, and Wier (2003) found that firms that employed a combination of financial and nonfinancial measures had significantly higher levels on return on assets and market returns.

Major financial stakeholders of a firm are generally considered to be the firm's stockholders and debtholders; however, a third financial stakeholder can be considered to be the government, through the collection of taxes. Using taxes as a proxy for social responsibility of corporations follows a rich body of research on the relationship of corporate social responsibility and firm performance, with mixed results on agreement of measures and results. Waddock and Graves (1997), Harrison and Freeman (1999), McWilliams and Siegel (2000). Hillman and Keim (2001) for instance, found that social issue participation, referring to use of corporate resources for social issues, such as avoidance of nuclear energy, negatively impacted shareholder wealth.

Methodology

To investigate significance of the relationship between each financial ratio and value-based indicators and share value, the following regression models is tested:

$$P = a_0 + a_1 X_i + \varepsilon \quad (1)$$

where,

- X_i = Represent either ROE, ROA, MVA, and/or EVA
- P = Stock Prices
- ROE = Return on Equity
- ROA = Return on Total Assets
- MVA = Market Value Added
- EVA = Economic Value Added

To examine the relationship between proxies of stakeholder satisfactions and share values the following multiple regressions is tested.

$$P = a_0 + a_1 ROE + a_2 TIE + a_3 S + a_4 T + a_5 \beta + \varepsilon \quad (2)$$

Where,

- TIE = Time-Interest-Earned Ratio
- S = Sales
- T = Taxes Paid
- β = Measure of Market Risk

ROE, sales, and time-interest-earned ratios are assumed to proxy the stockholder, consumer, and bondholder satisfaction in firm performance. The social responsibilities of firms is measured by the amount of taxes paid by corporations, and the market risk that individual firms are exposed to and may have an adverse effect on share values is measured by the company's beta (β). It is anticipated that the variables ROE, ROA, MVA, EVA, S, TIE, and β will have a positive effect and T to vary from positive to positive.

Variable Calculation:

- ROE = Net Income/Total Common Equity
- ROA = Net Income/Total Assets
- MVA = (Stock Price) x (Common Shares Outstanding) – Total Common Equity (\$)
- EVA = EBIT (1-T) – Total Capital x WACC
- TIE = Time-Interest-Earned Ratio = Operating Income/Interest Charges
- EBIT = Operating Income= (Operating Income before Depreciation - Depreciation & Amortization)
- T = Marginal Tax Rate = (Pretax Income- Net Income)/ Pretax Income
- WACC= After-tax percentage cost of capital is calculated as weighted average cost of debt, preferred stock, and equity using the following formula:

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$$WACC = w_d k_d (1 - T) + w_p k_p + w_e k_e$$

Where, W_d, W_p, W_e are the weights used for debt, preferred, and common equity.

W_d	=	Long-term total debt/total assets
W_p	=	Preferred stock carrying value/total assets
W_e	=	Common equity/total assets
K_d	=	Before tax component cost of debt=interest expenses/ (debt in current liabilities plus long-term debt)
K_p	=	Component cost of preferred stock = preferred stock dividends/preferred stock carrying value
K_e	=	Component cost of equity = $D_1/P_0 + G$ and $K_e = R_f + (R_m - R_f) \beta_i$
D_1	=	Expected dividend
P_0	=	Current stock price
R_f	=	3 - month t-bill rate
R_m	=	Market return, measured as return on S&P 500
G	=	Earning growth rate, retention rate time return on equity
β	=	Measure of market risk, covariance between stock and market returns divided by variance of market return

It is expected that changes in ROE, ROA, sales, TIE, and tax payments as measurements of stakeholders' views on firm performances to increase share values. Stockholders normally evaluate ROE when making their investment decisions. Satisfied customers, by their repeat and increased purchases, raise company sales and profit which, in turn, leads to higher share values. Of course, increases in sales may occur due to the introduction of new products, services, and/or by mergers and takeover activities. Regardless of sources of sale increase, any increase in sales could show consumer/public satisfaction for firm performance leading price increases. Bondholders also have strong interests in the financial health and performance of the firms. Higher financial risk would suggest higher potential for bankruptcy and risk to bondholders. The time-interest-earned ratio (TIE) is assumed to proxy for financial risk; a higher TIE ratio would indicate the ability of the firm to pay interest on debt and thus a more protections on the creditor's position. The social responsibilities of the firms and the outlook of a third financial stakeholder, the government, are measured by the amount of taxes paid. On the one hand, higher tax payment could present a firm as a socially responsible company that thus enhances its image and share values. On the other hand, higher taxes reduce net income to the shareholders due to double taxation and thus could have an adverse effect on share values. The net effect of taxes on share values needs to be tested statistically.

Other value-based financial indicators such as market value added (MVA) and economic value added (EVA) may also improve corporate value. MVA shows the present value of all expected future value added to the firm. EVA is a measure of operating performance that indicates how successful a firm has been at increasing the market value of a company in any given period. EVA can be thought of as the incremental contribution of a firm's operations to

the creation of MVA. MVA is the present value of all expected future EVA. EVA provides a good measure of the extent to which the firm operates in a manner that is consistent with maximizing shareholder value.

Data and Empirical Results

The data are obtained from the COMPUSTAT database. The sample includes data for all firms in the Dow Jones Industrial, Transportation, and Utility Averages for the period 1980.1-2005.1. Data are first used to calculate the financial series that are considered relevant to this study.

The quarterly series for each firm are then averaged to calculate the profitability indicators (ROE & ROA), value-based measures (MVA & EVA) plus the TIE, sales, and taxes paid. The beta (β) for each firm is estimated by dividing the covariance between returns in stock and the S&P500 by the variance of the market (S&P500). Missing values are replaced by the average values of the data services.

Unit Roots and Cointegration Tests

The Augmented Dickey-Fuller (1979) and Phillips-Perron (1988) tests are employed to investigate the stochastic behavior of the variables included in the regressions. Unit root results (not reported here) reveal that all variables but sales (S) and taxes (T) are integrated of order one and are nonstationary (variables S and T are stationary). Differencing the time series to create stationary in regression analysis is a normal practice, but many researchers have argued that such differencing may result in a loss of information about the long-run relationships between variables (Sims, (1980)). Stock and Watson (1988) have indicated that if time series are co-integrated of the same order, an ordinary least square (OLS) regression yields a "super-consistent" estimator for the co-integrating parameters without differencing. The Johansen cointegration (1995) approach is applied to test whether the data series used in this study are cointegrated of the same order and can be included in the same regression. The test results confirm that (though not reported here) at least one cointegrated equation at the 0.05 level between variable P and the rest of the variables except MVA exist. Such results imply that all integrated variables with the same order can be included in the same regression models without differencing the data. However, to include variables P and MVA in the regression analysis, they both need to be differenced to create stationary series.

We begin our analysis with a brief look at the estimated variables and descriptive statistics on the Dow Jones 30 (DJ30), Transportation 20 (DJ 20), and Utility 15 (DJ15) stocks. Table I presents descriptive statistics on DJ30, DJ20, DJ15, and on DJ65. The DJ65 series is constructed by pulling data from the other three indexes. Table II summarizes the regression results using stock prices of DJ65 companies as the dependent variable and the ROE, ROA, MVA, and EVA as independent variables. The test results reveal which variable has the furthest influence on the share values. Table III includes the Ordinary Least Squares

regressions results using stock prices as the dependent variable and ROE, TIE, Sales (S), Taxes (T), and beta(β) measure of market risk as exogenous variables.

As was expected and shown in Table I, stock prices of the utility companies are less volatile than the industrial and transportation firms. The volatility measured by the standard deviation (SD) and coefficient of variation (CV) for DJ15 are \$5.538 and 0.187 while they are \$15.15 and 0.257 for DJ30, and \$13 and 0.346 for the DJ20, respectively. The market risk measured by the average beta is lower for DJ15 than DJ30, DJ20, and DJ65. They are 0.823, 1.57, 1.121, and 1.303 respectively. The DJ30, DJ20, and DJ65 share values have the highest correlation coefficient with MVA than the remaining variables appearing in Table I.

An analysis of regressions (1) through (4) appearing in Table II suggests that all value-based performance measures have a significant relationship with the stock prices at the 5 percent significance level. The R-squares of the regressions vary across different equations from 18 percent to 79 percent with regression (3) having the highest R-square. The estimated results imply that among the four independent variables, the MVA is the most important performance indicator. The MVA shows the present value of all expected future value added to the firm.

The results of simple regressions (1) through (4) appearing in Table III, reveal that all proxies of stakeholders' approval of firms' performances have the expected signs. The return on equity (ROE) in equation (1) has a strong positive effect on share values at 5 percent significant level. The remaining variables time-interest-earned ratio, sales, and taxes as shown in regressions (2), (3), and (4) have strong and positive effect on stock prices indicating that stakeholders satisfaction lead to price improvements. Regression (5) tests the effect of market risk on share value. The estimated result implies that higher market risk and share values have a positive relationship. Regression (6) includes all variables into the test. Although all variables have the expected signs their significance levels diminishes. Elimination of insignificant variables from the regression (6) and addition of performance measures EVA and TIE yielded the best results that are presented in equation (7). The time-interest-earned ratio which proxies the bondholder satisfaction with firm performance has a strong significant effect on share values.

Historical experience indicates that when the stock market undergoes changes, prices of most individual securities also change, thus a declining market tends to push individual stock prices down, whereas the reverse occurs in a rising market. Also, higher taxes signify lower net income to the share holders; this could unfavorably impact share value. Normally, a higher TIE ratio indicates lower financial risk and thus has a positive effect on prices. The regressions (2) and (7) show the strong and positive effect of TIE on share values. In general, lower interest expenses and/or higher operating incomes lead to higher TIE ratios that improve firm's financial status. However, due to the high market interest rates, firms may decide to lower debt financing and consequently its interest expense. According to the Trade-off theory in finance, a firm's stock price will be maximized if it uses virtually 100 percent

debt. Thus, reduction of interest costs due to any decline in debt financing could improve the stock prices.

Overall, the cross-sectional regression results on D65 indicate that all profitability ratios and value-based performance measures have a significant relationship with stock prices. All variables used to measure stakeholder satisfaction showed a strong effect on prices. As performance measure the EVA had the best results. The results indicate because of the strong relationship between ROE, EVA, TIE, Sales, and Taxes and stock prices any improvement in share values will satisfy all stakeholders of the firm.

Conclusion

This paper studies first the relationship between several performance measures with stock prices. Using cross-section data combining information from DJ30, DJ20, and DJ15 to form DJ65 we find that the market-value-added variable has the strongest relationship with stock prices. This finding implies that targeting any of the profitability ratios (ROE & ROA) and value-based performance measures (EVA & MVA) will yield a higher corporate value. We also examine the relationship between stock price and stakeholders' satisfaction measured using some proxies. We find that stockholder interests in firm performance measured by ROE to have a significant and positive estimated coefficient with stock prices. The bondholders' satisfaction measured by TIE, consumer satisfaction measured by the increases in sales, corporate social responsibilities measured by the amount of taxes paid all showed a positive relationship with share values. Although a higher TIE ratio means better liquidity and more protection for creditors, higher market interest rates may imply that companies with higher debt could face higher interest expenses which, in turn, lead to a higher cost of capital that lower net income and cause prices to decline. Moreover, the higher interest costs increase a firm's financial risk at the potential displeasure of debt holders. Consumer satisfaction, as measured by sales, has a positive and significant relationship with the prices, indicating that stock price maximization makes firms' customers satisfied with its performance. The test results show the corporate social responsibility, measured by the amount of taxes paid, and share values move in the same direction meaning that price maximization and corporate social responsibilities are correlated. Overall, the results show that stock price maximization as the primary goal of a firm may lead to the stakeholder satisfaction.

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Table I.
Descriptive Statistics on Dow Jones Industrial, Transportation, Utility, and
Composite Indexes Over 19801- 2005.1

Variables	Price	ROE	ROA	MVA	EVA	TIE	Sales	Tax	β (beta)
<u>DJ30</u>									
Correlation	1.00	0.29	0.24	0.85	0.28	-0.13	-0.01	0.19	0.08
Mean	58.83	4.65	1.89	42.55	0.95	21.82	8562	345.52	1.57
SD	15.15	2.01	1.24	15.67	0.99	33.27	8046	273.85	0.69
CV	0.257	0.43	0.65	0.37	1.04	1.53	0.94	0.79	0.44
<u>DJ20</u>									
Correlation	1	0.33	0.11	0.64	0.33	0.37	0.76	0.78	0.32
Mean	37.56	1.04	1.09	19.82	1.04	17.78	1213.02	33.273	1.121
SD	13.00	9.05	0.97	11.83	1.05	39.59	1183.24	46.06	0.84
CV	0.346	8.67	0.88	0.59	1.00	2.23	0.97	1.38	0.75
<u>DJ15</u>									
Correlation	1	0.09	0.03	0.46	0.05	0.26	0.16	0.52	0.04
Mean	29.59	2.48	0.68	10.27	0.025	2.889	1629.35	63.69	0.823
SD	5.538	1.23	0.32	5.638	0.724	1.095	573.96	44.53	0.363
CV	0.187	0.49	0.47	0.55	28.96	0.38	0.35	0.69	0.44
<u>DJ65</u>									
Correlation	1	0.33	0.42	0.89	0.43	0.19	0.40	0.54	0.40
Mean	45.53	3.04	1.32	28.11	0.62	16.00	4698.87	184.47	1.303
SD	17.98	5.39	1.10	18.80	1.00	31.81	6544.98	240.31	0.676
CV	0.385	1.77	0.83	0.67	1.61	1.99	1.39	1.30	0.52

Note: Price is the average price of all DJ30, 20, 15, and 65 third quarter stock prices, ROE is return on equity, ROA is return on assets, MVA and EVA are market and economic value-added, TIE is time-interest-earned ratio, Tax is the average tax paid, and β represents the market risk.

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Table II.

Regression Results on the DJ65 Showing the Stakeholder Satisfaction from Firm Performances. The Dependent Variable is "Stock Price." The Independent Variables Are ROE, ROA, MVE, and EVA.

$$P = a_0 + a_1X_i + \varepsilon$$

Regression No	Intercept	Independent Variables				R ²
		ROE	ROA	MVA	EVA	
(1)	42.11612 (17.29)	1.124644 (2.84)	—	—	—	0.113
(2)	36.39644 (11.39)	—	6.900855 (3.71)	—	—	0.179
(3)	21.51274 (11.80)	—	—	0.854606 (15.82)	—	0.799
(4)	38.19112 (13.09)	—	—	—	7.014106 (2.82)	0.181

Note: Note: Price is the average of the third quarter stock prices of each firm in DJ30, DJ20, and DJ15 aggregated to form DJ65. ROE is return on equity, ROA is return on total assets, MVA is the market-value-added, and EVA is the economic value added. Missing data for variable T and TIE were replaced by median of the data set and for beta by mean of the data set; t-statistics are in the parentheses.

Table III.

Regression Results on the DJ65 Showing the Stakeholder Satisfaction from Firm Performances. The Dependent Variable is "Stock Price." The Independent Variables Are ROE, TIE, S, T, and β .

$$P = a_0 + a_1ROE + a_2TIE + a_3S + a_4T + a_5\beta + \varepsilon$$

Regression No	Intercept	Independent Variables					R ²
		ROE	TIE	S	T	β	
(1)	42.11612 (17.29)	1.124644 (2.84)	----	----	----	----	0.113
(2)	35.24417 (13.44)	----	1.354078 (5.52)	----	----	----	0.326
(3)	40.37535 (15.87)	----	----	0.001099 (3.46)	----	-----	0.160
(4)	38.15258 (15.89)	----	----	----	0.007963 (5.02)	----	0.286
(5)	34.27517 (6.83)	----	----	----	----	9.583365 (2.80)	0.128
(6)	24.84266 (4.52)	3.111881 (1.82)	0.013890 (0.16)	0.000611 (1.36)	0.007183 (0.44)	4.390593 (1.05)	0.388

$$P = a_0 + a_1EVA + a_2TIE + \varepsilon$$

(7)	29.01785 (10.05)	6.543400 (3.41)	1.645375 (5.07)	R ² = 0.523
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Note: Price is the average of the third quarter stock prices of each firm in DJ30, DJ20, and DJ15 aggregated to form DJ65. ROE is return on equity, TIE is time-interest-earned ratio, S is sales, T is Taxes paid, and β represents the market risk. Missing data for variable T and TIE were replaced by median of the data set and for beta by mean of the data set; t-statistics are in the parentheses.

Ethical Investment Constraints And Fund Performance

Lakshmi S. Narain

Abstract

This study evaluates the risk-adjusted performance of two author-defined categories of socially responsible mutual funds during the period of September 1999 to September 2004, using objective statistical measures grounded in modern portfolio theory. A socially responsible mutual fund is defined as one which employs "social screens" in stock selection. In this study, one category favors politically progressive, secular criteria and the second favors conservative religious values. The main objective of this study is to provide empirical documentation on the risk-adjusted returns of these mutual funds, to stimulate interest in further study of the political aspects of the screens that underlie them. This is one of the first, if not the first, academic studies to delineate socially responsible funds into such categories. The study results based on 30 funds indicate that funds favoring politically progressive secular criteria outperform the S&P 500 Index during the study period, while funds favoring conservative religious views overall do not outperform the S&P 500 Index.

Introduction

The concept of "socially responsible investing" (hereafter termed SR, or SRI) has been gaining ground in recent years. Originating back to the turn of the century, it is premised on the idea that one should invest only in the securities of companies which exercise "social responsibility," as defined by various moral or political value systems. This process is termed a "screen," which keeps companies that do not meet specified criteria out of a portfolio; a strategy most often employed by mutual funds. The active management and attractiveness to smaller investors offered by mutual funds have gone far in "democratizing" the investment field. And with this popularity, much discussion has ensued about what, if any, impact the strategy of social screening would have on investment performance.

By definition, SRI is controversial, just as the philosophies that underlie the concept are controversial. In today's polarized political climate, it might be an interesting exercise to sort out various screens employed by SR mutual funds by ideology.

Several prior studies have reached mixed conclusions in comparing SRI fund strategies against strategies without screens. This paper will attempt to measure differences in investment returns between portfolios employing 1) a conventional SRI screen based on politically progressive ideology which is typically antiwar, pro-labor, environmentalist, and friendly to the

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rights of women and minorities, and 2) screens based on (mostly conservative) religious values such as opposition to alcohol, gambling, pornography, abortion, and other “anti-family” concerns. A secondary comparison will be made between religion-based strategies, one of which includes funds managed with both Christian-based and Islamic-based screens, and one that is Christian-based only. The S&P 500 Index is used as the benchmark for comparison.

Review of Literature and Brief History of SRI

The concept of “screening” investments is far older than that of modern mutual funds, dating back to the 1700’s, when American Quakers shunned investment in companies associated with “sins” like alcohol, tobacco, gambling, or the slave trade. The first such screened fund, the Pioneer Fund, came about in 1928, only four years after the founding of the first mutual fund as the term is understood today. But it was not until 1968 that the SR funds took on an overtly political flavor. A young securities analyst, Alice Tepper Marlin, was asked by a pension fund to assemble a “peace portfolio” of companies with only marginal or no association with arming American troops in Vietnam. Word of her prepared report sparked interest from a Methodist group that launched the Pax World Fund in 1971, which still operates today (Entine 2003).

Through the 1970’s the trends of consumer activism a la Ralph Nader, and similar causes like feminism, gay rights, animal rights, opposition to nuclear power and the war in Vietnam effectively united with the older screens of the religious right as the foundation for modern SRI. The catalyst that struck the largest nerve among newly affluent, left-of-center baby boomers was a screen against companies doing business in then-apartheid South Africa. In the 1980’s the number of SR mutual funds increased from six to thirty-two by 1990 (Hamilton 1993).

The bull market that continued into the 1990’s lifted the SR funds to greater heights and numbers, though definitions of SRI vary. According to one article, SR mutual funds amassed assets of \$12 billion in sixty seven separate funds by the peak of the bull market in 2000 (Edwards 2003). But the Social Investment Forum, the recognized authority on all forms of SRI and keeper of the Socially Responsible Index, pegged the figure at \$136 billion in 2001 in 200 separate funds, obviously a more inclusive figure. The group also observed that while the mutual fund universe as a whole was hemorrhaging cash in the bear market year of 2002, SR mutual funds gained assets to the tune of \$1.5 billion over this period (SIF 2003).

Investment research evidence indicates that mutual fund returns tightly trail the most popular common stock index, the S&P 500. In fact, in any given year, nearly nine in ten managed funds fail to outperform this Index. If SR funds are in ascendancy in this field, what have they to show in the way of performance? Results of academic studies are mixed to slightly favorable, with most favorable findings predating the market downturn of 2000 to 2002 (Entine 2003). As examples, Grossman and Sharpe (Grossman 1986) found that a risk-adjusted portfolio free of South Africa-based investments beat the NYSE average by a negligible 0.187 percent annually. Hamilton found an underperformance of 0.76 percent annually through 1990 using seventeen SR funds measured against 170 conventional mutual funds from the Lipper database, though one might quibble with the differing beginning years used in their time periods (Hamilton, Hofe and Statman 1993).

John Guerard states that “socially responsible investing” might produce higher risk-adjusted portfolio returns than merely using all available stocks in the equity universe, yet cites only prior studies that are inconclusive (Guerard 1997). To second him, Peter Camejo, the independent running mate in Ralph Nader’s 2004 Presidential bid authored a book in 2002 titled, “The SRI Advantage” (Wheat 2002). Waddock and Graves found that the 249 S&P 500 firms included in the SR-oriented Domini Social Index outperformed the 251 firms excluded from it on a three, five, and ten-year basis, but these results are not adjusted for risk (Waddock and Graves 1998).

The study by Edwards and Samant, which serves as the model for the research conducted in this paper, found no statistically significant difference in risk-adjusted returns of its sample of SR funds in comparison to the S&P 500 Index (Edwards and Samant 2003). Dr. Samant even joked in personal conversation that his paper ought to include a suggestion to “sell short” such funds (Samant 2004).

Taken together, the murky conclusion from the existing body of work on this subject is simply to state that the impact of SRI on investment performance is very much an unanswered question. What this study will attempt to do is examine separately two, in this author’s opinion, notably different categories of SRI screens employed by SR funds. The political divisions of the secular left (SL) and the religious right (RR) that were papered over during the nascence of SRI are certain to reassert themselves in today’s politically charged climate. Discovering if the political philosophy of SR screening has a significant correlation with investment performance will be, at least, a curious exercise.

Data

Unlike existing works that focus singly on the use of SR screens versus investments that do not screen, the present study tries to distinguish among SR funds as Secular Left (SL) and Religious Right (RR) funds, based on their screens. There is significant overlap between the SL and RR screens: both regularly screen alcohol, tobacco, and gambling. The Aquinas (RR) fund family restricts investment in weapons, just like the father of the modern SL fund, Pax World Fund, which was launched by Christians opposing the Vietnam war. Yet almost no SL-oriented fund screens abortion, pornography, or questions of homosexuality (SIF 2004). One of the largest SL fund families, Calvert, employs no “moral screens,” as defined by one of their sales representatives. Individual screens for the SR funds in the study are identified in Table I.

However, these complexities are little different from methodological flaws in simply comparing screened and unscreened funds. Critics point out that most studies purporting to show statistically significant differences in performance leave important factors uncontrolled for. For example, sector weightings in the funds or indexes used can greatly influence performance if the time period is one in which one sector’s performance diverged from the rest of the market. Entine contends much of the higher returns of SR funds in the bull market of the late 1990’s were due to their overweighting in technology stocks. Did tech stocks perform *because* their firms were SR, or did great management and an economic climate hospitable to their field give them the luxury of being SR? Which came first, the chicken or the egg? (Entine 2003).

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In a subject as complex and multifaceted as investments, it is nearly impossible to conduct a “perfect” study. With this shortcoming in mind, the Edwards and Samant study of 2003 served as the model. A five-year time period was chosen due to the dearth of RR-oriented funds with long histories; only nine met the search criteria on the Morningstar database. Four were based on Catholic values, two on evangelical Christian values, one on Mennonite Christian values, and two on Islamic values. (None of any duration were found based on Judaism.)

For the SL funds, twenty-one which met criteria for a minimum five-year history and membership in the Social Investment Forum were chosen (SIF 2004). Bond funds and balanced funds perform largely in response to moves in interest rates rather than to superior management or financial performance of the issuing companies. Even among sub par, “junk” rated firms, less than 3 percent of bonds ever default. To keep comparisons relevant, funds with large bond positions were excluded, leaving all funds predominantly domestic equity.

Once individual funds of each category were selected, they were combined into three separate portfolios: one composed of the twenty-one SL funds, or the Secular Left Portfolio, one composed of the nine RR funds, or the Religious Right Portfolio, and, as an added exercise, one which excludes the Islamic RR funds leaving a totally Christian-oriented portfolio. Each portfolio will begin the time period with equal portions of the individual funds, but will not be rebalanced; shares will end in whatever proportions their performance has taken them.

Methodology

The time period chosen of September 30, 1999 to September 30, 2004 yields a five-year observation period. On a quarterly basis it gives twenty data points. *Mean returns* are calculated by averaging total returns for all twenty quarters. *Mean excess returns* are calculated by subtracting “risk-free” returns, the average yield on a 90-day Treasury bill for this period, or 0.72 percent per quarter. *Total risk* is measured by quarterly standard deviation of returns. *Systematic risk* is estimated by beta, calculated by regressing the fund’s rate of return on the rate of return on the S&P 500 Index. The S&P 500 Index is used, as it is the most commonly used benchmark in finance research.

The measures compiled are well-known in Modern Portfolio Theory (MPT). The Sharpe Ratio estimates returns for a given time period adjusted for risk, with risk expressed as volatility of returns, or standard deviation, of the portfolio, and the risk-free rate of return the yield on 90-day Treasuries (CFP 2003):

$$S_i = \frac{\text{Total portfolio return} - \text{Risk-free rate of return}}{\text{Portfolio standard deviation}}$$

An alternate measure of risk-adjusted returns is the Treynor Ratio, which uses beta as a proxy for risk (CFP 2003):

$$T_i = \frac{\text{Total portfolio return} - \text{Risk-free rate of return}}{\text{Portfolio beta}}$$

Jensen's Alpha is an outgrowth of the Capital Asset Pricing Model (Edwards & Samant 2003). It incorporates the portfolio's actual return, the portfolio's beta, the risk-free rate of return, and the market's return (CFP 2003):

$$J_i = R_p - [R_f + B_p(R_m - R_f)]$$

R_p = Portfolio's actual return
 R_f = Risk-free rate of return
 B_p = Portfolio beta
 R_m = Market return

Another, more recent measure employed by Edwards and Samant is the 1997 concept of the legend in the field of finance, Franco Modigliani, and his granddaughter, Leah. It is termed *M squared*, and its purpose is to express risk-adjusted performance in simple percentages rather than abstract mathematical ratios, which is more easily understood by the average investor (Edwards & Samant 2003):

$$M_p^2 = \frac{(R_p - R_f) * S_m}{S_p} + R_f$$

R_p = Portfolio's actual return
 R_f = Risk-free rate of return
 S_p = Portfolio standard deviation
 S_m = Market standard deviation

Results

The results are shown in Tables IIA and IIB. In these Tables, the fund returns include reinvestment of dividends and are net of expense ratios, given in the last column. The funds are listed in descending order of their quarterly returns. Table IIA shows the results for the SL funds and their portfolio. Table IIB shows the results for the RR funds and their portfolio as well as the Christian portfolio. It is seen from Table IIA that eighteen of the twenty-one SL funds outperformed the S&P 500 Index during the study period. Out of these, nine had statistically significant (at the 0.05 level) positive Jensen's alpha. Winslow Green Growth Fund managed a quarterly mean return of 6.87 percent compared to the S&P 500 Index's 0.08 percent. Out of the three SL funds, which underperformed the S&P 500 Index, two had statistically significant (at the 0.05 level) negative Jensen's alpha, one of them being a stalwart of SRI world, the Domini Social Equity Fund. The highest risk expressed both by quarterly standard deviation and beta was likewise found in Winslow Green Growth Fund, with 28.62% standard deviation versus just 9.59% for the S&P 500 Index, and beta of 2.39 versus 1, respectively. It also had the highest and statistically significant (0.05 level) positive Jensen's alpha of 7.68.

Sharpe Ratios and the benchmark-dependent ratios of Treynor, Jensen's alpha, and beta are given as well. The highest measures of Sharpe and the new M squared go to Bridgeway Ultra Small Company Tax Advantage Fund, with 0.26 and 5.16, respectively. It also has a high positive (6.21) and statistically significant (0.05 level) Jensen's alpha. The highest Treynor Ratio was achieved by the Ariel Fund, at 6.79. The lowest Treynor and Sharpe Ratios both go to Domini Social Equity and the Security Social Awareness Fund.

Perhaps, most notably, the Secular Left Portfolio of all the twenty-one SL funds also outperformed the S&P 500 Index. It had a statistically significant (at the 0.05 level) positive Jensen's alpha. It had a Treynor Ratio of 1.19, and an M squared of 1.87.

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The RR funds stack up somewhat differently, as seen from Table IIB. While seven of the nine RR funds outperformed the S&P 500 Index, only one, the Timothy Plan Small Cap Value fund, had a statistically significant (at the 0.05 level) positive Jensen's alpha. This fund also gets the top spot for risk-adjusted M squared and Jensen's alpha, 2.7 and 2.92, respectively. Interestingly, the worst performer was its fellow evangelical, the Noah Fund, underperforming with a quarterly mean return of -1.27 percent, but with a negative Jensen's alpha not statistically significant (at the 0.05 level). The highest quarterly standard deviation was in Amana Growth Fund at 18.19; the lowest in MMA Praxis at 7.11.

The Religious Right Portfolio of all the nine RR funds outperformed the S&P 500 Index with a mean quarterly return of 0.63 percent versus 0.08 percent for the Index. Its M squared is 0.63, and the strategy actually produces negative Sharpe and Treynor Ratios of -0.01 and -0.09, respectively. However, Jensen's alpha for this portfolio (0.54) is not statistically significant at the 0.05 level. All this suggests *an investment performance with an RR screened portfolio higher than the S&P 500, but not a statistically significant one.*

The third portfolio, one that uses only funds of a Christian orientation, excluding the two Amana funds with Islamic screens, would appear only to depress performance. It produces a quarterly mean return of 0.33 percent, versus 0.08 percent of the S&P 500 Index, and negative Sharpe and Treynor Ratios of -0.04 and -0.4, respectively. M squared is just positive at 0.33. This portfolio's positive Jensen's alpha (0.23) is not statistically significant at the 0.05 level.

Discussion

In what ways do the results of this study tend to confirm the current views of SRI, and in what ways do they challenge them? As mentioned, a common criticism of SRI advocates who tout positive performance in recent studies is the overly simplistic test of controlling for screens and a lack thereof, risk as measured by standard deviation or beta, and very little else. Entine points out that an obvious explanation for favorable performance in SR funds is sector composition. Most studies compare performance in periods no more recent than 2000, very close to the market peak in March of that year, which was driven in large part by technology and financial stocks. In his article dated September of 2003, Entine notes that a common SRI benchmark, the Domini Social Index (DSI) was overweighted in both the financial and technology sectors compared to the S&P 500 Index: 25 percent for the DSI versus 20.5 percent for the S&P 500 in the financial sector, and 18.75 percent for the DSI versus only 14.3 percent for the S&P 500 in the technology sector

The argument would suggest an explanation for SR overperformance through 2000, but not through the period covered in this study, a period that saw technology take the hardest fall. Also, using data from Yahoo! Finance, the calculated sector weightings of the Secular Left (SL) Portfolio are in fact underweight in technology (hardware and software) relative to the S&P 500, at 12.6 percent to 15.4 percent (Table III). Sector compositions of indices and funds obviously change over time, suggesting that SR funds may have placed their sector bets and cashed in their chips at just the right time.

Entine's other main criticism of SRI performance is on arbitrary time periods, with most studies of the past twenty years covering the general bullish market of that same period until

2000. Entine is correct that no rationale is offered for using the time period (Entine 2003) but there happens to be little else to use, as SR funds came of age so recently. In any case, this study suggests favorable SR performance during one of the most adverse periods in the market since the 1930's, the period of the bursting of the tech bubble in late 2000.

There is little available information, outside of investment companies, on the performance of RR screened mutual funds. Not much, if any, research has been done on them as a stand-alone subject, and there are simply not many funds or indices overtly *favoring* pornography or the "gay lifestyle" against which to test an RR strategy. To this author's knowledge, this study is the first attempt at gauging their returns, establishing them as average or just slightly below.

What is noteworthy is the rationale for excluding conventional banks from Islamic-oriented funds: it is considered a sin – "usury," it is termed - among Muslims to charge interest on borrowed money (Islamic 1995). Instead, Islamic banks become actual partners in the businesses they decide to loan to, effectively treating each loan as a miniature stock offering. This has the effect of depressing the presence of financial stocks in the Religious Portfolio relatively to the Christian and Socially Responsible portfolios, as well as to the S&P 500 Index.

Conclusion

This study investigates the risk-adjusted return performance of two author-defined socially responsible mutual funds-the Secular Left (21) and Religious Right (9) funds. Using quarterly returns with dividends reinvested and net of expenses, the study finds that during the study period from September 30, 1999 to September 30, 2004 eighteen of the twenty-one Secular Left funds (over eighty-five percent) outperform the S&P 500 Index on a risk-adjusted basis. Of these eighteen, nine had positive Jensen's alpha, statistically significant at the 0.05 level. Only three of the Secular Left funds underperformed the S&P 500, with only one having a negative Jensen's alpha, statistically significant at the 0.05 level. The Secular Left Portfolio of all the twenty-one SL funds outperformed the S&P 500 Index during the study period, with a positive Jensen's alpha, statistically significant at the 0.05 level. The study also finds that seven of the Religious Right funds (about seventy-seven percent) outperformed the S&P 500 Index, with only one having a positive Jensen's alpha, statistically significant at the 0.05 level. The Religious Right Portfolio of all the nine RR funds outperformed the S&P 500 Index, even though its positive Jensen's alpha is not statistically significant at the 0.05 level. The Christian portfolio of all the seven RR funds with Christian orientation also modestly outperformed the S&P 500 Index, with a positive Jensen's alpha that is not statistically significant at the 0.05 level. Unlike earlier studies on Socially Responsible funds involving twenty years of generally bullish stock market, the current study also includes the bear market from 2000 to 2003, after the crash of technology stocks. The performance of the Secular Left funds and their portfolio also seem to outperform the Religious Right funds and their portfolio as well as the Christian portfolio. Since there were only nine funds in the Religious Right category, it may be of interest for future researchers to use a larger number of Religious Right funds, only they are not too many in number! Excessive weighting in the technology sector does not seem to be the reason for the better performance of the SL portfolio, as it is found to be underweighted during the study period in this sector compared to the S&P 500 Index.

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Table I. Screens Used by Socially Responsible Mutual Funds

Fund Name	Alc	Tob	Gam	Abo	Por	Wea	Ani	Pro	Env	Hum	Lab	Emp	Col	CoR
Ariel Appreciate (CAAPX)		*				*			*			*		
Ariel Fund (AFGFX)		*				*			*			*		
Bridgeway Aggressive Growth Portfolio (BRAGX)		*				*								
Bridgeway Ultra Small Company Tax Advantage(BR		*				*								
Calvert Capital Accumulation A (CCAFX)	*	*	*			*	*	*	*	*	*	*	*	*
Calvert New Vision Small Cap A (CNVAX)	*	*	*			*	*	*	*	*	*	*	*	*
Citizens Emerging Growth A (CGRDX)	*	*	*			*	*	*	*	*	*	*		*
Neuberger Berman Socially Resp Inv (NRSRX)	*	*	*			*		*	*	*	*	*		*
New Alternatives (NALFX)	*	*	*			*	*	*				*	*	
Pamassus Fund (PARNX)	*	*	*			*	*	*	*	*	*	*	*	*
Pax World Growth (PXWGX)	*	*	*			*	*	*	*	*	*	*	*	*
Security Social Awareness A (SWAAX)	*	*	*			*			*			*		*
Sierra Club Stock Fund (SCFSX)		*				*	*		*	*	*	*		*
Smith Barney Social Awareness Fund A (SSIAX)		*				*		*	*			*		
The Flex Fund's Total Return Utility (FLRUX)	*	*	*			*	*	*	*		*	*	*	
Walden Social Equity Fund (WSEEX)	*	*				*	*	*	*	*	*	*	*	*
Winslow Green Growth Fund (WGGFX)									*					
Women's Equity (FEMMX)	*	*				*	*	*	*	*	*	*		
American Trust Allegiance (ATAFX)	*	*	*			*		*	*	*	*	*		
Domini Social Equity A (DSEEX)	*	*	*			*		*	*	*	*	*		*
Parnassus Equity Income (PRBLX)	*	*	*			*	*	*	*	*	*	*	*	*
Aquinas Growth (AQEGX)		*		*	*	*		*	*	*	*	*	*	*
Aquinas Small Cap (AQLX)		*		*	*	*		*	*	*	*	*	*	*
Aquinas Value (AQELX)		*		*	*	*		*	*	*	*	*	*	*
Noah Fund (NOAHX)	*	*	*	*	*									
Catholic Equity (CTHQX)	*	*	*	*	*					*		*		
Timothy Sm Cap Val (TPLNX)	*	*	*	*	*									
MMA Praxis (MMPAX)	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Amana Growth Fund (AMAGX)	*		*	*										
Amana Income Fund (AMANX)	*		*	*										

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Table II A. 5 Yr Performance of SL Mutual Funds on Quarterly Basis (09/30/1999-09/30/2004)

Fund/Portfolio Name	Quarterly Mean Return (%)	Quarterly Std Dev (%)	Sharpe Ratio	Correlation Coefficient w/S&P500	Beta	R Squared	M Squared	Jensen's Alpha	Treynor Ratio	Expense Ratio (%) (Annual)
Secular Left Portfolio	1.99	10.62	0.12	0.96	1.06	0.93	1.87	<u>1.94</u> 2.97*	1.19	1.4
Winslow Green Growth Fund (WGGFX)	6.87	28.62	0.21	0.80	2.39	0.64	2.78	<u>7.68</u> 1.96*	2.58	1.49
Bridgeway Ultra Small Company Tax Advantage (BRSIX)	6.23	11.90	0.46	0.88	1.09	0.77	5.16	<u>6.21</u> 4.94*	5.05	0.65
Bridgeway Aggressive Growth Portfolio (BRAGX)	5.11	19.43	0.23	0.78	1.58	0.61	2.89	<u>5.40</u> 1.97*	2.78	1.62
Ariel Fund (ARGFX)	3.76	7.67	0.40	0.56	0.45	0.32	4.52	<u>3.33</u> 2.37*	6.79	1.07
Ariel Appreciation (CAAPX)	3.05	9.00	0.26	0.73	0.69	0.53	3.20	<u>2.77</u> 3.40*	3.40	1.16
Calvert New Vision Small Cap A (CNVAX)	2.96	12.38	0.18	0.89	1.15	0.79	2.46	<u>2.98</u> 2.31*	1.95	1.74
Parnassus Equity Income (PRBIX)	2.11	6.78	0.21	0.87	0.62	0.77	2.69	<u>1.78</u> 2.46*	2.26	1.06
New Alternatives (NALFX)	1.87	14.47	0.08	0.63	0.95	0.4	1.48	<u>1.76</u> 1.21	1.21	1.25
Parnassus Fund (PARNX)	1.72	13.53	0.07	0.79	1.11	0.62	1.43	<u>1.71</u> 0.91	0.90	1.01
Neuberger Berman Socially Resp Inv (NBSRX)	1.31	8.21	0.07	0.93	0.80	0.86	1.41	<u>1.10</u> 1.59	0.74	0.95
Women's Equity (EEMMX)	1.15	7.53	0.06	0.97	0.76	0.93	1.27	<u>0.92</u> 2.11*	0.56	1.79
Walden Social Equity Fund (WSEFX)	1.05	7.44	0.04	0.95	0.74	0.91	1.15	<u>0.80</u> 1.60	0.45	1.12
Calver Capital Accumulation A (CCAEX)	0.86	12.69	0.01	0.92	1.22	0.85	0.83	<u>0.92</u> 0.81	0.11	1.71
Citizens Emerging Growth A (CGRDX)	0.63	16.92	-0.01	0.85	1.50	0.73	0.67	<u>0.87</u> 0.43	-0.06	1.60
Sierra Club Stock Fund (SCFSX)	0.36	10.21	-0.04	0.98	1.04	0.97	0.38	<u>0.31</u> 0.76	-0.35	1.59
Smith Barney Social Awareness Fund A (SSIAX)	0.32	6.48	-0.06	0.96	0.65	0.92	0.13	<u>0.02</u> 0.05	-0.62	1.10
The Flex Fund's Total Return Utility (FLRUX)	0.25	9.53	-0.05	0.73	0.73	0.53	0.25	<u>0.01</u> 0.00	-0.65	2.18
American Trust Allegiance (ATAFX)	0.19	13.67	-0.04	0.87	1.24	0.76	0.35	<u>0.26</u> 0.17	-0.43	1.89
Pax World Growth (PXWGX)	-0.06	10.00	-0.08	0.86	0.90	0.73	-0.03	<u>-0.21</u> -0.17	-0.87	1.77
Domini Social Awareness A (SWAAX)	-0.56	9.24	-0.14	0.99	0.95	0.98	-0.61	<u>-0.06</u> -2.06*	-1.34	1.19
Security Social Awareness A (SWAAX)	-0.67	9.14	-0.15	0.98	0.93	0.97	-0.74	<u>0.79</u> 2.11*	-1.49	1.46
S&P 500 Index	0.08	9.59	-0.07	1.00	1.00	1.00	0.08	0.00	N/A	N/A
US 90 Day Treasury Bill	0.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: t values are given under the values of Jensen's Alpha. * indicates significant at 0.05 level.

Table II B. 5Yr Performance of RR Mutual Funds on Quarterly Basis (09/30/1999-09/30/2004)

Fund/Portfolio Name	Quarterly Mean Return (%)	Quarterly Std Dev (%)	Sharpe Ratio	Correlation Coefficient w/S&P500	Beta	R Squared	M Squared	Jensen's Alpha	Treynor Ratio	Expense Ratio (%) (Annual)
Religious Right Portfolio	0.63	9.68	-0.01	0.98	0.99	0.97	0.63	<u>0.54</u> 1.42	-0.09	1.66
Timothy Sm Cap Val (TPLNX)	2.98	10.96	0.21	0.90	1.03	0.8	2.70	<u>2.92</u> 2.67*	2.20	1.56
Amana Growth Fund (AMAGX)	2.58	18.19	0.10	0.83	1.57	0.69	1.70	<u>2.86</u> 1.26	1.18	1.40
Amana Income Fund (AMANX)	1.02	7.70	0.04	0.89	0.71	0.8	1.09	<u>0.76</u> 0.98	0.42	1.40
Aquinas Value (AQEIX)	0.31	8.07	-0.05	0.88	0.74	0.77	0.23	<u>0.06</u> 0.07	-0.55	1.49
Aquinas Growth (AQEGX)	0.27	10.15	-0.04	0.93	0.98	0.86	0.29	<u>0.18</u> 0.21	-0.46	1.46
Catholic Equity (CTHGX)	0.19	9.33	-0.06	0.99	0.96	0.99	0.18	<u>0.08</u> 0.37	-0.55	1.94
MMA Praxis (MMPAX)	0.09	7.11	0.11	0.95	0.70	0.91	-0.37	<u>-0.36</u> -0.76	-1.15	1.74
Aquinas Small Cap (AQLX)	-0.70	9.87	-0.14	0.90	0.93	0.81	-0.66	<u>-0.83</u> -0.85	-1.53	2.32
Noah Fund (NOAHX)	-1.26	12.80	-0.15	0.90	1.20	0.81	0.76	<u>-1.21</u> -0.96	-1.65	1.63
Christian Portfolio	0.34	9.25	-0.04	0.98	0.95	0.96	0.33	<u>0.23</u> 0.54	-0.40	1.58
S&P 500 Index	0.08	9.59	-0.07	1.00	1.00	1.00	0.08	0.00	-0.64	N/A
US 90 Day Treasury Bil	0.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: t values are given under the values of Jensen's Alpha. * indicates significant at 0.05 level.

Table III. Portfolio Sector Weightings in percentage

Sectors	Secular Left Portfolio	Religious Right Portfolio	Christian	S&P 500 Index
Utilities	4.53	3.44	1.10	2.66
Business services	9.52	9.01	8.82	3.92
Financials	17.98	14.48	18.62	20.3
Telecommunications	2.76	2.96	1.54	3.42
Media	4.56	2.67	2.53	3.86
Consumer goods	7.45	6.59	6.54	9.65
Energy	4.46	7.47	5.71	6.52
Hardware	8.27	10.13	9.47	10.82
Health	15.17	14.1	13.44	13.33
Software	4.35	4.38	4.62	4.55
Consumer services	10.00	10.53	12.98	8.76
Industrial materials	10.96	14.25	14.61	12.2

The Effect of Changes in Financial Leverage on the Relation Between Earnings and Stock Returns: Evidence from Korean Firms

Young S. Kwak, Jongdae Jin, and Kyung Joo Lee

Abstract:

This study examines whether a firm's default risk as measured by its financial leverage affects the relationship between accounting earnings and stock returns, viz., the earnings response coefficient (ERC). From analytical results, we hypothesize that the ERC is a negative function of the firm's default risk. We test this hypothesis by comparing the ERC's between pre-change and post-change period, using a sample of Korean firms that experienced changes in their financial leverages through either the issue of new debt or the retirement of outstanding debt. The empirical results indicate that the ERC's have decreased for the issue of new debt, but increased for the retirement of outstanding debt from pre-change to post-change period. Furthermore, these shifts in the ERC's are statistically significant, even after controlling for the differences in the systematic risk and growth between pre-change and post-change period. Overall, our findings suggest that the default risk is an important factor affecting the ERC for the Korean firms.

1. Introduction:

This study addresses the issue of whether the risk of a firm's debt (default risk) affects the relationship between accounting earnings and stock returns. We investigate this issue by examining the effect of the changes in the firm's financial leverage on the coefficient (hereafter, earnings response coefficient: ERC, in short) relating earnings and stock returns. Specifically, we compare ERC's during the period prior to the financial leverage change (pre-change period) with those during the period subsequent to the change (post-change period). The types of financial leverage changes considered in this study are both the issue of new debt and the retirement of outstanding debt.

The determinant of cross-sectional and/or inter-temporal variations of the ERC has been investigated in quite a few previous studies (see Lee, Jin and Huh (2005) for a list of studies). The determinants of the ERC identified in these studies include the characteristics of the firm's earnings generating process, systematic risk of common stock, firm size, growth opportunity, cost structure, dividend payout ratio, audit opinion, industry, and interest rates (see Holtahusen and Watts 2001; Kothari 2001; Beaver 2002 for literature surveys).

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The purpose of this study is to extend this line of research by focusing on the firm's default risk as a determinant of the ERC. Several studies provide empirical evidence suggesting that the ERC is affected by the existence and the level of debt in the firm's capital structure (Dhaliwal, Lee and Fargher 1991), and the default risk measured by bond ratings (Dhaliwal and Reynolds 1994). Recently, Dimitrov and Jain (2006) provide evidence documenting a negative association between changes in financial leverage and contemporaneous stock returns. In this study, we hypothesize and empirically test a negative association between changes in financial leverage and ERC.

The remainder of this paper is organized as follows. In the next section, we outline the theoretical relationship between the firm's default risk and the ERC within the framework proposed by Dhaliwal and Reynolds (1988). Section three contains our research hypotheses, sample selection procedure, and research methodology. The empirical results are presented in section four. A summary of the results and some suggestions for future research appear in final section.

2. Default Risk and Earnings Response Coefficient:

Studies that have examined the relation between unexpected changes in accounting earnings and stock returns have, implicitly or explicitly, assume an equity valuation model. Two such models are the dividend/earnings capitalization model of Miller and Modigliani (1961) and the information variable model of Garman and Ohlson (1980). Either of these models underlies much of the extant literature on the ERC. Dhaliwal and Reynolds (1988) combine a firm valuation model with the option-pricing model (OPM) to identify the economic determinants of the ERC. Among other things, they demonstrate that the ERC is a negative function of the firm's default risk. In this section, we describe the essential feature of their theoretical results. Our derivation is somewhat different from theirs in terms of assumption about time-series properties of accounting earnings.¹ However, the implications of the final specification of the ERC are essentially equivalent.

To simplify the analysis, we assume that i) a firm has two types of financing: equity and debt; ii) cash flows to the firm and operating accounting earnings before interest are identical; and iii) expected rate of return for the firm is constant over time. Under these assumptions, the value of the firm at the beginning of the period t (V_{t-1}) is the present value of expected future operating earnings:

$$V_{t-1} = \sum_{s=1}^{\infty} \frac{E_{t-1}(X_{t-1+s})}{(1+K)^s}$$

,where $E(\cdot)$ is an expectation operator, X represents operating earnings, and K denotes the expected rate of return on the firm's total asset. Firm index i was suppressed for notational simplicity. In the context of capital asset pricing model (CAPM), K may be expressed as:

$$K = R_f + \beta_A [E(R_m) - R_f]$$

¹) Dhaliwal and Reynolds (1988) assume a random walk model as a process generating earnings, and hence the persistence coefficient (defined later) is omitted in characterizing the ERC. We incorporate the persistence into their model by assuming a general specification of earnings generating process.

,where β is the systematic risk of the firm's total asset, R_f and R_m are the risk-free interest rate and rate of return on market portfolio, respectively. At the end of period t when actual earnings are realized, an unexpected change in the firm value (ΔV_t) associated with unexpected earnings (ΔX_t) can be expressed as follows:²

$$\frac{\Delta V_t}{V_{t-1}} = \frac{1}{V_{t-1}} \left[\Delta X_t + \sum_{s=1}^{\infty} \frac{\Delta E_t(X_{t+s})}{(1+K)^s} \right] \quad (1)$$

,where $\Delta E_t(X_{t+s})$ are the revisions in expected future earnings. We further assume that the firm's earnings generating process is described by a model such that $\Delta E_t(X_{t+s})$ are related to ΔX_t according to

$$\Delta E_t(X_{t+s}) = \Theta \Delta X_t, s \geq 1$$

,where Θ represents the extent to which the current period's unexpected earnings affect the revisions in expectations of future earnings, usually referred to as 'persistence coefficient' or 'revision coefficient'. The sign and value of Θ will depend on the time-series properties of the firm's earnings. Substituting for $\Delta E_t(X_{t+s})$ and K in equation (1) and rewriting, we get:

$$\frac{\Delta V_t}{V_{t-1}} = \left[1 + \frac{\Theta}{R_f + \beta_A \{E(R_m) - R_f\}} \right] \left[\frac{\Delta X_t}{V_{t-1}} \right] \quad (2)$$

The specification of the ERC in the extant literature may be viewed as special cases of the above equation. First, if the firm has no debt in its capital structure (all-equity firm), equation (2) is the exact relation we can get using an equity valuation model because the firm value in this case is simply the value of equity. Second, the extant studies differ on the characterization of the parameter Θ , depending on the assumptions about time-series process of earnings. For example, Kormendi and Lipe (1987) assume ARIMA (210) process while Easton and Zmijewski (1989) assume ARIMA (100) model.

Given the change in firm value associated with unexpected earnings as in equation (2), allocation of the incremental (or decremental) wealth between stockholders and bondholders will be determined by the risk of the firm's debt. Alternatively stated, unexpected change in earnings is not entirely reflected in the value of equity alone when the firm's debt is risky. To see this, first recognize that the value of equity (S) is the call option written on the value of the levered firm (V). From the OPM literature, it can be shown that (Copeland and Weston 1983, p.413)

$$\frac{\Delta S}{S} = \frac{\partial S}{\partial V} \frac{\Delta V}{V} \frac{V}{S}$$

This equation says that the change in equity value (ΔS) is related to the change in firm value (ΔV) by the weight $\partial S/\partial V$. Alternatively, $\partial S/\partial V$ may be viewed as the mechanism allocating ΔV to stockholders. Using the comparative static result, $\partial S/\partial V = N(Z)$, and substituting (2) into the above equation, we have

²) Miller and Rock (1985) and Watts and Zimmerman (1986) have derived the same relationship by i) using a two-period model, and ii) assuming that earnings are generated by a moving average of order one and a random walk model, respectively.

$$\frac{\Delta S_t}{S_{t-1}} = N(Z) \left[1 + \frac{\Theta}{R_f + \beta_A \{E(R_m) - R_f\}} \right] \frac{\Delta X_t}{S_{t-1}} \quad (3)$$

$N(\cdot)$ is the standardized cumulative normal density function, and

$$Z = \frac{\ln(V/D) + (R_f + s^2)T}{\sqrt{s^2 T}}$$

,where D is the face value of debt, T is time to maturity of debt, and s^2 is the instantaneous variance of returns on firm value. It is obvious from equation (3) that the impacts of Θ , β_A , and $N(Z)$ on the ERC (the bracketed term) are, *ceteris paribus*:

$$\frac{\partial ERC}{\partial \Theta} > 0, \frac{\partial ERC}{\partial \beta_A} < 0, \frac{\partial ERC}{\partial N(Z)} > 0$$

The first two results reveal that other factors being constant, the ERC is positively related to the persistence coefficient (Θ) and negatively to the systematic risk of the firm's total asset (β_A). Kormendi and Lipe (1987), Easton and Zmijewski (1989) and Collins and Kothari (1989), among others, provide empirical evidence consistent with these predictions. Of most interest in this study is the third comparative static result. As stated previously, $N(Z)$ is the portion of the change in firm value being allocated to stockholders. We interpret $N(Z)$ broadly as the probability that the firm will not go bankrupt. Alternatively, $1-N(Z)$ can be viewed as the firm's default risk. Note that for an all-equity firm, $N(Z)=1$, viz., it has no default risk. Hence, the third comparative static result indicates that the ERC is a negative function of the firm's default risk.

To see the intuition behind this 'default risk effect' on the ERC, consider a firm that has risky debt in its capital structure.³ Assume that the risk of debt can be quantified by: $N(Z)=0.7$. For a \$1.00 increase in firm value resulting from positive unexpected earnings, \$0.70 will be allocated to stockholders. In case of negative unexpected earnings, stockholders will lose \$0.70 while remaining \$0.30 of \$1.00 loss is born by bondholders. Now suppose the quality of debt has been downgraded such that $N(Z)$ decreases to 0.4.⁴ Stockholders will now gain (lose) \$0.40 for \$1.00 increase (decrease) in firm value from positive (negative) unexpected earnings. Relative to the previous case, a larger portion of the loss (\$0.60) will be shared by bondholders. This illustrates that for a given amount of unexpected earnings, the stockholders of high (low) default risk firm will gain or lose less (more) than those of low default risk firm, suggesting a negative relation between the ERC and the default risk.

³) The same line of reasoning can be applied to the comparison of the ERC's across firms with different levels of default risk. Our example is to illustrate the impact of the change in default risk on the ERC for a given firm, which is essential feature of our hypothesis testing.

⁴) A number of factors may affect $N(Z)$. These may include leverage, maturity of debt, return variability, and unexpected earnings. In the example illustrated, we are envisioning the situation where $N(Z)$ remains the same for a while before and after its change.

3. Research Design:

3.1 Research Hypotheses

The maintained null hypothesis in this study is that the ERC is independent of the firm's financial leverage. To test this hypothesis, we examine whether there is any significant difference in the ERC's between periods prior to and subsequent to a financial leverage change. To the extent that financial leverage is an appropriate proxy for the default risk, the issue of new debt and the retirement of outstanding debt would have opposite effects on the ERC's. Formally, the following two hypotheses (in alternative form) are tested:

Hypothesis 1: The ERC is *smaller* for the period subsequent to a change in financial leverage than for the period prior to the change, *when new debt is issued*.

Hypothesis 2: The ERC is *larger* for the period subsequent to a change in financial Leverage than for the period prior to the change, *when outstanding debt is retired*.

3.2 Sample Selection

Our sample consists of Korean firms that have experienced changes in their financial leverage, through either the issue of new debt or the retirement of outstanding debt, during ten-year period from 1988 to 1997. To be included in the sample, the firm must satisfy the following criteria: (1) each firm had to experience a change in financial leverage (either the issue of new debt or the retirement of old debt) at least once over the study period; (2) each financial leverage change should not be immediately followed or preceded by another change within three year period; (3) sufficient accounting and market data (returns and stock prices) were available to calculate relevant variables for three year period before and after each financial leverage change; (4) each firm must have the same fiscal year end over the study period. The second requirement was imposed to avoid a potential 'information effect' of the changes in financial leverage on ERC's.⁵ It should be noted that our approach is to compare the ERC's across periods (pre -change ve rsus post -change), excluding the year in which financial leverage changes occurred.

The above selection criteria yielded a sample of 24 firms with financial leverage changes. Table 1 provides distribution of sample firms by calendar year and types of leverage changes. Several points are worth noting from Table 1. First, there is little clustering in particular years, with exceptions in 1988 that accounts for 5 (41.7%) of the retirement of old debt and in 1994 that has no case of leverage changes. Second, average amount for the retirement of outstanding debt is \$4.7 million, but \$27.1 million for the issue of new debt;

5) Changes in financial leverage can convey information to stockholders (Dimitrova and Jain 2006). Therefore, the ERC's at the years of change may be affected by the 'information effect' as well as the shift in the default risk associated with the financial leverage changes. If one year rather than three year restriction was applied, the number of firms in the sample would be increased by about three times. However, these firms are susceptible to the potential 'information effect'. Considering this trade-off, we opted for the small but clean sample.

Third, the ratio of amount (issue or retirement) to total debt is 9.22% for the debt issue and 7.71% for the debt retirement. It is quite difficult to evaluate whether this ratio is significant enough to change the firm's default risk. If the magnitude of financial leverage changes in our sample were quite small, this would obviously work against finding any significant difference in the ERC's between pre-change and post-change period.

<Insert Table 1>

3.3. Methodology

We hypothesized that the ERC is affected by the firm's default risk as measured by the change in its financial leverage through either the issue of new debt or the retirement of outstanding debt. To test this hypothesis, we estimated the following regression model:⁶

$$RET_{it} = a + bUE_{it} + \phi D_{it} * UE_{it} + e_{it} \quad (4)$$

where RET_{it} = stock returns for firm i in year t ,

UE_{it} = unexpected earnings for firm i in year t ,⁷

D_{it} = dummy variable which takes a value of one if year t for firm i is in the post-change period, and zero if year t is in the pre-change period.

Recall that the year t is in terms of event time not calendar time; that is, $t = [-3, 0, 3]$. The years in which financial leverage changes occurred ($t=0$) were excluded from the analysis to avoid potential 'information effect' of the changes on ERC's and to make comparisons symmetrical across periods. Above model was estimated separately for the issue of new debt and the retirement of outstanding debt. Empirical test for any significant difference in the ERC's between pre-change period and post-change period is equivalent to testing the significance of the estimated coefficient ϕ in the model (4). Thus, our hypotheses can be stated as:

Hypothesis 1: $H_0: \phi = 0$, $H_a: \phi < 0$ for $i \square$ Issue of new debt
 Hypothesis 2: $H_0: \phi = 0$, $H_a: \phi > 0$ for $i \square$ Retirement of outstanding debt

4. Empirical Results:

4.1 Descriptive Statistics

Table 2 presents descriptive statistics for selected variables of interest: systematic risk of common stock (BETA)⁸; growth rate as measured by the ratio of market value to book value of equity (GROWTH); and financial leverage as measured by the ratio of total liabilities to book value of equity (LEVG). Median values of these variables are reported for

⁶) We also employed CAR (cumulative abnormal returns) as dependent variable. The results are essentially the same as reported except for low R-square. The use of RET is also in spirit of Easton, Harris and Ohlson (1992).

⁷) Unexpected earnings (UE) were determined by changes in actual earnings per share, and then deflated by stock price at the beginning of the fiscal period. To avoid the problem of extreme values, observations with $|UE| > 100\%$ were excluded.

⁸) Systematic risk was estimated from the market model using returns data up to 60 months (at least 24 months) preceding the end of year.

each of the seven-year period beginning three year before the year in which financial leverage changes occurred. Also reported is Wilcoxon Z-statistics that test differences in these variables between pre-change and post-change period. The rationale for selecting and comparing these particular variables over time is their association with ERC's. Easton and Zmijewski (1989), Collins and Kothari (1989) and Dhaliwal, Lee and Fargher (1991) provide empirical evidence indicating that BETA, GROWTH and LEVG are important determinants of the variation in ERC's.

Table 2 shows noticeable trends in some of the variables over time for the sample. For the firms of new debt issue, both BETA and LEVG exhibit increasing patterns, while GROWTH is decreasing. On the other hands, the firms of debt retirement appear to experience a decrease in GROWTH and LEVG, but a increase in BETA. However, z-statistics from the Wilcoxon signed-ranks tests indicate that the changes in BETA and LEVG are statistically insignificant, except GROWTH that is significant at less than 0.01 levels for both types of leverage changes.

<Insert Table 2>

4.2 Results of Testing Hypotheses

Table 3 presents the results of testing whether there is any significant shift in the ERC's from pre -change to post -change period when the firm experiences change in its financial leverage. We estimated equation (4) separately for the pre-change and post-change period, as well as for the entire period. The results are reported for two types of financial leverage changes, the issue of new debt (Panel A) and the retirement of outstanding debt (Panel B).

The estimation results are consistent with the theoretical prediction when financial leverage is changed through the issue of new debt. The ERC was 1.441 during the pre-change period, but 0.373 during the post-change period. This decrease in the ERC can be seen in the negative value of the regression coefficient ϕ , which is statistically significant (at $\alpha < 0.10$). This result lends support to Hypothesis 1. For the retirement of outstanding debt, there was an increase in the ERC from pre-change (0.193) to post-change (0.535) period. Hence, the estimated coefficient ϕ has the expected sign (positive), which is consistent with the theoretical prediction. However, the coefficient is statistically insignificant, suggesting only a directional support to Hypothesis 2. Overall, these results support our maintained hypothesis that the ERC is a negative function of a firm's default risk associated with the financial leverage change.

<Insert Table 3>

4.3 Additional Analysis: Controlling for Risk and Growth

In the preceding two subsections, we find that the issue of new debt and the retirement of outstanding debt result in decrease and increase, respectively, in the ERC's. These results may be due to systematic differences between pre-change and post-change

period in the variables that affect the ERC's. The variables such as the systematic risk and growth have been shown to affect ERC's (e.g., Easton and Zmijewski 1989; Collins and Kothari 1989). In fact, the Wilcoxon tests reported in section four indicate that there is a significant difference in the growth variable between pre-change and post-change period. As an attempt to investigate this possibility, we estimated the following regression model:

$$RET_{it} = b_0 + b_1UE_{it} + b_2RISK_{it}*UE_{it} + b_3GROW_{it}*UE_{it} + \phi D_{it}*UE_{it} + e_{it}$$

where $RISK_{it} = 1$ if the systematic risk of common stock (BETA) for firm i in year t is above sample median, and 0 if otherwise,

$GROW_{it} = 1$ if growth rate (GROWTH) for firm i in year t is above sample median, and 0 if otherwise.

The estimates of the above model are reported in Table 4. The estimate of the coefficient ϕ on $D*UE$ for the issue of new debt is similar to earlier result, with the coefficient being negative and statistically significant ($\alpha < 0.10$). However, the coefficient is not only positive, but also statistically significant ($\alpha < 0.01$) for the retirement of outstanding debt. Overall, these results lend a weak support to Hypothesis 1, but a strong support to Hypothesis 2.

Several potential arguments may explain relatively weak statistical significance for the new debt issue. First, the relation between the level of financial leverage and the default risk in Korea may be different from that in other countries (e.g., U.S.A.). For example, the relation may be asymmetrical in that the issue of new debt may decrease, rather than increase, the "real" default risk of the firm. Therefore, the issue of new debt may not reflect the change in the default risk for the firms in Korea. Second, financial leverage of typical Korean firms consists of more short-term debt than long-term debt such as corporate bonds. Hence, the issue of long-term debt may have only a small, if any, effect on the default risk.

<Insert Table 4>

5. Conclusion:

This study examines whether a firm's default risk as measured by its financial leverage affects the relation between unexpected changes in accounting earnings and stock returns, viz., the ERC. From analytical results, we develop the hypothesis that the ERC is a negative function of the firm's default risk. Using a sample of Korean firms that experienced changes in their financial leverages through either the issue of new debt or the retirement of outstanding debt during 1988-1997 period, we test this hypothesis by comparing the ERC's between pre-change and post-change period.

The empirical results indicate that the ERC's have decreased for the issue of new debt, but increased for the retirement of outstanding debt from pre-change to post-change period. Furthermore, these shifts in the ERC's are statistically significant, especially for the case of the retirement of outstanding debt. These results hold up even after controlling for the

differences in the systematic risk and growth. Overall, our findings suggest that the default risk is an important determinant of ERC's in Korea.

Several related issues are left for future research. First, additional testing of the 'default risk effects' can be conducted by using the sample of firms that have experienced changes in their bond ratings. To the extent that bond ratings are better proxy for the default risk, the use of bond rating instead of financial leverage will enhance the chance of observing the effect of default risk on the ERC's. Second, we may conduct empirical tests based on increased sample size by including firms with leverage changes that are not followed or preceded by another change within one-year period, rather than three-year period. Third, a straightforward extension of this study would be to examine the effect of default risk on the relation between unexpected earnings and bond returns. The analytical results described in section 2 imply that the default risk is positively related to the ERC's of bond returns.

Table 1

**Distribution of Changes in Financial Leverage by
Calendar Year and Types of Changes**

Year	Issue of New Debt			Retirement of Outstanding Debt		
	N	Average Amount (\$Million)	Ratio to Total Liabilities (%)	N	Average Amount (\$Million)	Ratio to Total Liabilities (%)
1988	-	-	-	5	2.446	2.84
1989	1	4.000	14.12	-	-	-
1990	1	0.800	3.41	2	6.500	21.94
1991	1	20.000	8.87	-	-	-
1992	3	15.307	5.36	-	-	-
1993	2	21.288	4.36	1	6.921	7.70
1995	2	31.268	12.62	2	5.000	3.05
1996	-	-	-	1	4.632	11.87
1997	2	74.824	17.12	1	10.773	8.71
Total	12	27.124	9.22	12	4.797	7.71

Table 2**Sample Median of Selected Variables**

Year Relative to financial leverage change	Issue of New Debt			Retirement of Outstanding Debt		
	BETA _a	GROWTH _b	LEVG _c	BETA	GROWTH	LEVG
-3	0.844	1.713	2.326	0.657	1.510	2.737
-2	0.882	1.128	1.808	0.708	1.862	1.690
-1	0.802	1.286	2.292	0.648	1.413	1.963
0	0.935	0.978	2.766	0.793	1.224	2.159
1	0.879	0.857	2.649	0.901	0.821	1.885
2	0.816	0.662	2.760	0.893	0.848	1.975
3	0.737	0.718	2.546	0.756	0.542	1.244
Wilcoxon Z-value ^d	0.039	-3.306**	0.310	0.997	-2.962**	-1.425

a) Systematic risk of common stock, estimated from market model.

b) Growth as measured by the ratio of market value to book value of equity.

c) Leverage as measured by the ratio of total liabilities to book value of equity.

d) Wilcoxon signed ranks tests statistics on mean difference between the periods before and after the issue of new debt or the retirement of outstanding debt.

ζ= Significant at $\alpha=0.10$; * = Significant at $\alpha=0.05$; ** = Significant at $\alpha=0.01$; two-tailed tests.

Table 3**Effect of Changes in Financial leverage on the Earnings Response Coefficients**

$$RET_{it} = a + bUE_{it} + \phi D_{it} * UE_{it} + e_{it}$$

<i>Panel A: Issue of New Debt</i>				
Independent variables ^a	Expected sign	Pre-change period	Post-change period	Total
Intercept	?	0.210 (1.460)	-0.001 (0.000)	0.098 (1.110)
UE	+	1.441 ^ζ (1.850)	0.373 (1.440)	1.660 ^{**} (2.460)
D*UE	-			-1.263 ^ζ (1.700)
R ² (%)		9.15	5.74	10.32
F-value		3.42 ^ζ	2.07	3.97 [*]
<i>Panel B: Retirement of Outstanding Debt</i>				
Independent variables	Expected sign	Pre-change period	Post-change period	Total
Intercept	?	0.676 ^{**} (3.240)	0.143 (1.040)	0.409 ^{**} (3.200)
UE	+	0.193 (0.840)	0.535 ^{**} (3.110)	0.166 (0.840)
D*UE	+			0.337 (1.120)
R ² (%)		2.05	22.13	7.57
F-value		0.71	9.66 ^{**}	2.83 ^ζ

a) D_{it} is a dummy variable that takes a value of one if the year t for firm i is in the period subsequent to a financial leverage change, and zero if the year t is in the period prior to the financial leverage change.

b) t -values in parentheses.

^ζ = Significant at $\alpha=0.10$; * = Significant at $\alpha=0.05$;

** = Significant at $\alpha=0.01$; two-tailed tests.

Table 4

Effect of Change in Financial leverage Changes on the Earnings Response Coefficients: After Controlling for Systematic Risk and Growth

$$RET_{it} = b_0 + b_1UE_{it} + b_2RISK_{it}*UE_{it} + b_3GROW_{it}*UE_{it} + \phi D_{it}*UE_{it} + e_{it}$$

Independent variables ^a	Issue of New Debt		Retirement of Outstanding Debt	
	Expected sign	Estimates (t-value)	Expected Sign	Estimates (t-value)
Intercept	?	0.080 (0.890)	?	0.295* (2.180)
UE	+	1.592 ^ζ (1.850)	+	-0.263 (0.870)
RISK*UE	-	0.669 (0.890)	-	0.193 (0.620)
GROW*UE	+	-0.223 (0.300)	+	0.754* (2.160)
D*UE	-	-1.403 ^ζ (1.750)	-	0.792* (2.060)
R ² (%)		12.55		14.48
F-value		2.40 ^ζ		2.84*

RISK_{it} = 1 if the systematic risk of common stock for firm i in year t is above sample median, and 0 otherwise.

GROW_{it} = 1 if growth (ratio of market value to book value of equity) for firm i in year t is above sample median, and 0 otherwise.

D_{it} = 1 if the year t for firm i is in the period subsequent to a financial leverage change, and 0 if year t is in the period prior to the financial leverage change.

ζ = Significant at α=0.10; * = Significant at α=0.05; ** = Significant at α=0.01; two-tailed tests.

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The Shift From Defined Benefit to Defined Contribution Retirement Plans: Are College Students Ready?

Brian Porter

Abstract

As defined contribution retirement plans, rather than defined benefit retirement plans, become the norm, it is imperative that people have a thorough understanding of retirement planning. From 1975 to 1998, there was an increase of 42 million Americans enrolled in non-Social Security retirement programs, from 44 million to 86 million. In 1975, the predominant plan was defined benefit with 32 million Americans participating in 103,000 different defined benefit plans. In contrast, 10 million Americans were participating in 208,000 different defined contribution plans. By 1998, the dominant plan had switched. Forty-six million Americans were in defined contribution plans and 40 million were in defined benefit plans (Migration News). The trend is clearly away from defined benefit plans and to defined contribution plans. Even financially healthy companies, such as IBM, Hewlett Packard, and Motorola have frozen their traditional pension plans and replaced them with 401(k)s.

This paper will examine how the United States has arrived at its present day pension situation, what the implications are, and assess the readiness of college students for this environment. A succinct historical overview of pensions is presented followed by a description of the current pension climate, including the increasing necessity for individuals to be financially literate, particularly in the area of retirement planning. Previous research has largely focused on the fact that young people lack adequate broad based financial skills, but it has not focused specifically on retirement planning.

This study fills the gap that currently exists in this area and advances this body of knowledge in three important ways. One, it assesses the financial literacy of current college students in the specific area of retirement planning. Two, it compares three factors that may impact college students' knowledge in retirement planning: (1) taking a college course in finance with exposure to retirement planning, (2) gender, and (3) major. Three, it suggests methods for improving the retirement planning knowledge of college students. Results of this study indicate that college students are deficient in retirement planning knowledge and that even a short topical module on retirement planning included in an introductory finance course significantly improves students' retirement planning literacy.

History of Pensions in the United States

Historically, pensions had little relevance in the United States. It was not until midway through the 20th century that pensions became an integral part of the American life. Prior to this, the tendency was that one worked one's entire life, or was cared for by one's family. In the later half of the 19th century the life expectancy was less than 65 years of age, and for those males that did live to 65, seventy-five percent were still working (Sass, 1997).

Government pensions date to veterans of the Revolutionary War, but it was not until 1875 that American Express Co., a transcontinental freight hauler, set up the first private company pension fund. Fueled by the industrial revolution, manufacturing grew from 3.5

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million to 14.2 million workers between 1870 and 1910 (Greenblatt, 2006). During this period, railroads were leaders in offering pensions to employees. Though offering pensions was largely pragmatic, employers, and society, were also driven by a sense of social ethics. In 1912, Lee Wielling Squier wrote “From the standpoint of the whole system of social economy, no employer has a right to engage men in any occupation that exhausts the individuals’ industrial life in 10, 20, or 40 years, and then leave the remnant floating on society at large as a derelict at sea” (McGill, 1979).

The government of the United States largely supported the idea of private pensions with a very limited governmental role. In 1921, the first tax incentive for employers was introduced that exempted income from pension and profit-sharing trusts. Even still, the majority of private companies did not offer private retirement plans. In 1935, when the Social Security System was created, less than 15 percent of the workforce was covered by a private retirement plan, and of those that did offer plans, strict age and years-of-service were required. Only about 50 percent of covered employees lived long enough, usually 65, to receive full benefits (Greenblatt, 2006).

For two reasons, during the period of World War II, private pensions began to flourish. First, Social Security and other government programs increased federal income taxes to as high as 70 percent for top wage earners. Pension plans became a popular shelter as a benefit that was not immediately taxed. Second, wage-and-price controls forbid unions to negotiate for increased wages. Thus, pension benefits become an attractive alternative. In the two-year period from 1942 to 1944 the IRS approved 4,000 pension plans and over the seven year period from 1938 to 1945, the number of people covered by private pension plans tripled to 6.5 million employees (Sass, 1997). The automobile industry began offering pensions in 1949 and by 1960, 40 percent of all private-sector employees were covered by pension plans.

In 1974, the Employee Retirement Security Act (ERISA) was passed by Congress and established the Pension Benefit Guarantee Corporation (PBGC). In addition, companies were required to adhere to funding and vesting rules. In 1978, Congress established 401(k) accounts, chiefly to allow executives to shelter income from tax rates as high as 70 percent. Employers, however, soon peddled 401(k) accounts to employees, extolling their ability to be fully portable. In reality, 401(k) plans were much cheaper for employers, requiring no obligation once an employee retired. Today, 60% of private sector employees and 98% of state and local government employees have some kind of retirement plan (Byrnes, 2005).

The Current Pension Situation

Currently, the PBGC and Social Security are in a precarious state. In 2004, the PBGC had a \$23 billion deficit and estimates by the Congressional Budget Office predict that the deficit could increase to \$142 billion by the year 2024 unless stricter pension-funding rules are enacted (www.pbgc.gov). Demographics are pressuring Social Security as it currently exists. In the next two decades the number of people over the age of 65 will nearly double from what it is today (Schwadron, 2006). In 1950, there were 16 workers to support every one beneficiary of Social Security. Today, there are only 3.3 workers supporting every Social Security beneficiary. It is projected that in 45 years, there will be only 2 workers supporting each beneficiary (Rohrich, 2005).

In August 2006, President Bush signed into law what he called “the most comprehensive reforms to America’s pension system in 30 years” (Dairymple, 2006). The changes impact both employers and employees. Under most circumstances, employers with under funded plans (an estimated 30,000 defined benefit plans totaling \$450 billion) are now given seven years to reach 100 percent funding. The law also encourages defined contribution plans by allowing companies to automatically enroll workers in 401(k) programs, and it increases the amount individuals can contribute annually to IRAs.

Implications and Inadequate Retirement Investing Knowledge

Federal Reserve Chairman Ben Bernanke recently told Congress that “Sharpening Americans’ financial know-how and skills is crucial to consumers’ ability to make smart money choices and is also good for the overall economy” (Aversa). Because of this shift from traditional defined benefit plans to self-managed defined contribution plans, an increasing number of people, even those with little, or no, finance and investing expertise, are being forced to make financial investing decisions for retirement. Unfortunately, according to the nonprofit group Jump\$tart Coalition for Personal Financial Literacy, too many people are financially illiterate. According to the organization’s 2006 survey, which assesses a broad comprehension of basic financial principles, high school seniors were able to correctly answer only 52.4 percent of questions about personal finance and economics (Jump\$tart).

If people are deficient at understanding basic financial principles, how more so are they in comprehending the specifics of investing and planning for retirement? This is particularly disturbing given that knowledge of investing and retirement planning must begin at a young age. Even waiting a few years can have significant negative consequences. For example, if one begins saving for retirement at 25 years of age, rather than 30 years of age, the total accumulated savings can be twice as much at retirement. Thus, it is useful to assess the retirement investing knowledge of young people, such as college students, and determine what deficiencies exist. Based on this assessment, decisions can be made as to how to educate and prepare college students for retirement investing decisions.

Prior Research

Though there is very little research pertaining to the retirement planning literacy of college students, research exists that focuses on college students’ knowledge of finance in general. Previous research has consistently indicated that college students, on a whole, are financially illiterate. Chen and Volpe (1998) administered a personal financial literacy survey to college students and found that students answered only 53% of the questions correctly. Although different subgroups were examined (e.g., class rank, work experience, age), no subgroup correctly answered more than 65% of the questions. Volpe, Chen, and Pavlicko (1996) also conclude that college students have inadequate knowledge of personal investment basics. Recently Chen and Volpe (2002) found that, on average, women know less about personal finance than men. Chen and Volpe suggest that future research should “focus on how to improve both women and men’s knowledge of personal finance and their ability to handle personal finances” (p. 306).

Only a few research studies have examined college students’ skills in specific financial areas. Knowledge of credit cards and credit card involvement has been studied (Palmer et al, 2001; Warwick and Mansfield, 2000). Research regarding retirement planning has typically

studied workers already in their careers. For example, Bajtelsmit et al. (1999) find that women, compared with men, exhibit greater relative risk aversion in their allocation of wealth into defined contribution pension assets. Though it useful to study the retirement planning knowledge and behavior of workers, such as post-college graduates, it is even more vital to research younger people, such as college students. Delaying retirement planning, or uninformed retirement decisions in early years, can have detrimental implications on retirement savings. Therefore, it is critical to evaluate and improve retirement and investing knowledge at an early age.

Research Survey and Factors Examined

A survey was created to evaluate the retirement investing knowledge of undergraduate college students. For three reasons, this group is highly relevant. First, today's undergraduates are highly impacted by the shift to defined contribution retirement plans and the personal responsibility they entail. Second, college undergraduates are on the cusp of embarking on careers and it is vital that they begin retirement investing early on. Third, by assessing college undergraduates, it will be found what changes need to be made in college programs and finance classes to address knowledge deficiencies.

Specific questions assessed the respondent's knowledge of a variety issues related to retirement investment planning and the current pension environment. The survey also evaluated the concerns and preferences of the respondents. The survey was given to both majors and non-majors of business. The survey was also given to both students that have taken a course in finance, which included a short module on retirement planning, and those that have not. A total of 151 undergraduate students took the survey. After administering the survey, it was found that some students did not respond to all questions and certain responses by students were not usable. Therefore, the sample size is less than 151 for certain questions. A representation of the survey is provided in Table I.

Based on prior research pertaining to finance in general, it is hypothesized that college undergraduates are not sufficiently knowledgeable or prepared for retirement planning and investing. It is thought that the knowledge pertaining to retirement planning and investing will differ by both students' gender and major. It is also hypothesized that those students that have taken a course in finance will be more knowledgeable of retirement planning and investing.

Research Results

Tables II through VIII report the results of the survey. Tables II through VII summarize the means and standard deviations to the 14 questions for each of the three factors. Tables II and III are for *course in finance*, Tables IV and V are for *gender*, and Tables VI and VII are for *major*. Table VIII provides a summary of the one-way analysis of variance (ANOVA) for each of the three factors. Table VIII identifies significant differences (< 0.05 level) within subgroups in bold and underline. Tables II through VII can then be used to gain further insight into these significant differences.

Before commenting on the ANOVA results, an overall observation from Tables II, IV, and VI is that of the three job component considerations (salary, health care, and pension), it appears that retirement benefits are the least important to students. Also, for the three

components of retirement income (Social Security, company pension, and personal savings), students expect personal savings to be the largest component and Social Security to be the smallest. Students also report that they do not have a good understanding of different retirement plans.

The ANOVA summary in Table VIII and Tables II and III indicate that there is indeed a difference between students that have taken a course in finance and those that have not. This factor has a significant impact on eight of the 14 questions. Students that have taken a course in finance, compared with those that have not, are less likely to expect Social Security (FICA, $p = 0.001$) and a company pension (DBPN, $p = 0.001$) to be a major component of their retirement income. These students also report to having a better understanding of the difference between defined benefit and defined contribution plans (DBDC, $p = 0.000$), and different retirement saving plans (IRA, $p = 0.032$). They are also more likely to make saving and planning for retirement a priority (PLAN, $p = 0.017$).

Table VIII and III underscore the increased aptitude of students in retirement planning that have taken a course in finance. Table VIII indicates that there is a significant difference in what students think is the total savings required for retirement (\$RET), should be saved yearly for retirement (\$SAV), and the expected return on retirement savings (INTR). Students without a finance course report, on average, that \$480,718 is needed in savings for retirement whereas a student that has taken a finance course reports over twice this amount, \$1,149,804. The average student without a finance course suggests that yearly retirement savings should be \$9,563 and expects to earn an *unrealistic* 14.21% per year on retirement savings. The student with a finance course suggests saving \$15,797 annually and expects to earn a more realistic 7.66% per year on retirement savings. Clearly, those students that have taken a course in finance, compared with those students that have not, are more financially literate in the area of retirement planning. In all eight of the 14 questions where there is a significant difference, the response is superior for those that have taken a course in finance.

The ANOVA summary in Table VIII which compares students by gender indicates that for six of the 14 questions, there is a significant difference. Table IV reveals that salary (SLRY, $p = 0.006$) is more of a job consideration to men than it is to women. Women, compared with men, are more likely to expect Social Security to be a larger component of their retirement income (FICA, $p = 0.004$). Men report to having a better understanding of the difference between defined benefit and defined contribution plans (DBDC, $p = 0.029$), and different retirement saving plans (IRA, $p = 0.006$). Men are also more likely to make saving and planning for retirement a priority (PLAN, $p = 0.049$).

Table V shows that females, relative to males, expect to need less money upon retirement (\$RET, $p = 0.010$). Females expect to need a total retirement savings of \$558,404 and males expect to need \$887,013. In all questions that indicate a significant difference between gender, males have a better and more realistic understanding of retirement planning. These findings are consistent with prior research that has shown that, in general financial areas, women are less knowledgeable (Chen and Volpe, 1998 and 2002). Therefore, it is not surprising that women are also less astute in retirement planning. This should be of concern, given changing demographics (e.g., more women in the workforce) and longer life expectancies for women than men. It is crucial that women have a better understanding of retirement planning.

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Table VIII shows that students' major is a significant factor for only four of the 14 questions. From Table VI it is seen that when considering a job offer, business majors consider retirement benefits more important than do non-business majors (PNSN, $p = 0.032$). Business majors also reported a better understanding of the difference between a defined benefit and defined contribution retirement plans (DBDC, $p = 0.001$). The reported total amount needed for retirement (\$RET, $p = 0.010$) and the age for which retirement saving should begin (AGES, $p = 0.044$) are both significantly different between majors. From Table VII it is seen that non-business majors, on average, suggest savings for retirement should begin at age 25.36 and that a total savings of \$521,211 is needed to retire. Business majors report that savings for retirement should begin at age 22.85 and a total savings of \$868,631 is needed for retirement. In all four of these questions where the students' major is a significant factor, business majors have a better understanding of retirement planning. Just as interesting, however, may be the finding that students' major is not a significant factor for eight of the 14 questions.

Conclusion

This research presented a brief history of pensions in the United States. Historically, pensions are a relatively new phenomenon. Until recently, pensions that did exist were predominately defined benefit. However, the pendulum has swung in the other direction and now defined contribution plans outnumber defined benefit plans. This shifts responsibility to individuals and with this responsibility is a need to understand retirement planning and investing. A survey was created to assess the retirement investing knowledge of college undergraduates. This demographic is critical for three reasons. One, it is highly impacted by the shift to defined contribution plans. Two, retirement planning must begin early in one's career. Three, college programs and finance classes can be modified to address deficiencies in retirement and investing planning.

It was found that students that have taken a course in finance, which includes a short module on retirement planning, have a better understanding of retirement programs and the necessity to plan and save for retirement. These students also have a more realistic understanding of the financial market. Consistent with prior literature, gender is a significant factor, with men having a better knowledge of retirement planning. Though not as significant, students majoring in business, compared with non-business majors, are more financially literate. This study suggests, in today's environment, where defined contribution rather than defined benefit retirement plans are the norm, students benefit greatly from taking a course in finance. Also, with more women in the workforce and living longer than men, there is a great need in particular for women to become more judicious in retirement planning.

This is seminal research in assessing and improving retirement planning literacy of college students. A continuation of this study would be to research how the retirement planning knowledge of students can be improved. One possible application would be for all finance courses to include a module on personal finance and retirement planning. Although most students majoring in business will take a finance course, they may not take a personal finance course. Therefore, integrating a short personal finance component on retirement planning and investing, in a general finance course, could reap great benefits. A second possibility for improving students' financial literacy would be to offer a basic finance and personal investing course, which includes teaching on retirement planning and investing, for non-business majors. Potentially, because of its importance, a course such as this could be required of all students.

Although a student may not major in business, there are fundamental financial concepts, such as retirement planning, that all students need to understand in the 21st century.

Table I
Survey Given To Students

Answer the following personal information:

- (a) Have you taken a Finance Course?: No Yes
(b) Gender: Male Female
(c) Major: Business Non-Business

Respond to questions 1 to 9 based on the following scale:

Strongly Disagree 1 2 3 4 5 Strongly Agree

1. When considering a job offer, salary is important. (SLRY)
2. When considering a job offer, health insurance is important. (HLTH)
3. When considering a job offer, retirement benefits are important. (PNSN)
4. Social Security will be a major component of my retirement income. (FICA)
5. A defined benefit pension will be a major part of my retirement income. (DBPN)
6. Personal savings will be a major part of my retirement income. (PSAV)
7. I understand the difference between a defined benefit and defined contribution plans. (DBDC)
8. Saving and planning for retirement are a priority of mine. (PLAN)
9. I understand retirement saving programs such as an ordinary IRA and a Roth IRA. (IRA)

Answer questions 10 to 14 regarding retirement savings and planning:

10. How much money in retirement savings is needed to retire? (\$RET)
11. How much money should be saved yearly for retirement ? (\$SAV)
12. At what age should saving for retirement begin? (AGES)
13. At what age should one retire? (AGER)
14. What is the expected average rate of return on retirement savings? (INTR)

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Table II
Means for Survey Items 1-9: Taken a Course in Finance

COURSE FINANCE		SLRY	HLTH	PNSN	FICA	DBPN	PSAV	DBDC	PLAN	IRA
No	Mean, N=91	4.03	4.18	3.97	2.74	3.19	4.33	2.25	3.86	2.27
	Std. Dev	.526	.797	.888	.998	.788	.633	1.060	1.060	1.126
Yes	Mean, N=60	4.18	4.33	3.93	2.18	2.70	4.52	4.10	4.25	2.72
	Std. Dev	.676	.752	.880	.948	1.046	.596	1.258	.836	1.367
Total	Mean, N=151	4.09	4.24	3.95	2.52	2.99	4.40	2.99	4.01	2.45
	Std. Dev	.593	.781	.882	1.012	.927	.624	1.456	.993	1.242

Table III
Means for Survey Items 10-14: Taken a Course in Finance

COURSE FINANCE		\$RET	\$SAV	AGES	AGER	INTR
No	Mean	\$480,718	\$9,563	24.09	62.21	.1421
	N	71	72	86	68	66
	Std. Deviation	\$564,172	\$18,195	6.613	4.328	.19298
Yes	Mean	\$1,149,804	\$15,797	23.06	61.34	.0766
	N	51	47	54	44	53
	Std. Deviation	\$665,434	\$10,405	7.545	4.710	.03834
Total	Mean	\$760,418	\$12,025	23.69	61.87	.1129
	N	122	119	140	112	119
	Std. Deviation	\$690,595	\$15,835	6.979	4.481	.14909

Table IV
Means for Survey Items 1-9: Gender

GENDER		SLRY	HLTH	PNSN	FICA	DBPN	PSAV	DBDC	PLAN	IRA
Male	Mean, N=88	4.20	4.23	3.99	2.32	2.92	4.43	3.20	4.15	2.68
	Std. Dev	.571	.769	.877	1.012	.997	.621	1.456	.878	1.273
Female	Mean, N=63	3.94	4.25	3.90	2.79	3.10	4.37	2.68	3.83	2.13
	Std. Dev	.592	.803	.893	.953	.817	.630	1.412	1.115	1.129
Total	Mean, N=151	4.09	4.24	3.95	2.52	2.99	4.40	2.99	4.01	2.45
	Std. Dev	.593	.781	.882	1.012	.927	.624	1.456	.993	1.242

Table V
Means for Survey Items 10-14: Gender

GENDER		\$RET	\$SAV	AGES	AGER	INTR
Male	Mean	\$887,013	\$14,011	22.96	61.73	.1024
	N	75	71	80	62	80
	Std. Deviation	\$726,498	\$19,489	4.585	4.684	.13454
Female	Mean	\$558,404	\$9,090	24.67	62.04	.1344
	N	47	48	60	50	39
	Std. Deviation	\$581,048	\$7,011	9.214	4.257	.17518
Total	Mean	\$760,418	\$12,026	23.69	61.87	.1129
	N	122	119	140	112	119
	Std. Deviation	\$690,595	\$15,836	6.979	4.481	.14909

Table VI
Means for Survey Items 1-9: Major

BUSINESS MAJOR		SLRY	HLTH	PNSN	FICA	DBPN	PSAV	DBDC	PLAN	IRA
Yes	Mean, N=103	4.10	4.31	4.06	2.52	3.02	4.35	3.25	4.12	2.55
	Std. Dev	0.586	0.714	0.790	0.969	0.929	0.652	1.467	0.878	1.258
No	Mean, N=48	4.08	4.08	3.73	2.50	2.94	4.52	2.42	3.79	2.23
	Std. Dev	0.613	0.895	1.026	1.111	0.932	0.545	1.269	1.184	1.189
Total	Mean, N=151	4.09	4.24	3.95	2.52	2.99	4.40	2.99	4.01	2.45
	Std. Dev	0.593	0.781	0.882	1.012	0.927	0.624	1.456	0.993	1.242

Table VII
Means for Survey Items 10-14: Major

BUSINESS MAJOR		\$RET	\$SAV	AGES	AGER	INTR
Yes	Mean	\$868,631	\$12,208	22.85	61.54	0.1068
	N	84	78	93	80	84
	Std. Deviation	\$672,805	\$9,647	4.667	4.398	0.11847
No	Mean	\$521,211	\$11,679	25.36	62.69	0.1276
	N	38	41	47	32	35
	Std. Deviation	\$677,400	\$23,674	9.966	4.652	0.20632
Total	Mean	\$760,418	\$12,026	23.69	61.87	0.1129
	N	122	119	140	112	119
	Std. Deviation	\$690,595	\$158,356	6.979	4.481	0.14909

Table VIII
ANOVA SUMMARY

Question	Course In Finance				Gender			
	Sum of Squares	D F	F	Sig.	Sum of Squares	D F	F	Sig.
SLRY	0.818	1	2.348	0.128	2.638	1	7.850	0.006
HLTH	0.897	1	1.477	0.226	0.026	1	0.043	0.837
PNSN	0.041	1	0.052	0.819	0.258	1	0.331	0.566
FICA	11.055	1	11.547	0.001	8.300	1	8.505	0.004
DBPN	8.569	1	10.603	0.001	1.122	1	1.307	0.255
PSAV	1.264	1	3.300	0.071	0.164	1	0.419	0.519
DBDC	123.387	1	94.480	0.000	10.005	1	4.840	0.029
PLAN	5.581	1	5.840	0.017	3.815	1	3.943	0.049
IRA	7.062	1	4.691	0.032	11.302	1	7.652	0.006
\$RET	1.3287E+13	1	35.895	0.000	31200E+12	1	6.859	0.010
\$SAV	1105279110	1	4.540	0.035	693399110	1	2.807	0.097
AGES	35.704	1	0.732	0.394	99.572	1	2.060	0.153
AGER	19.987	1	0.995	0.321	2.732	1	0.135	0.135
INTR	0.126	1	5.900	0.017	0.027	1	1.212	0.273

Question	Major			
	Sum of Squares	DF	F	Sig.
SLRY	0.006	1	0.018	0.895
HLTH	1.692	1	2.810	0.096
PNSN	3.546	1	4.670	0.032
FICA	0.019	1	0.019	0.891
DBPN	0.220	1	0.254	0.615
PSAV	0.961	1	2.495	0.116
DBDC	22.870	1	11.547	0.001
PLAN	3.455	1	3.562	0.061
IRA	3.442	1	2.250	0.136
\$RET	31580E+12	1	6.947	0.010
\$SAV	7543250	1	0.030	0.863
AGES	197.049	1	4.137	0.044
AGER	30.229	1	1.512	0.221
INTR	0.011	1	0.478	0.491

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Can Financial Services Mutual Fund Managers Add Value?

James Philpot

Abstract

Prior research suggests that mutual fund managers operating in specific sectors may be able to take advantage of “pockets of inefficiency” and thus produce positive abnormal returns. I examine the performance of financial sector mutual funds over the time period 2002-2005, which was a unique market for financial services marked by low interest rates, strong mortgage loan demand and completion of several rounds of bank deregulation. During this time period, financial sector indices outperformed general market indices. Financial fund managers on average produced positive abnormal returns as measured using both a single-and multi-factor returns model. In cross section, these abnormal returns are unrelated to fund size. There is marginal evidence that fund returns are inversely related to portfolio turnover rates and directly related to fund expense ratios.

Introduction

Most finance scholars hold that mutual fund managers in the aggregate do not enhance investment returns enough to offset the expenses of their management activity. In addition, empirical literature and observation of performance of the average mutual fund versus unmanaged market indices generally suggest that less-active managers produce higher risk-adjusted returns than more-active mutual fund managers. Despite these academic admonitions and evidence, the investing public continues to invest heavily in actively-managed portfolios. Some recent studies provide evidence that active management may improve mutual fund returns when managers are limited to a specific sector. When confined to a particular market sector, managers may develop valuable expertise, and certain sectors may contain “pockets” of inefficiency that can be exploited.

I examine the performance of U.S. financial sector specialty mutual funds over the period 2002-2005 and the ability of their managers to enhance returns and thus shareholder value. During the last two decades of the twentieth century, the United States financial sector, and banking in particular, underwent a deregulation process that brought substantial changes to the industry. During that process, and since the last major deregulation brought by the Financial Modernization (Gramm-Leach-Bliley) Act in 1999, firms in the U.S. financial sector have increased their efficiency and profitability. Consequently since 2000, indices tracking stock-price performance of the financial sector have advanced at a greater rate than those tracking

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stocks in general, and the number of U.S. financial sector specialty mutual funds has increased over 4-fold from 1991 to 2005.

Given the fast growth and high returns in the financial sector, the question arises as to whether mutual fund managers can enhance risk-adjusted returns when limited to a high-return sector. I examine this question; specifically, I measure risk-adjusted returns for the funds using single and multi-factor models, and I model fund risk-adjusted returns as a function of fund characteristics and management activity.

Equity and Sector Fund Manager Performance

Many studies have examined the performance of equity mutual funds. In his pioneering study, Jensen (1968) examines a sample of 115 equity mutual funds over the time period 1945-1964. Jensen finds that when evaluated versus a variant of the Capital Asset Pricing Model, the average fund in his sample earned less than predicted by the model, given the fund's risk. In fact only one of the 115 returned more than the CAPM predicted. Some ensuing studies, most notably Ippolito (1989), report evidence that mutual fund managers generate risk-adjusted returns that are zero or even positive. That is, managers appear to have enough access to private information to justify their fees. Ippolito notes that this condition is consistent with an efficient market where information is costly.

In a more recent important update to the Jensen study, Malkiel (1995) finds that the population of mutual funds in existence from 1971-1991 in aggregate underperformed unmanaged indices both on a gross (before expenses) and a net (after expenses) basis. Malkiel attributes some of the findings of the interim studies that find positive average abnormal performance to survival bias in those studies' samples. Fortin and Michelson (2002) also examine the performance of actively-managed mutual funds. They find that while most types of equity mutual funds underperform the unmanaged indices over the period 1976-2000, actively managed small company and international sector funds significantly outperform (returns adjusted for taxes, but not for risk) their respective sector indices. Fortin and Michelson make a qualified suggestion that sector fund managers operating in less efficient markets may be able to identify and capitalize on mispricing in those markets.

Khorana and Nelling (1997) compare the performance of sector funds from several different sectors to the performance of equity mutual funds in general and to market and sector indices over the period 1989-1992. They find that sector funds generally perform (after adjusting for risk) as well as equity funds as a whole, and that for some sectors the average sector fund outperforms both market and industry sector indices. Specifically, Khorana and Nelling find that this is the case for their sample of 9 financial sector funds, although they do not report any statistical tests. More recently, Dellva (2001) examines the performance of Fidelity Investments' family of sector funds over the period 1989-1998. Dellva finds that when their performance is compared to the corresponding Dow Jones industry group index, the average fund provides positive risk-adjusted performance. Dellva cites this result as evidence of superior security selection ability on the part of sector mutual fund managers, a result consistent with the conjecture of Fortin and Michelson (2002). In separate tests, Dellva finds evidence of poor market timing ability by sector fund managers. O'Neal and Page (2004) examine the performance of real estate mutual funds over the time period 1996-1998. They use a multi-factor performance evaluation model and find that in the aggregate, real estate mutual funds do not provide positive average abnormal returns. However, when modeling fund abnormal returns as a

function of fund characteristics, O'Neal and Page find that abnormal returns are directly related to trading activity as measured by portfolio turnover.

Deregulation and the U.S. Financial Sector

During the latter part of the twentieth century, at least three major market and environmental changes took place in the U.S. financial services (particularly banking) industry. First, technological development changed financial institutions operations and financial consumers' habits. Second, interest rates increased in volatility. Third, competition in the financial services industry increased, as institutions began to offer non-traditional products or products traditionally offered by other types of financial institutions. These market and environmental changes both motivated and equipped financial institutions to increase the efficiency of their operations.

Recognizing and accommodating the new market environment, Congress passed several acts deregulating the banking industry, and some of these acts also affected financial institutions other than banks. Very briefly, the major acts and their results are:

Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA).

Eliminated restrictions on banks' product offerings and their pricing, as well as reducing operating differences among different types of depository institutions.

Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (Riegle-Neal).

Removed federal restrictions on interstate branching by banks and the purchase of out-of-state banks by holding companies.

Financial Modernization Act of 1999 (Gramm-Leach-Bliley). Removed the division of investment and commercial banking activities, allowing financial institutions to offer a full range of financial products and services.

The ultimate desired result of two decades of deregulation is a financial services market environment in which sound financial institutions can achieve economies of scale, offer their customers a complete set of products and services, and compete with each other on a level playing field.

Since the turn of the century, when the latest of the deregulation acts took effect, the financial institutions industry appears to have benefited from the new environment, as measured by returns to the stocks of financial firms. Over the period January 2000-October 2005, the Dow Jones Industrial Average lost 3.08 percent, the Standard and Poor's 500 index lost 17.49 percent, and the NASDAQ Composite Index lost 45.86 percent. However, over the same time period, the NASDAQ Financial 100 gained 76.59 percent. The financial services sector has clearly been a strong-performing sector of the equity market. Given the speculation by Fortin and Michelson (2002) that sector fund managers may have specialized security selection skill within their sectors, and also given the superior performance of the financial services sector since 2000, the research question becomes: Can sector mutual fund managers add value through returns-enhancing management when they are confined to a market sector that is itself a strong performer?

Data and Method

I examine a sample of financial sector mutual funds in existence over the period September 2002-September 2005. I choose this three-year time period as it was a time during which financial industry indices were high performers as a result of deregulation in the industry. I choose a three-year period because it is long enough to allow modeling of abnormal returns with monthly returns data, yet short enough to limit the amount of survival bias introduced by our sampling. Malkiel (1995) shows that survival bias increases dramatically as the observation period increases. I collected returns data from those supplied by Morningstar via Yahoo! Finance. I include funds with 36 months of returns data, and in the event of multi-share class funds, I use returns data of the largest class. The sampling procedure results in a final sample of 37 mutual funds; Morningstar data indicate 45 such funds (excluding multi-classes) in existence in 2005. Table I lists the sampled funds.

I test for managerial effectiveness by measuring average risk-adjusted returns in the sample over the time period. First I do this with a single-factor model using the Standard and Poor's 500 Index as a market proxy. I also evaluate returns using a multi-factor model (after Elton, Gruber, Das and Hvlaka [1993] and O'Neal and Page [2000]), that includes the S&P 500 Index, the Russell 2000 Index, and the NASDAQ Financial 100 Index. If the sample produces positive average abnormal returns, particularly after evaluation with a multi-factor model, then there is evidence that managers were able to add value in these sector funds.

After computing the funds' abnormal returns, I model the returns using a regression equation after O'Neal and Page (2000). I model a fund's risk-adjusted return as a function of the fund's age, average asset size, average expense ratio, and average portfolio turnover rate over the sample time period. Market efficiency, as well as the results of most prior studies suggests that returns should be inversely related to trading activity as measured by expense ratios and turnover rates. Returns may be positively related to assets, given the likelihood of economies of scale. A fund's return may be related to its age if its management increases its skill through experience. Table II displays descriptive statistics for the sample data.

Results

I first compute abnormal returns for each fund with a single-factor model. I model the fund's return as:

$$(R_{i,j} - R_{f,j}) = \alpha_i + \beta_i (R_{S\&P500,j} - R_{f,j}), \quad (1)$$

where $R_{i,j}$ is Fund i 's return in month j , $R_{f,j}$ is the return to Treasury bills during month j , and $R_{S\&P500,j}$ is the return to the S&P 500 during month j . In the model, α_i is Fund i 's risk-adjusted return. For the 37 financial sector mutual funds in the sample, the mean annual alpha is 2.792 percent, and this figure is significant at a level of less than one percent ($t = 5.455$). This result supports the hypothesis that managers of financial sector mutual funds out-performed the S&P 500 during the sample period, and thus added value to their funds.

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The use of a multi-factor model may be more appropriate than a single-factor model for evaluating manager performance. Elton, Gruber, Das and Hvlaka (1993) use a multi-factor model that includes a bond index and a small-capitalization stock index, arguing that single-factor models ignore the range of possible investments for fund managers, and thus may be misspecified. Additionally, if managers are limited to a sector that had good relative average performance, it would be expected that managers may have an easy time beating a single, broad index. Similar to O’Neal and Page (2000), I estimate a multi-factor model to estimate an abnormal return for each fund, using three indices: the S&P 500, the Russell 2000 (to include small-capital stocks), and the NASDAQ Financial 100 (to model industry effects). This model of abnormal returns is:

$$(R_{i,j} - R_{f,j}) = \alpha_i + \beta_{1,i} (R_{S\&P500,j} - R_{f,j}) + \beta_{2,i} (R_{Russell,j} - R_{f,j}) + \beta_{3,i} (R_{NF100,j} - R_{f,j}). \quad (2)$$

This specification parallels Equation 1 in modeling Fund *i*’s risk premium in month *j*, except for the two additional factors.¹ For the sampled 37 funds, the average annual risk-adjusted return is 2.477%, and this mean is significant at a level of less than one percent (*t* = 5.09). This result is particularly interesting in that it supports the ability of financial sector mutual fund managers to produce above average returns compared to a broad index, and when compared to a respective industry index. This result also provides support for the Dellva (2001) and Fortin and Michelson (2002) suggestions that mutual fund managers operating in specific sectors may have an information advantage and positive security selection ability.

I also attempt to model the funds’ abnormal returns as a function of individual fund characteristics. I estimate the regression equation:

$$\alpha_i = \gamma_0 + \gamma_1 ASSETS_i + \gamma_2 TURNOVER_i + \gamma_3 EXPENSE_i + \gamma_4 AGE_i, \quad (3)$$

where α_i is Fund *i*’s risk-adjusted return alternatively measured with single- and multi-factor models, ASSETS is Fund *i*’s average assets, TURNOVER is the fund’s average portfolio turnover rate, EXPENSE is the fund’s average annual expense ratio, and AGE is the fund’s age at the beginning of the sample period. If financial sector mutual funds exhibit economies of scale, γ_1 will be positive. If mutual fund managers enhance abnormal returns through trading activity, γ_2 will be positive; otherwise γ_2 will be negative. If mutual fund managers in general are able to increase returns to more than offset fees, γ_3 will be positive; otherwise it will be negative. If financial sector mutual fund managers increase their skills through experience, then γ_4 will be positive.

Table III displays γ coefficient estimates for the two model estimations alternately using single- and multi-factor model alphas as dependent variable. In analyzing the regression results, I must first note that the regression equations are significant at levels between five and ten percent, thus the estimates may provide only weak evidence. In both regression equations, it appears that scale economies do not increase fund risk adjusted returns. The coefficient estimates for TURNOVER are negative in both equations and significant at a one-tailed

¹ It should be noted that all three of the control indices are unmanaged indices that record capital appreciation only, while the funds being studied produce both capital and income gains. While this may bias performance estimates upward, the use of such indices reflects the industry practice of comparing mutual fund performance to popular unmanaged indices and using such indices to compute betas and alphas. It is a common practice in academic studies; see Delva (2001), O’Neal and Page (2000).

probability level of 0.05 in the single factor alpha equation and 0.07 in the regression equation with multi-factor alpha as dependent variable. This result indicates an inverse relation between fund trading activity and fund returns, consistent with the Dellva (2001) findings of generally poor market timing ability of sector fund managers. In the regression equations, the coefficient estimate for EXPENSE is positive and significant at probability levels of 0.09 and 0.07 for single- and multi-factor alphas, respectively. This result contradicts most prior work and supports the notion that financial sector mutual fund managers provide returns commensurate with their compensation and resources spent on fund management.

Finally, the coefficient estimate for AGE is negative and significant at probability levels of 0.05 for both dependent variables, indicating that younger financial sector mutual funds outperform older funds. While prior studies (See O'Neal and Page [2000].) use fund age to proxy for manager experience, this variable may not be a good proxy. Alternatively, this study's result may support the conventional wisdom in the industry that mutual fund families put their most talented managers on their newest funds, in order to enhance the efforts of marketing of those new funds to the investing public.

Conclusion

I examine the performance of financial sector mutual funds over the period 2002-2005. During this time period, the financial sector performed well, likely due to the completion of two decades of banking deregulation. If mutual fund managers are able to add value by enhancing returns, this was a good time and sector for them to do so; if they could not produce risk-adjusted returns in such an environment, particularly using a single-factor returns model, there would be very strong evidence against the value of mutual fund management.

Using both single- and multi-factor models to adjust for risk, the average financial sector mutual fund provided positive risk-adjusted returns over the sample period. Thus, I am unable to flatly reject the value of active sector mutual fund management. Regression models of fund abnormal returns as a function of individual fund characteristics lend marginal support to the notion that fund managers produce returns commensurate with their fees and expenses, but may not be good market timers.

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Table I
List of Sampled Financial Sector Mutual Funds

AIM Financial Services
AXA Enterprise Global Financial Services A
Burnham Financial Services B
Constellation TIP Financial Services
Davis Financial A
Diamond Hill Bank and Finance A
FBR Large Cap Finance
Fidelity Adv. Financial Services
Fidelity Select Banking
Fidelity Select Brokerage and Investments
Fidelity Select Financial Services
Fidelity Select Home Finance
Fidelity Select Insurance
Forward Emerald Banking and Finance
Gartmore Global Finance A
Hartford Global Financial Services A
Huntington Dividend Capture
Icon Financial
ING Financial Services A
Jennison Financial Services B
John Hancock Financial Industry A
John Hancock Regional Bank A
Legg Mason Financial Services
Merrill Lynch Global Financial Services I
Morgan Stanley Financial Services B
Mutual Financial Services A
ProFunds Ultra Banking Inv.
ProFunds Ultra Sector Financial
Rydex Banking Inv.
Rydex Financial Services Adv.
Saratoga Financial Services B
Schwab Financial Services
Scudder Dreman Financial Services A
SenBanc
Smith Barney Financial Services B
T. Rowe Price Financial Services
Wells Fargo Advantage Special Financial Services A

Table II
 Sample Data Descriptive Statistics for Financial Sector Mutual Funds over the Time Period
 2002-2005. n = 37.

Variable	Mean	Standard Deviation
Annual Total Return	15.87%	44%
Expense Ratio	1.5585%	0.3835%
Portfolio Turnover Rate	231.53%	373.35%
Assets	\$243.14 million	\$373.36 million
Age as of September 2002	9.71 years	7.25 years
Standard and Poor's 500 Mean Annual Return	14.33%	
Russell 2000 Mean Annual Return	21.79%	
NASDAQ Financial 100 Mean Annual Return	12.36%	

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Table III
Coefficient Estimates from Regression Equation of Financial Sector Mutual Fund Risk-adjusted
Return on Individual Fund Characteristics, n = 37.

Variable	Parameter Estimate (t-statistic)	
	Model 1 Single-Factor Alpha	Model 2 Multi-Factor Alpha
ASSETS	-0.0000014 (1.21)	0.0000013 (1.22)
TURNOVER	-0.0000015 (-1.76)	-0.00000125 (-1.56)
EXPENSE	0.00163 (1.38)	0.00170 (1.53)
AGE	-0.0000083 (-1.69)	-0.0000092 (-2.00)
Model F-value	2.27 (p = 0.0831)	2.59 (p = 0.0551)
Model Adjusted R ²	0.123	0.150

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Modeling Risk with Unit-variance Leptokurtic Fractal Normal Statistics

James Stacey and Alex Faseruk

Introduction:

One of the basic paradigms in the theory of finance is that in the long-run investors will be rewarded for risk-taking behavior. Stated more simply the greater the risk of an investment the greater the return that will be expected. Since the development of modern portfolio theory in the early 1950s, financial theorists have sought to appropriately define and measure risk and return in not only individual assets but also portfolios of assets. While Artzner, Delbaen, Eber and Heath examined various measures of risk, they concluded that the seminal work by Markowitz (1952) led researchers initially toward examining the first two moments of the statistical distribution becoming preoccupied with mean and variance (standard deviation). The underlying assumption was that asset prices were normally distributed. Later, researchers became concerned with the third moment of the statistical distribution, such as Friend and Westerfield (1980) and Kraus and Litzenberger (1976), while others laid the groundwork for moving towards higher moments as examined by Samuelson (1970) and Scott and Horvath (1980).

A study of cotton prices by Mandelbrot (1963) provided evidence that the stochastic process underlying financial time series deviated from the normal probability density function that had previously been the assumed paradigm in the finance literature. This led Mandelbrot to suggest that prices were more accurately described by stable Lévy distributions. In an extensive study of the statistical properties of the companies in the Dow Jones Industrial Average, Fama (1965) provided support for Mandelbrot, indicating that Mandelbrot's hypothesis seemed to be supported by the data.

Lévy probability density functions (pdfs) are characterized by much fatter tails in the distributions; that is, the probability of large fluctuations is much more likely than for the normal pdf. Analysis of Lévy distributions by Voit (2003) indicated that, for Lévy indices $q < 2$, the variance of this pdf is infinite but when for $q \leq 1$, the mean of this pdf is undefined. Stocks with returns distributed according to a Lévy distribution are inherently more risky than stocks with returns that are normally distributed.

This study examines the hypothesis that there exists a family of unit-variant leptokurtic probability density functions with the attractive properties of normal statistics.

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The current study constructs numerically a family of symmetric Normal pdfs defined for fractal spaces with index q . These distributions have the attractive property of having unit variance for $1 < q < 2$ and approximately unit variance for $0.5 < q < 1$ (the limit of the range that was studied). This paper studies the conjecture that there exists a family of Normal distributions with unit variance that can be defined on metric spaces of dimension $m=q/2$ for $0 < q < 2$. Some analytical techniques that arise from this conjecture are explored, indicating how one could apply a broader theory of fractal statistics in practice. The power of these techniques follows from the property that the scale of the numerically generated probability distributions is independent of the fractal index q . This allows the non-linearity of fractal statistics to be absorbed into a universal non-linear function of a shape measure with the kurtosis chosen to illustrate the method: for what this study calls Fractal Normal, or Formal, pdfs. It is found that the application of Fractal Normal statistics retains the attractiveness of Normal statistics by allowing optimal solutions to be determined in a straightforward fashion.

Overview of Normal Statistics:

A time series of prices for stock j is given by

$$\text{Eq. 1} \quad X_j = \{x_i; i = 1, T\}_j$$

where $x_i > 0$ for all i , x_i is a shorthand notation for $x_i = x(t_i)$, and t_i is the time at which x is determined. As the index i increases by one unit, the value of time is presumed to increase by a constant Δt , such that $t_1 < t_2 < \dots < t_T$. x is a random variable where the x_i are distributed according to the pdf $p(x)$.

The standard variable z is defined through the relation

$$\text{Eq. 2} \quad z - z_0 = \frac{x - \mu}{A} = A^{-1}(x - \mu),$$

where μ is the mean of the pdf for the x (in a manner that is yet to be defined) and A is the characteristic scale for the distribution of the x about the mean μ . Eq. 2 implies that $z = A^{-1}x$, and $z_0 = A^{-1}\mu$.

Conventionally, the scale A is identified with the standard deviation σ (the square root of the variance) but for Lévy distributions the second moment of the pdf (the variance) is infinite (or at least undefined) and, in some cases, even the first moment of the pdf (the mean) is undefined. This implies that, in general, identifying A as σ is incorrect. For the same reason, it is generally incorrect to identify μ as the expectation value $\langle x \rangle$ as this quantity may not be defined for some pdfs.

The standard variable z is a dimensionless quantity. For following discussion, z_0 can be taken to be zero, without loss of generality. However, as noted below, all distributions in z should be considered proxies for distributions expressed in terms of $z - z_0$. Eq. 2 can be rearranged as

$$\text{Eq. 3} \quad x = \mu + Az.$$

Probability distributions for which it is possible to introduce a standard variable z in this way constitute a location-scale family of pdfs. Both Normal and Lévy pdfs are examples of distributions belonging to location-scale families.

The time series of price data x for a stock can be modeled as a random walk

$$\text{Eq. 4} \quad x_i = x_{i-1} + Az,$$

where z is a random variable drawn according to some pdf $p(z)$, as will be defined below. In practice, studying the distribution of stock price data is not as illuminating as the distribution of stock return data. Returns may be defined in several ways. In this paper stock returns are defined as

$$\text{Eq. 5} \quad r_i = \frac{x_i - x_{i-1}}{x_{i-1}}.$$

Eq. 4 and Eq. 5 can be combined to yield

$$\text{Eq. 6} \quad r_i = \frac{A}{x_{i-1}} \cdot z \cong A'z.$$

For stocks where $x \gg A$ the distribution of returns r_i are well approximated by the pdf $p(z)$ scaled by $A' = A/\langle x \rangle$.

Towards Fractal Normal Statistics:

With normal random variables, the additivity of variances is similar to the Pythagorean relation in multiple dimensions. In this work, the authors are motivated to retain an analogue of Pythagoras' fundamental relationship with fractional dimensional spaces.

A metric space can be defined on the positive real axis with a single-valued, non-negative real distance function, given by

$$\text{Eq. 7} \quad \delta(x, x_0) = |x - x_0|^{q/2}.$$

The exponent $q/2$ is the dimensionality m of the metric space, although the theory of fractals identifies q as the dimension of the fractal space as identified in Peters (1991). Following the derivation from Hein as recounted in Gardner (1977), the equation of a circle with this definition of metric is written as

$$\text{Eq. 8} \quad \delta((x, y), (x_0, y_0)) = \left[|x - x_0|^q + |y - y_0|^q \right]^{1/q}.$$

The circumference of a unit circle in this metric space can be calculated (by performing a path integral, integrating $ds = (dx^q + dy^q)^{1/q}$ around the circumference of the unit circle) and thereby determine that the value for π is no longer constant, but a unique function of q . For example, for $q = 1$, the value of π is 4. In general $\pi(q) > \pi(2)$ for all $q \neq 2$.

In this paper, a Normal distribution is then a 1-dimensional pdf, and fractal pdfs have dimensionality defined on the interval (0,1) which implies pdfs with index q will be considered as fractal distributions with dimension $m = q/2$, although throughout the study it will more commonly refer to the fractal *index* q rather than the fractal *dimension* m to conform with standard practice.

The algebra of the underlying metric space with fractal dimension $m = q/2$ affects the statistics of the Normal pdf. This analysis cannot start with the definition of a characteristic function since the value of π is not constant and an appropriate fractal calculus and corresponding fractal Fourier transform are not available. Instead, the analysis begins with a Normal random number generator based on the Polar Marsaglia variant of the Box-Muller algorithm from Gardner (1977). This algorithm does not require knowledge of π , nor does it require knowledge of the trigonometry of the underlying $q/2$ -dimensional metric space. It relies on the equation of a unit circle in this metric space in Eq. 8.

A Normal pdf with unit variance is obtained by generating a uniform distribution of points on a disk circumscribed by a unit circle. This algorithm is extended by generating a uniform distribution of points on a unit disk in a fractal space of dimension $q/2$. The resulting distributions share the attractive features of normal pdfs and shall be referred to as Fractal-Normal distributions (or Formal pdfs).

The method is defined by the following algorithm, which generates a pair of random variates F_1 and F_2 distributed according to a Formal pdf, as follows. First, a pair of uniformly distributed temporary random variables t_1 and t_2 are drawn on the interval $[-1,+1]$ by

$$\text{Eq. 9} \quad \begin{aligned} t_1 &\leftarrow U(-1,1) = 2 \cdot U(0,1) - 1 \\ t_2 &\leftarrow U(-1,1) = 2 \cdot U(0,1) - 1 \end{aligned}$$

One then defines a point in the unit square in the space $\mathbb{R}^m \times \mathbb{R}^m$ using

$$\text{Eq. 10} \quad \begin{aligned} v_1 &= \text{sign}(t_1) \cdot |t_1|^{q/2} \\ v_2 &= \text{sign}(t_2) \cdot |t_2|^{q/2} \end{aligned}$$

To generate a point within the unit disk in this fractal space, the radius r is calculated as

$$\text{Eq. 11} \quad r = (v_1^2 + v_2^2)^{1/q}$$

which is equivalent to

$$\text{Eq. 12} \quad r^{q/2} = (v_1^2 + v_2^2)^{1/2}.$$

When $r \leq 1$, a pair of Formally distributed random variates is given by

Eq. 13

$$F_1 = \frac{v_1}{r^{q/2}} \cdot (-2 \ln(r^q))^{1/q}$$

$$F_2 = \frac{v_2}{r^{q/2}} \cdot (-2 \ln(r^q))^{1/q}$$

This algorithm is similar in form to that for the exponential power distribution (also known as the generalized error distribution). For $q=1$, the above algorithm generates a distribution similar to the Laplace distribution while, for $q=2$, a Normal pdf is generated. The essential difference is that the Formal distribution generated according to the above algorithm has a unit variance where, for example, the Laplace distribution has a variance equal to 8 (which, notably, is equal to two π for $q=1$).

The radial distribution of points arising from this algorithm are presented in Figure 1 as a function of $q = 2, 1.5, 1.0$, and 0.5 . The linear dependence of the distributions on the radius is consistent with the points being uniformly distributed on the unit disk for each value of q . In Figure 2, Formal distributions are compared to the corresponding Lévy distributions at $q=2, 1.5, 1.0$ and 0.5 . In order for Lévy distributions with scale $A = 1$ to be directly compared with Formal distributions with scale $A=1$, the following form for the characteristic function is used:

Eq. 14

$$\hat{L}_q(k) = \exp\left(-\frac{1}{2}|Ak|^q\right).$$

Lévy pdfs are then generated by performing an inverse Fourier transform on this characteristic function. For $q < 1$, the Formal distributions become increasingly cusp-shaped at $z=0$. Lévy distributions have less pronounced, but similar, behaviour.

Normal probability density functions have zero kurtosis, or $\kappa = 0$. Pdfs with $\kappa > 0$ are leptokurtic and have peaks that are narrower and have tails that are fatter than that of a Normal pdf. Figure 3 plots (a) the standard deviation σ versus the fractal index q , (b) the kurtosis κ versus the fractal index q and (c) the fractal index q of Formal pdfs as a function of kurtosis κ for $0.5 \leq q \leq 2$.

The standard calculation of σ (available in spreadsheets and most analysis programs) was used to determine the scale A for the Formal pdf. Surprisingly, Formal pdfs have unit standard deviations on the interval $[1,2]$ with only a weak drop-off for $q < 1$, dropping by a factor of less than 15% at $q = 0.5$. This drop-off may be due to the increased sensitivity of this algorithm to the performance of the uniform random number generator at the extremes of the range $[0, 1]$. If so, it means that the scale $A = \sigma$ of the Formal pdf is independent of q , the index of the underlying metric space. These numerical results also suggest that Formal pdfs may well have unit variance in general. This would be a defining property of Formal distributions.

This independence of sigma from q also implies that q uniquely determines the shape of the Formal distribution. Since the kurtosis κ is one measure of the shape of a pdf, it should be possible to uniquely determine q from the kurtosis, i.e. $q = q(\kappa)$. A sum of exponentials was fitted to numerically generated Formal data of index q versus kurtosis κ (See Figure 3c). Each

point in the fit represented a Formal pdf with 200,000 generated values. The function $q(\kappa)$ was then approximated by the following functional form:

$$\text{Eq. 15 } q(\kappa) \approx c_1 \exp(-b_1 \kappa^{a_1}) + c_2 \exp(-b_2 \kappa).$$

Formal pdfs are leptokurtic. The peak is generally sharper than Lévy pdfs and the tails are less broad, particularly as q approaches 1, but for intermediate values of q (say 1.2 to 2.0) there is little difference between Lévy and Formal distributions, apart from the faster drop-off in the tails which renders the variance unity for Formal pdfs and infinite for Lévy pdfs.

Figure 4 and Figure 5 compares Lévy and Formal distributions against S&P 500 daily data (9-July-2002 through 26-June-2006) with identical values of the fractal index q , scale σ and mean μ . (All stock data used in this paper were obtained online from <http://finance.yahoo.com> and were corrected for dividends and stock splits.) For the index q , the value 1.4, as quoted by Voit (2003) from studies of S&P 500 data by Mantegna, was used.

Heuristics for Fractal-Normal Statistical Analysis:

The preceding numerical analysis indicates that Formal statistics can be characterized by the fractal index q (with the kurtosis κ acting as a proxy for q), scale σ and mean μ . In this section, an outline of how Fractal Normal statistics might be applied to the general case of stock portfolios with correlations is given.

First, the means μ_i for each stock return are calculated. In general, once a column vector of weights for the stocks is given, the weighted means of the stock returns are added to determine the mean of the portfolio return. The means are fundamental to calculating the higher central moments.

Second, the covariance matrix Σ^2 of the portfolio is calculated. The elements of the covariance matrix are given by

$$\text{Eq. 16 } [\Sigma^2]_{ij} = E\langle (x_i - \mu_i)(x_j - \mu_j) \rangle.$$

The variance of the portfolio σ_p^2 is given by

$$\text{Eq. 17 } \sigma_p^2 = w^T \cdot \Sigma^2 \cdot w$$

where w is a column vector of weights for each stock. Determining the optimal weights of a portfolio (e.g. Markowitz mean-variance portfolio theory), calculating the efficient frontier, calculations of betas, constructing the CAPM and like models based on the variance and standard deviation of the portfolio return as a measure of the *scale* of risk (i.e. the volatility), are included within Formal statistics without modification.

Where Formal statistics departs from Normal statistics is that while the scale of risk may be unchanged, and the algebra involving the scale of risk is unchanged, the probability of any

given return depends on the shape of the Formal distribution. This requires analysis of higher moments to determine the fractal index of the underlying Formal distribution.

Therefore, thirdly, determining the fractal index q of the Formal distribution depends on determining a shape measure (for example, this paper uses the kurtosis) for the distribution of portfolio returns. For a general portfolio of N stocks, with correlations between stocks, one can proceed in two ways. If the weights are known (optimized according to Markowitz portfolio analysis, for example) then the kurtosis of the distribution of portfolio returns can be calculated directly. In this case, the advantages of Formal statistics adds little value beyond giving an estimate of risk measures like value-at-risk or VaR.

The more interesting case is presented when the weights are still to be determined, say by optimizing the portfolio's σ_p and VaR simultaneously. In this case, further analysis is complicated by the necessity of calculating a 4-th rank tensor analogous to the covariance matrix calculated above (which can be thought of as a second rank tensor). If there are N stocks in the portfolio, then there are N^4 elements in this tensor, given by

$$\text{Eq. 18 } K_{rstu} = \frac{E\langle (x_r - \mu_r)(x_s - \mu_s)(x_t - \mu_t)(x_u - \mu_u) \rangle}{\sigma_p^4}.$$

This tensor is interesting because K admits the calculation of correlations between 2, 3 and 4 stocks simultaneously. Given K , the kurtosis of the portfolio is then given by

$$\text{Eq. 19 } \kappa = \sum_{r,s,t,u=1}^N w_r w_s w_t w_u K_{rstu} - 3.$$

Note that one subtracts 3 after the summation is performed.

Finally, once the kurtosis of the portfolio is determined, one can predict the value of the fractal index q for the portfolio using the function $q(\kappa)$. One can then generate an appropriate Formal distribution with the predicted index and compare with the distribution of portfolio returns. The non-linearity of Formal statistics is contained in $q(\kappa)$. This is a significant enhancement over the current non-linear theory employing Lévy distributions, where the fractal index and scale of the pdf must be obtained with non-linear fitting of data to Lévy distributions, or other non-trivial analytical methods.

Discussion:

Probability density functions that can be cast into a universal form as a function of the dimensionless variable z with unit scale constitute a location-scale family of pdfs. All of the distributions discussed in this paper (Normal, Lévy and Formal pdfs) satisfy this criterion. For such pdfs, Eq. 2 provides a means of determining finite values for both the mean μ and the scale A where the expectation value $\langle x \rangle$ and standard deviation σ might not formally exist. Eq. 2 is a fundamental relation. The existence of the scale A can be established independently of the standard deviation of the pdf. For Normal and Formal pdfs, algebraic relations for the

expectation values of the first moment and second central moment provide unbiased estimators for the mean μ and the scale A . For Lévy pdfs, in principle, a non-linear fit to a distribution of observed data provides a means of estimating these same quantities.

Lévy pdfs have the desirable statistical property of being leptokurtic and include the Normal pdf as a limiting case. On the other hand, Lévy pdfs are not closed; i.e. the product of two Lévy distributions with different indices is not itself a Lévy pdf which may be a limiting problem. Financial data indicates that returns for different stocks are generally distributed with different values of the index q , when Lévy pdfs are chosen as a model.

In Figure 6, the shape of the sum of two Formal distributions with different values of the index q is shown. For this case, the two distributions are uncorrelated. The agreement between the measured and predicted distributions is excellent.

Similarly, in Figure 7, a portfolio of an equally weighted sum of two stocks, Microsoft and IBM, with non-zero correlation is constructed. Five thousand daily returns (03-September-1986 through 26-June-2006) were used for each stock. On the basis of the kurtosis for each stock, 11.0 and 9.4 for IBM and Microsoft respectively, the fractal indexes were 0.79 and 0.83 respectively. The predicted (measured) fractal index for the two stock portfolio was 0.80 (0.77). From the Figure it is evident that the predicted Formal pdf does a poor job of fitting the peak but does a much better job fitting the tails of the distribution. Two conclusions can be drawn; first, that the kurtosis is not the best measure of the shape of a pdf as it is strongly biased towards the tails of the distribution and, second, that Formal pdfs that provide a better fit for the central peak of the distribution may still underestimate the tails of the distribution (relative to a Lévy pdf, for example).

A better illustration of the promise of the approach is illustrated in Figure 8 with a portfolio of twenty stocks with random weights from the top 25 stocks in the S&P500, with 1716 daily returns over six years (22-November-1999 through 19-September-2006).

In this case, the agreement between the predicted and actual distributions of returns is much improved. It should also be noted that the fractal index of the portfolio was observed to be greater than the fractal indices of the constituent stocks, indicating the portfolio is trending towards a normal distribution as stocks are added, an indication that the central limit theorem may be supported by Formal statistics.

It is evident that portfolio optimization using Fractal Normal statistics promises to be significantly more challenging than that given by Markowitz. Correlations between 2, 3 and 4 stocks are introduced through the kurtosis tensor defined above. As the size of the portfolio increases, the number of terms in the kurtosis tensor scales by the fourth power of the number of stocks in the portfolio. Fortunately, there is significant duplication between entries which renders the calculation tractable in practice.

Conclusions:

This study has explicitly constructed a family of unit variance Formal pdfs which includes the Normal pdf as a limiting case. This family of pdfs is generated using the geometry of the underlying metric space as the guiding principle, rather than using a characteristic function and Fourier transforms. Formal pdfs are leptokurtic with a shape that is uniquely characterized by the fractal index q . Formal statistics has been shown in this paper to have an algebra that is consistent with the algebra of Normal statistics.

Fractal Normal statistics provides a means of significantly enhancing the application of familiar Normal statistics. Most of the attractive features of a non-linear theory are included (leptokurtic pdfs, underlying fractal theory) while the undesirable features of the non-linear theory are excluded (infinite-variance Lévy pdf, lack of closure, difficult analytical techniques).

An intuitive leap has been made to arrive at the fundamental conjecture of this work – that there exists a family of unit-variance leptokurtic probability density functions with the attractive properties of normal statistics. It would have been more desirable if this conjecture had been based more on fundamental theorems in the analysis of fractal metric spaces, fractal trigonometry, fractal calculus and fractal Fourier transforms. However, the existent literature in these topical areas is not readily applicable to the current problem.

In summarizing the implications of these findings for finance, several are readily identifiable. The first finding is that the standard deviation of a distribution of portfolio returns is independent of q , that the foundation for CAPM and Markowitz portfolio theory will be validated, even for distributions of data described by pdfs with $q < 2$.

A generalizable result arising from this study is the importance of drawing a distinction between the scale of a probability distribution and the shape of a probability distribution. The standard deviation is a measure of scale. One can associate measures of risk with the scale of fluctuations (as in CAPM) or one can associate measures of risk with the shape distribution of fluctuations (essential for calculating VaR measures, for example).

Finally, this work indicates that the theory of fractals does not necessarily demand that fractal statistics is necessarily non-linear.

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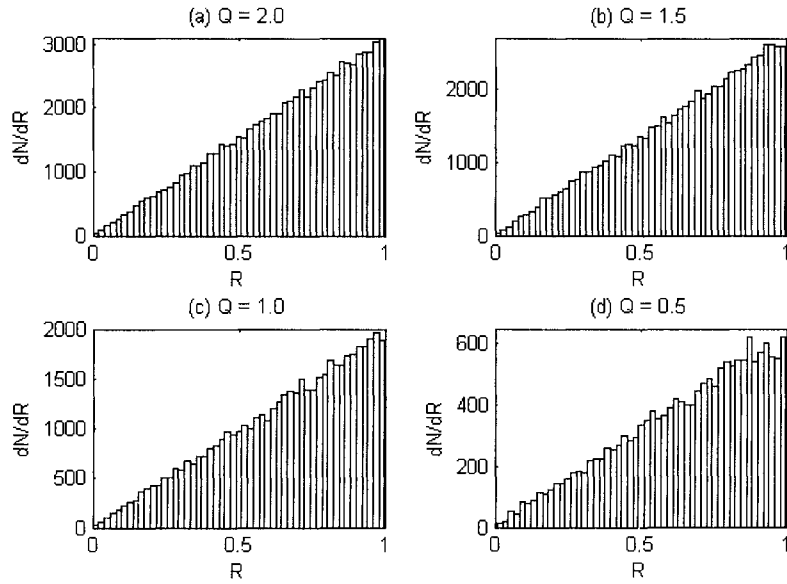


Figure 1: Radial distribution of points distributed uniformly on unit disk with fractal index q .

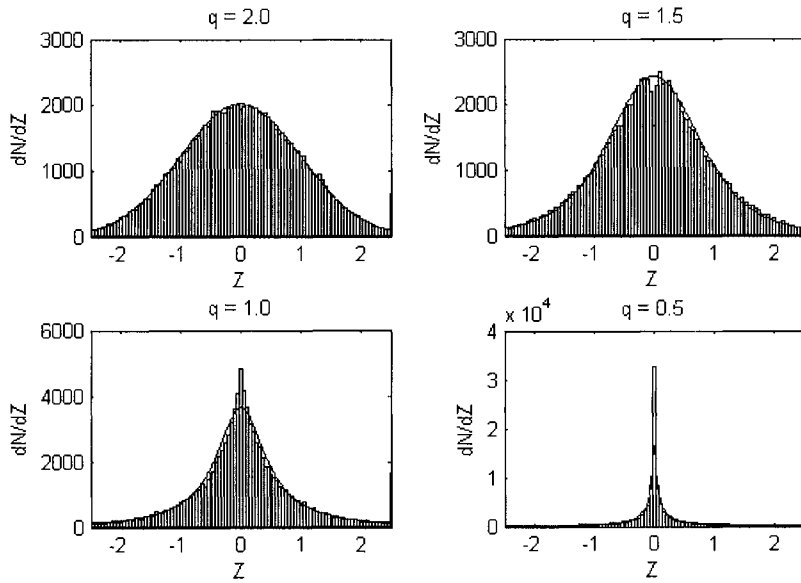


Figure 2: Comparison of generated Formal pdf versus calculated Lévy pdf with fractal index q and unit scale.

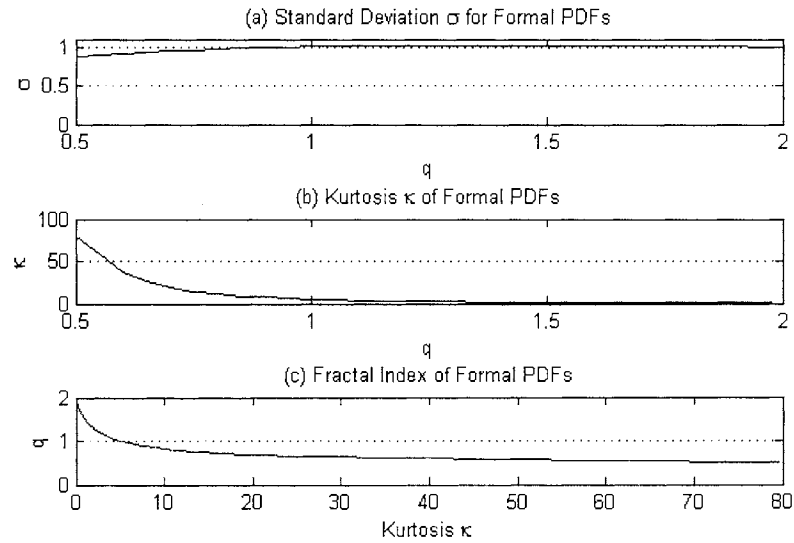


Figure 3: Properties of Formal pdfs as a function of fractal index q .

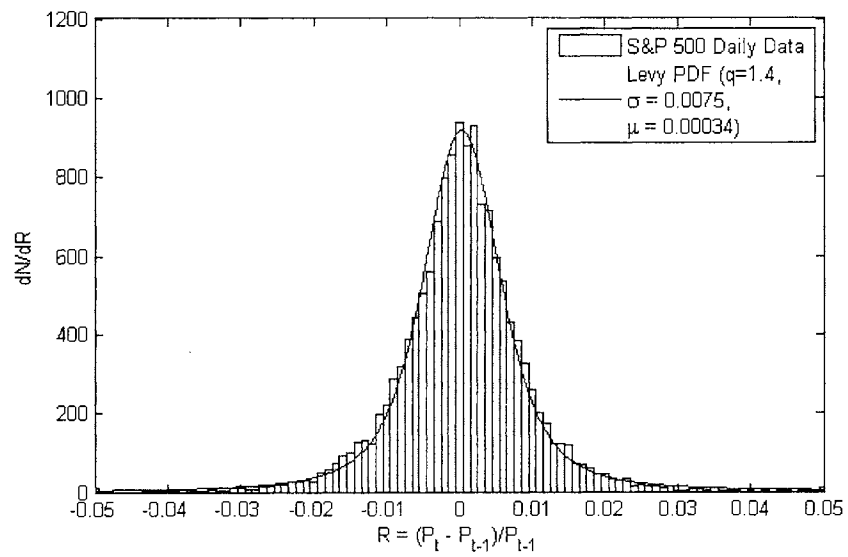


Figure 4: Comparison of Lévy pdf (curve) with S&P 500 daily data (histogram) for the period 9-July-2002 through 26-June-2006.

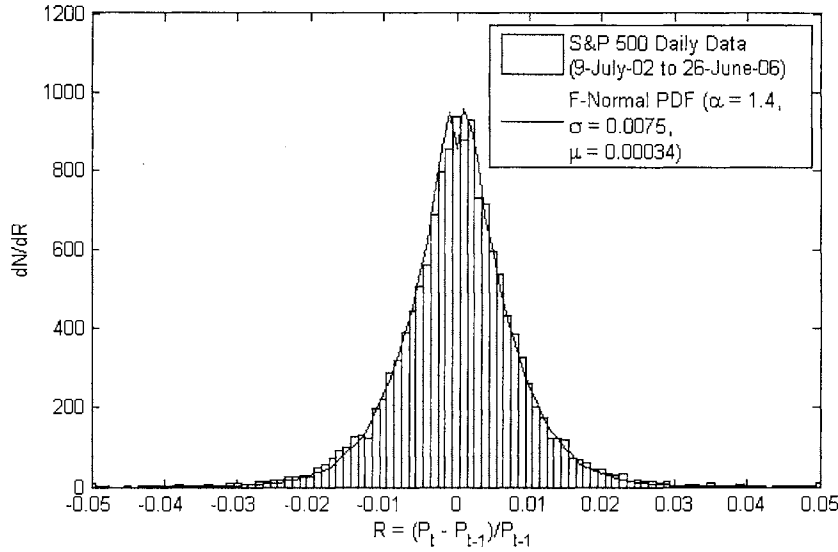


Figure 5: Comparison of Formal pdf (curve) with S&P500 daily data (histogram) for the period 9-July-2002 through 26-June-2006.

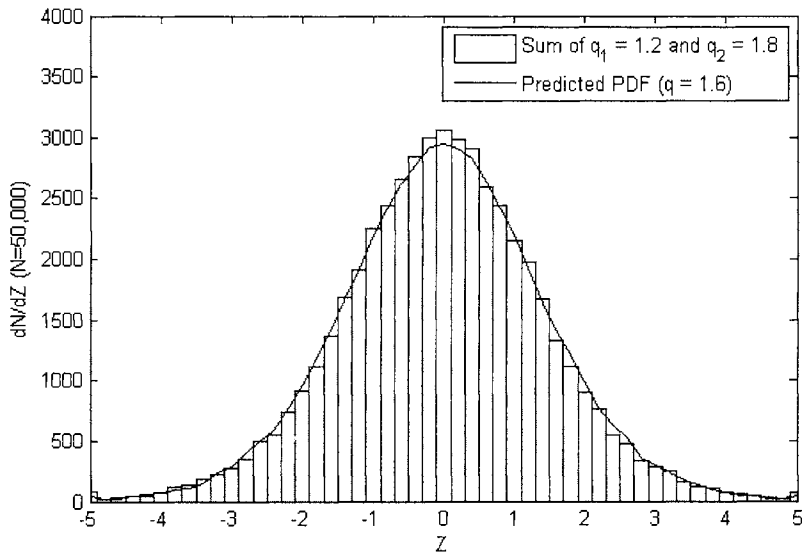


Figure 6: Sum of two uncorrelated Formal pdfs with different fractal indices q versus predicted Formal pdf.

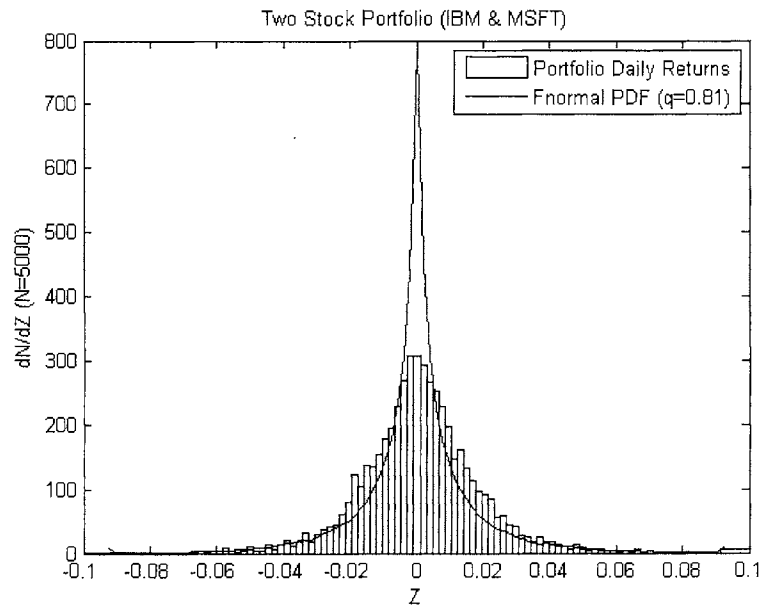


Figure 7: Two stock portfolio of equally weighted IBM and MSFT stocks (histogram) versus predicted Formal pdf (curve). (Daily data 03-September-1986 through 26-June-2006.)

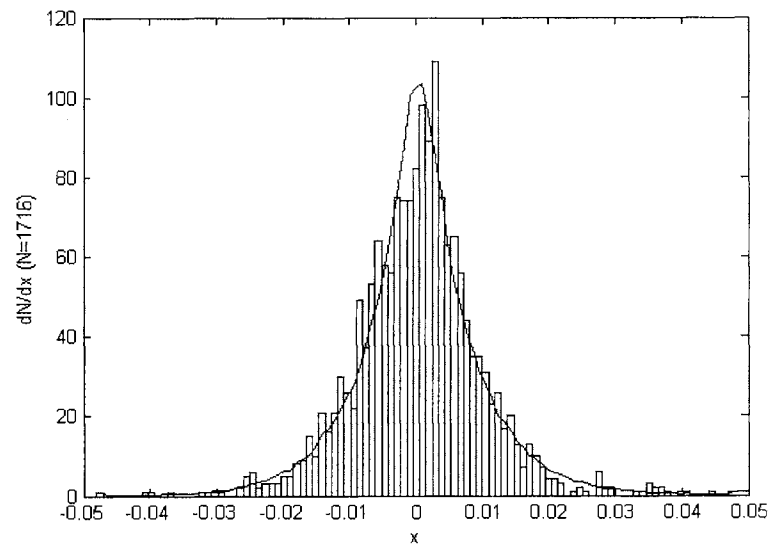


Figure 8: Comparison of randomly weighted portfolio of 20 of the Top 25 stocks of the S&P500 (histogram of 1716 daily returns) versus predicted Formal distribution (curve). (Daily data (22-November-1999 through 19-September-2006.)

Multivariate Stable Distributions and Value at Risk: The Case of the Asian Currency Crisis

David Basterfield and Thomas Bundt

Abstract

This paper explores practical applications of multivariate stable distributions to value at risk modeling during the Asian currency crisis. We fit multivariate stable distributions to daily foreign exchange rate data 1996 through 1998 for six Asian currencies using a rolling estimation procedure and backtest daily marginal and conditional probabilities under 95% and 99% value at risk nulls. We also examine gains in value at risk accuracy from using multivariate stable distributions relative to univariate benchmarks such as generalized autoregressive conditional heteroskedasticity or univariate stable models. We find multivariate stable distributions overstate the probability of extreme losses.

Introduction

It is widely accepted that empirical unconditional foreign exchange return distributions are characterized by leptokurtosis and volatility clustering, questioning traditional mean-variance portfolio theory and currency risk management applications based on Gaussian assumptions. For example, delta-normal value at risk (VaR) models perform poorly when applied to financial returns data relative to generalized autoregressive conditional heteroskedasticity (GARCH) models.

A heavy-tailed alternative related to the normal is the stable distribution. Known as the Stable Paretian Hypothesis, (Mandelbrot 1963) asserted that empirical asset price distributions have infinite variance and are appropriately modeled by non-Gaussian members of the stable family of distributions. Other advocates of the application of stable distributions to modeling financial returns include (Fama 1963), (Roll 1970), and (McCulloch 1978).

This paper conducts three experiments backtesting multivariate stable distributions during the Asian currency crisis. Specifically, we test VaR coverage rates using multivariate stable marginal and conditional probabilities. We find multivariate stable distributions overstate the probability of extreme losses evaluated at 95% and 99% VaR.

Stable Paretian Distributions

Stable Paretian distributions are limiting distributions of normalized sums of i.i.d. variates, where the normal is the only finite variance case. (Lévy 1924) showed tails of non-Gaussian stable distributions asymptotically follow the law of Pareto, giving rise to the term “stable Paretian.” In addition, stable distributions possess the “stability” property, i.e., they are closed under addition. Stable distributions offer risk managers an alternative measure of risk to

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standard deviation when the 2nd moment is undefined. This is the stable index, which determines the general shape of distribution tails.

Stable distributions are analyzed in terms of characteristic functions, i.e., their spectral representation, since stable density functions typically have no closed-form solution (notable exception is the normal). Stable distributions have four parameters: characteristic exponent or index of stability $\alpha \in (0, 2]$, skewness parameter β , scale parameter γ , and location parameter δ . The key parameter governing the rate of decline of tail mass is the index of stability α , i.e., $P[|X| > x] \sim cx^{-\alpha}$. An important property of stable laws is that α determines the number of unbounded moments, i.e., moments of order $r > \alpha$ do not exist. Accordingly, if $\alpha < 1$, distribution tails are of such large mass that moment-generating integrals are unbounded. For $\alpha < 2$, variance and covariance do not exist.

(Nolan 1998) denotes a d-dimension α -stable random vector with spectral measure Γ and shift vector μ^0 as $\mathbf{X} \sim S_{\alpha,d}(\Gamma, \mu^0)$, with characteristic function:

$$(1) \quad \phi_{\mathbf{X}}(\mathbf{t}) = \mathbf{E} \exp\{i \langle \mathbf{X}, \mathbf{t} \rangle\} = \exp\left(-I_{\mathbf{X}}(\mathbf{t}) + i \langle \mu^0, \mathbf{t} \rangle\right)$$

$$\mathbf{I}_{\mathbf{X}}(\mathbf{t}) = \int_{S_d} \psi_{\alpha}(\langle \mathbf{t}, \mathbf{s} \rangle) \Gamma(d\mathbf{s})$$

Here: $\langle \mathbf{t}, \mathbf{s} \rangle = t_1 s_1 + \dots + t_d s_d$ is the inner product, and

$$\psi_{\alpha}(u) = \begin{cases} |u|^{\alpha} \left(1 - i \operatorname{sign}(u) \tan \frac{\pi\alpha}{2}\right) & \alpha \neq 1 \\ |u| \left(1 + i \frac{2}{\pi} \operatorname{sign}(u) \ln|u|\right) & \alpha = 1 \end{cases}$$

Accordingly, the complex valued function $\mathbf{I}_{\mathbf{X}}(\mathbf{t})$ determines the specific distribution of \mathbf{X} . The key parameter is Γ which contains information about the dependence structure in \mathbf{X} . Unfortunately, the general case of multivariate stable distributions is beyond current computational capabilities. (Nolan 2006) has developed computational capabilities under additional assumptions about the nature of the spectral measure. In this paper we employ the elliptically contoured/sub-Gaussian stable distribution which has characteristic function:

$$(2) \quad E \exp(i \langle \mathbf{u}, \mathbf{X} \rangle) = \exp\left(-\left(\mathbf{u}^T \mathbf{R} \mathbf{u}\right)^{\alpha/2} + i \langle \mathbf{u}, \boldsymbol{\delta} \rangle\right)$$

where \mathbf{R} is a $d \times d$ positive definite covariation matrix and $\boldsymbol{\delta}$ is a $d \times 1$ location vector.

The Asian Currency Crisis

Over 1997-1998 regional Asian currencies plunged in response to speculative attacks reacting to unsustainable economic fundamentals such as large trade deficits, massive dollar-denominated debt, and overvalued currencies pegged to the U.S. Speculative attacks began in Thailand and quickly spread over the region. Indeed, a notable characteristic of the crisis was its

contagious nature, with speculators attacking several emerging market currencies beginning summer 1997. Accordingly, the Asian currency crisis represents an important period in history that may render valuable information about the performance of risk management models in times of widespread currency speculation.

Daily data 1/1/1996 through 12/31/1998 were obtained for six currencies: Indonesian Rupiah [IDR], Malaysian Ringgit [MYR], Philippines Pesos [PHP], South Korean Won [KRW], Thai Baht [THB], and the Taiwan Dollar [TWD]¹. Loss distributions were created by taking log first-difference of the daily exchange rate measured in European terms. Accordingly, under home currency preference, investors look to the positive tail of the distribution of losses in risk analysis.

Our loss distributions showed significant deviations from normality. Specifically, we rejected Gaussian nulls of zero skewness and zero excess kurtosis for all currencies in the crisis period. In addition, we rejected the null of no serial correlation in squared losses for every currency. We also rejected the joint null of normality for all six currencies using the Shapiro-Wilk multivariate normality test at the .1% level of significance. Accordingly, our data are consistent with the stylized facts of leptokurtosis and higher-order dependence.

Univariate Stable Index Estimates and Goodness-of-Fit Analysis

Before we fit any multivariate stable distributions, we first examined evidence our data lie in the domain of attraction of stable distributions. Estimates of stable parameters were obtained using John Nolan's STABLE 4.0 program for Windows². Null hypotheses of interest are (1) finite variance: $H_0: \alpha = 2$ and (2) finite expectation: $H_0: \alpha > 1$ against non-finite alternatives $H_A: \alpha < 2$ and $H_A: \alpha \leq 1$. As reported in Table I, the average estimated stable index using MLE is 1.49 for the pre-crisis period and 1.05 for the crisis period, showing an increase in tail masses of loss distributions during the crisis. The finding of average stable indexes near one during the crisis period is notable as the average stable index for stocks tends to be close to 2 (Fama 1965). Using 95% confidence intervals, the finite variance null is rejected for all currencies over both sample periods, suggesting our data are in the domain of attraction of non-Gaussian stable laws. The null of finite expectation is rejected for IDR, MYR, PHP, and KRW in the crisis period.

(Nolan 1999) suggested procedures to determine whether data are consistent with stable distributions including empirical density plots, "variance stabilized" p-p plots, "thinned" q-q plots, and log(likelihood) values relative to the normal. Using these goodness-of-fit tools, we found the stable model was appropriate for our data and it outperformed the normal.

Backtesting Value at Risk

Value at Risk (VaR) is a quantile-based measure of market risk exposure, interpreted as the maximum holding-period loss measured with a specific level of confidence. Specifically, VaR_p is the p-percentage quantile of a loss distribution, exceeded with probability $(1 - p)$, conditional on information at time $t-1$, Ω_{t-1} :

¹ Data were obtained from the Pacific Exchange Rate Service at <http://pacific.commerce.ubc.ca/xr/>.

² Documentation on STABLE 4.0 is available at www.RobustAnalysis.com.

$$(3) \quad VaR_{p,t} = F_{i|\Omega_{t-1}}^{-1}(p)$$

Our backtesting methodology consists of one-day performance comparisons recommended by the 1988 Basel Accord amended to VaR coverage rates. Specifically, we conducted three backtesting experiments designed to explore how multivariate stable distributions perform in VaR analysis. Each experiment compares daily estimated coverage rates based on multivariate stable marginal and conditional probabilities with target coverage rates under nulls of 95% and 99% VaR using failure rate analysis in (Christoffersen 1998). Accordingly, if we are to employ multivariate stable distributions in risk management, we expect estimated marginal probabilities to equal their target frequencies under the relevant VaR null.

We employed (Nolan 2006) STABLE 4.0 to estimate multivariate stable distributions and calculate multivariate stable probabilities. First, we estimated the spectral parameter from sample data then a particular multivariate stable distribution was defined. This multivariate stable distribution was then used to calculate marginal or conditional probabilities used in our three experiments. This procedure was done on a rolling daily basis based on the previous 240 days for the forecast period 1997-1998. Accordingly, our approach produces daily multivariate stable distributions which are time varying, allowing the stable index parameter to change as the Asian crisis evolved.

Once we have fit a multivariate stable distribution to the data we then calculate marginal and conditional probabilities by simulating 100,000 random stable vectors each day using the specific multivariate distribution for that day. Specifically, we estimate marginal probabilities for a given currency using relative frequencies:

$$(4) \quad \hat{p} = P[X \leq x_t] = \frac{\#\{i^{th} \text{ element} \leq x_t\}}{100,000}$$

where x_t is the loss to currency i on a given day. The set of daily probabilities produced can be used to judge whether an exception would have occurred at the 95% or 99% level. We define an exception, I_i , on a given day as the event an estimated marginal probability inferred from a multivariate stable distribution exceeds its desired coverage rate. The conditional coverage null is $E[I_i|\Omega_{t-1}] = p$, where p is the desired coverage rate. For instance, an estimated marginal probability of .98 is recorded as an exception under the 95% VaR null, but not the 99% null.

Experiment #1: MARGINAL STABLE DISTRIBUTIONS

We fit a multivariate stable distribution to all six currencies and estimated marginal probabilities of daily losses for each currency. The null is $H_0: p = .95$ for 95% VaR and $H_0: p = .99$ for 99% VaR.

As reported in Table II, all estimated marginal probabilities significantly exceeded their expected values under the nulls of 95% and 99% VaR. For instance, for IDR, under the 95% null, estimated stable marginal p -values exceed the 95% level approximately 24% of the time.

The fact multivariate stable distributions overstate expected coverage rates suggest they may also overstate VaR at extreme quantiles, although this is not tested directly.

Experiment #2: BIVARIATE STABLE DISTRIBUTIONS

We next estimated bivariate stable distributions for all currency pairs and applied our testing methodology. Consider two currencies X and Y. Two cases were considered:

1. Marginal distribution for a currency, $P[X < x_t \mid -\infty < Y < +\infty]$
2. Conditional distribution for a currency, $P[X < x_t \mid Y = y_{t-1}]$

In our first case, we fit daily bivariate stable distributions and calculated daily marginal probabilities of the day's loss on a given currency and tested 95% and 99% VaR nulls.

Our second case computes daily conditional probabilities of the loss of a target currency given knowledge of the value of a hedging currency on the previous day: $P[X < x_t \mid Y = y_{t-1}]$ evaluated at 95% and 99% nulls. We used the 'dmvstable' subroutine in STABLE 4.0 to generate density values over the range $[-R, +R]$, where R was the maximum absolute daily loss from the full sample of six currencies ($R = 0.302$). Simpson's algorithm for numerical integration was then used to calculate the conditional probability:

$$(5) \quad P[X < x_t \mid Y = y_{t-1}] = \frac{\int_{-R}^{x_t} pdf_y(s) ds}{\int_{-R}^{R} pdf_y(s) ds},$$

where $pdf_y(s)$ denotes the conditional probability distribution function.

Tables III and IV report failure rates based on estimated marginal and conditional probabilities estimated from bivariate stable distributions for all currency pairs. As reported in Tables III and IV, bivariate stable estimated marginal and conditional probabilities consistently overstate conditional coverage rates rejecting their conditional coverage nulls in most cases. Notable exceptions are TWD/MYR, KRW/MYR, TWD/PHP, TWD/THB and IDR/PHP, since their marginal distributions had reasonable failure rates for 99% VaR. Thus our results show bivariate stable distributions consistently overstate desired coverage rates both at 95% and 99% VaR. In addition, failure rates tend to be higher for conditional probabilities, suggest prior knowledge of cross-currency values increase the incidence of overstating coverage rates.

Experiment #3: BACKTESTING A PORTFOLIO

This experiment examined an equally-weighted portfolio of currencies using our testing procedures. Using our rolling daily estimation procedures, we estimated the probability of a portfolio loss by taking the average of each vector using simulation:

$$(6) \quad \hat{p} = P[X \leq x_t] = \frac{\#\{\text{average of vector} \leq x_t\}}{100,000},$$

where x_t is the portfolio loss on a given day. We then tested these estimated multivariate stable probabilities against their desired values under the VaR nulls. We also examined the following benchmarks:

1. Univariate Stable
2. Normal
3. GARCH (1, 1)
4. Historical

In the first case, Nolan's STABLE 4.0 univariate stable estimation and quantile routines were used. Normal VaR calculations follow (Jorion 2001) and the GARCH case fits a GARCH(1, 1) using a rolling estimation procedure similar to that used in this paper. Historical VaR estimates were based on actual (sample) quantiles.

Table V reports backtesting results for estimated multivariate stable marginal probabilities for the equally-weighted portfolio for 95% and 99% VaR.

As reported in Table V we fail to reject VaR nulls for the GARCH (1, 1) model. Specifically, only the GARCH values are not significantly different from their expected values, taking into account coverage statistics. Our results are consistent with (Basterfield and Bundt 2006) in that GARCH (1, 1) performed well over both 95% and 99% VaR, whereas the univariate stable model is useful only at 99% VaR. Finally, the multivariate stable model performed the worst systematically overpredicting VaR coverage rates.

Conclusion

Given the contagious nature of the Asian crisis, gains in VaR forecasting accuracy may result from applications of multivariate methods relative to univariate procedures such as GARCH models. However, the applications tested in this paper were largely unsuccessful. The multivariate stable model performed quite poorly systematically over-predicting VaR coverage rates. Of particular interest is how poorly multivariate stable distributions perform relative to univariate stable models for 99% VaR!

A plausible explanation may be the restriction that all currencies have the same stable index, our estimation procedures, and other issues. Accordingly, future research must consider multivariate stable estimation procedures and stable index parameter restrictions, as well as information flows between equity and currency markets. Finally, comparing daily with weekly VaR as well as examining non-crisis historical data for equities remains a priority for future research.

Table I: Stable Index ML Estimates

	IDR	MYR	PHP	KRW	THB	TWD
Pre-Crisis Period 1/1/1996-12/31/1996	1.56	1.37	1.63	1.36	1.47	1.30
Crisis Period 1/1/1997-12/31/1998	0.85	0.67	0.60	0.81	1.12	0.99

Table II: Multivariate Stable Marginal Probability Failure Rates

	IDR	MYR	PHP	KRW	THB	TWD
95% VaR	23.6%	26.1%	25.3%	18.2%	23.8%	11.4%
99% VaR	14.8%	17.4%	21.6%	11.0%	12.8%	3.6%

Table III: Bivariate Stable 95% VaR Failure Rates

	THB TWD	THB PHP	THB KRW	THB MYR	THB IDR	TWD PHP
Marginal	13.0%	7.6%	11.6%	10.2%	12.8%	9.6%
Conditional	21.0%	13.4%	19.4%	18.8%	22.4%	13.4%

	TWD KRW	TWD MYR	TWD IDR	PHP KRW	PHP MYR	PHP IDR
Marginal	6.8%	7.2%	6.4%	21.6%	16.4%	17.8%
Conditional	8.2%	16.8%	14.0%	22.2%	24.8%	22.6%

	KRW MYR	KRW IDR	MYR IDR	TWD THB	PHP THB	PHP TWD
Marginal	12.6%	11.6%	14.0%	9.0%	17.0%	24.2%
Conditional	16.8%	15.4%	18.0%	15.0%	23.8%	34.5%

	KRW THB	KRW TWD	KRW PHP	MYR THB	MYR TWD	MYR PHP
Marginal	15.0%	10.6%	14.6%	15.0%	14.2%	9.2%
Conditional	20.8%	16.0%	15.6%	23.6%	25.3%	14.4%

	MYR KRW	IDR THB	IDR TWD	IDR PHP	IDR KRW	IDR MYR
Marginal	14.0%	17.4%	14.0%	10.0%	13.2%	13.0%
Conditional	19.8%	26.3%	23.4%	20.0%	22.2%	23.6%

Table IV: Bivariate Stable 99% VaR Failure Rates

		THB	THB	THB	THB	THB	TWD
		TWD	PHP	KRW	MYR	IDR	PHP
Marginal		13.0%	7.6%	11.6%	10.2%	12.8%	9.6%
Conditional		21.0%	13.4%	19.4%	18.8%	22.4%	13.4%
		TWD	TWD	TWD	PHP	PHP	PHP
		KRW	MYR	IDR	KRW	MYR	IDR
Marginal		6.8%	7.2%	6.4%	21.6%	16.4%	17.8%
Conditional		8.2%	16.8%	14.0%	22.2%	24.8%	22.6%
		KRW	KRW	MYR	TWD	PHP	PHP
		MYR	IDR	IDR	THB	THB	TWD
Marginal		12.6%	11.6%	14.0%	9.0%	17.0%	24.2%
Conditional		16.8%	15.4%	18.0%	15.0%	23.8%	34.5%
		KRW	KRW	KRW	MYR	MYR	MYR
		THB	TWD	PHP	THB	TWD	PHP
Marginal		15.0%	10.6%	14.6%	15.0%	14.2%	9.2%
Conditional		20.8%	16.0%	15.6%	23.6%	25.3%	14.4%
		MYR	IDR	IDR	IDR	IDR	IDR
		KRW	THB	TWD	PHP	KRW	MYR
Marginal		14.0%	17.4%	14.0%	10.0%	13.2%	13.0%
Conditional		19.8%	26.3%	23.4%	20.0%	22.2%	23.6%

Table V: Portfolio Marginal Probability Failure Rates

	95% VaR	99% VaR
Multivariate Stable	27.7%	20.0%
Univariate Stable	12.2%	2.2%
Normal	15.2%	8.8%
GARCH (1, 1)	5.2%	1.8%
Historical	14.0%	5.8%

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Does Index Investing Work Well in Sector Funds?

C. Edward Chang, George S. Swales, Jr. and Tsu-Hong Yen

Introduction

Index investing is a strategy that attempts to approximate the performance of a broad market index. Index investing has grown significantly in recent years in the U.S. and other developed countries as investors have become less satisfied with the performance of actively managed alternatives (Baer and Gensler, 2002; Ferri, 2002; Swedroe, 2004; Woolley and Bird, 2003). The first index mutual fund was created in 1976. The second index fund didn't see the light of day until eight years later. During the first several years, it was proclaimed a flawed concept: "why would an investor settle for average returns?" After three decades, the market share of index funds constitutes 17% of equity fund assets: 10% by classic index mutual funds and 7% by the exchange-traded funds (Bogle, 2007).

The growing popularity of sector investing has led to a proliferation of sector investment vehicles in recent years. For example, from 1998 to 2003, the number of actively managed Information Technology funds has nearly tripled, while the number of Financials and Healthcare funds doubled (Edwards and Dash, 2003). Index-based sector investing vehicles have also proliferated, with a number of sector mutual funds and exchange-traded funds now available. The debate on the merits of active and index investing is relatively new for sector investing, unlike the old debate for broad-based size (large-, mid-, or small-cap) or style (value, growth or blend) segments of the market. The new debate for sector investing assumes importance in light of increasing interest in sector investing and a growing number of active and passive investment options.

This paper contributes to the debate by examining characteristics, risk and performance measures of all available vehicles for index investing in U.S. sector funds. In this study, funds used in index investing include not only sector index mutual funds (hereafter "sector index funds"), but also their recently emerging close substitutes --- sector exchange-traded funds (hereafter "sector ETFs"). Enhanced index funds, a hybrid between actively-managed funds and passive index funds, are not included because these funds have behaved more like actively-managed funds (Chang and Swales, 2006). Our results would help shed light on the following two issues. First, how do sector index funds perform compared with average of all sector mutual funds, and thus actively-managed funds? Second, how well do sector ETFs perform?

Pros and Cons of Equity Index Investing

Broad-based index funds have several advantages. By their very nature, index funds ensure widely diversified assets. They typically cost less to operate than actively managed equity funds because they have lower turnover and transaction costs, and require no research into

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individual stocks. Consequently, index fund expense ratios are generally lower than those of actively managed equity funds. Other factors being equal, this could increase an index fund investor's return. For investors wishing to minimize taxes, the lower turnover rate of index funds reduces the likelihood of capital gain distributions. Most studies (see Haslem (2003, pp. 308-311) for a recent review) find that actively managed mutual funds under perform passively managed portfolios. Fund net returns are negatively related to expenses. Moreover, the higher portfolio turnover, the lower fund net returns relative to benchmark indices (Madlem, 1999, p. 20).

There are some potential drawbacks to index investing. The index fund manager cannot react to trends within market sectors by shifting assets from one to another. Index funds offer no opportunity to outperform their indices. Diversification cannot protect against loss in a declining market. Though equity index funds boast extensive diversification within their own universe, they can be limiting on a broader scale. For example, an index fund including only U.S. stocks does not offer the diversity or performance opportunity of a portfolio that includes international stocks, bonds, and money market investments. This paper investigates how well index investing works on a narrower scale – sector funds.

The percentage of conventional mutual funds that focus on a single sector or industry is about 6%. By contrast, more than 40% of all ETFs are sector or industry funds (Culloton, 2006). The history of sector mutual funds shows investors tend to misuse them. They chase hot returns and then dump the funds when they cool off (O'Neal, 2000). Academic research shows that investors are generally "horrible" market timers (Spence, 2002). Usually the narrower the sector funds, the higher are their costs. Many sector funds are concentrated in a handful of firms (Madlem, 1999, p. 21), because they are composed of slices of market-cap-weighted equity indexes. Khorana and Nelling (1997) find that sector funds tend to be less diversified than other equity funds, and they exhibit larger total risk, but do not entail greater systematic risk.

Data and Methodology

Sector mutual funds are defined by Morningstar as domestic equity mutual funds that specialize in a particular sector of the market, including communications, financials, health care, natural resources, precious materials, real estate, technology, utilities, and convertible bond. Sector mutual funds with at least three-year data available on June 30, 2006, were collected from Morningstar and Yahoo! Finance. Table I shows of 1,034 sector mutual funds, only twelve were index funds. These twelve sector index funds were supplemented with 27 sector ETFs for investigation of index investing. In order to make meaningful comparisons, we choose to compare funds with matching category and duration (time period), and not all available funds. Average expense ratios and turnover rates were calculated for these categories as were Morningstar return, risk and star ratings. Conventional return, risk, and risk-adjusted return measures as suggested by Simons (1998) are calculated. All these measures were contrasted in two panels. The first panel is to compare sector index funds and average of all sector mutual funds. The second panel is to compare sector ETFs and average of all sector mutual funds.

Findings

Expense ratios and annual turnover rates are shown in Table II. Most sector index funds have lower expense ratios and annual turnover rates than actively-managed sector mutual funds. An exception is the only sector index fund (CNCRX) in the health care category, which has an exceptionally high expense ratio (4.45%). Sector ETFs have even lower expense ratios and annual turnover rates than both sector index funds and actively-managed sector mutual funds.

Morningstar's proprietary return, risk and star (or risk-adjusted return) ratings are shown in Table III. Morningstar rates mutual funds from one to five stars based on how well they have performed (after adjusting for risk and accounting for sales charges) in comparison to similar funds. Within each Morningstar category, the top 10% of funds receive five stars, the next 22.5% four stars, the middle 35% three stars, the next 22.5% two stars, and the bottom 10% receive one star. Funds are rated for up to three time periods (three-, five-, and ten-years) and these ratings are combined to produce an overall rating. Return and risk ratings are done in the same manner.

Using overall ratings, this study finds sector index funds exhibit statistically insignificantly higher return (3.06), lower risk (2.94), and lower risk-adjusted return (2.81) than the average of all sector mutual funds. Exceptions are (1) real estate sector index funds exhibiting lower return and higher risk, and (2) technology sector index funds exhibiting higher return, lower risk and higher risk-adjusted return. This study also finds sector ETFs exhibit statistically significantly lower return (2.64), similar risk (3.01) and lower risk-adjusted return (2.67). Only financials sector ETFs performed differently with higher return, higher risk, and higher risk-adjusted return.

Plus-or-minus return for sector index funds in each category over the past fifteen-year period and annualized returns for sector ETFs over the past three- and five-year period are shown in Table IV. We use NAV returns for sector mutual funds and market returns for sector ETFs. This study finds sector index funds underperformed or performed only as well as the average of all sector mutual funds in their respective category. Some exceptions are sector index funds in the category of health care over the past three-year period. Real estate sector index funds have underperformed their category average over the past ten-year period. Sector ETFs exhibit significantly lower market returns than the average of all sector mutual funds in their respective category over both three-year and five-year periods. Exceptions are financials sector ETFs over the past 3-year period and real estate ETFs over the past 5-year period, which had slightly higher returns.

Table V shows results of standard deviations (total or stand-alone risk) over the past three-, five- and ten-year periods. Both sector index funds and sector ETFs have mixed and statistically insignificant results, compared with the average of all sector mutual funds in their respective category. Real estate sector index funds exhibit higher risk over the five-year period, but lower risk during the ten-year period. Moreover, technology sector index funds exhibit lower risk over the ten-year period. With the exception of the health care sector, sector ETFs exhibit higher risk than sector index funds.

Additional three-, five- and ten-year results of systematic or market risk, measured by beta coefficients, and risk-adjusted returns, measured by Alphas, is shown in Table VI and Table VII. Sector index funds exhibit significantly lower market risk and insignificantly higher risk-adjusted return than the average of all sector mutual funds. Sector ETFs exhibit statistically significantly lower market risk for the 3-year period and lower risk-adjusted return for the 5-year period than the average of all sector mutual funds.

Conclusion

The authors of this study find sector index funds and sector ETFs have lower expense ratios and lower turnover rates than the average of actively-managed sector mutual funds in their respective category. Pure sector investing is for the active investor and is not a buy-and-hold technique. Unlike their counterparts for broad-based size or style segments of the market, sector index funds have at best performed only as well as the average of actively-managed sector mutual funds with lower risk and comparable return and risk-adjusted return. As newcomers, sector ETFs have had a good start, with the lowest expense ratios and turnover rates. Sector ETFs, however, have underperformed the average of actively-managed sector mutual funds with similar or lower risk, and statistically significantly lower return and risk-adjusted return since their inceptions.

Table I
Number of Available Sector Funds as of June 30, 2006

Panel I.A: Number of All Sector Mutual Funds

Morningstar Category	With 3-Year Data	With 5-Year Data	With 10-Year Data	With 15-Year Data
Specialty-Communications	41	41	11	5
Specialty-Financials	126	112	18	13
Specialty-Health Care	191	156	27	12
Specialty-Natural Resources	96	83	38	20
Specialty-Real Estate	205	152	47	6
Specialty-Technology	282	243	36	16
Specialty-Utilities	93	79	49	18
Total Number of Funds	1,034	866	226	90

Panel I.B: Number of Sector Index (Mutual) Funds

Morningstar Category	With 3-Year Data	With 5-Year Data	With 10-Year Data	With 15-Year Data
Specialty-Communications				
Specialty-Financials				
Specialty-Health Care	1			
Specialty-Natural Resources				
Specialty-Real Estate	6	5	2	
Specialty-Technology	4	4	1	
Specialty-Utilities	1	1	1	1
Total Number of Funds	12	10	4	1

Note: Sector index (Mutual) Funds are part of All Sector Mutual Funds

Panel I.C: Number of Sector Exchange-Traded Funds

Morningstar Category	With 3-Year Data	With 5-Year Data	With 10-Year Data	With 15-Year Data
Specialty-Communications	2	1		
Specialty-Financials	4	3		
Specialty-Health Care	4	3		
Specialty-Natural Resources	4	2		
Specialty-Real Estate	3	3		
Specialty-Technology	8	4		
Specialty-Utilities	2	2		
Total Number of Funds	27	18		

Note: Sector Exchange-Traded Funds are not part of All Sector Mutual Funds

Table II
Expense Ratio (%) and Annual Turnover (%)

Panel II.A: Sector Index Funds vs. Average of All Sector Mutual Funds

Morningstar Category	Expense Ratio		Annual Turnover	
	Sector IFs	Average	Sector IFs	Average
Specialty-Health Care	4.45	1.82	2.00	129.46
Specialty-Real Estate	0.87	1.56	15.50	87.91
Specialty-Technology	1.29	1.89	13.75	179.33
Specialty-Utilities	0.80	1.45	20.00	98.48
Average	1.85	1.68	12.81	123.80
T-test (probability)	0.423372499		0.007490604***	

*** Significant at the 0.01 level.

Panel II.B: Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	Expense Ratio		Annual Turnover	
	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	0.63	1.65	18.00	254.32
Specialty-Financials	0.53	1.72	7.75	177.61
Specialty-Health Care	0.50	1.82	6.75	129.46
Specialty-Natural Resources	0.50	1.54	6.25	146.78
Specialty-Real Estate	0.40	1.56	19.67	87.91
Specialty-Technology	0.50	1.89	15.00	179.33
Specialty-Utilities	0.43	1.45	4.50	98.48
Average	0.50	1.66	11.13	153.41
T-test (probability)	0.000000417***		0.000244205***	

*** Significant at the 0.01 level.

Table III
Morningstar Return, Risk, and Star Ratings

Panel III.A: Sector Index Funds vs. Average of All Sector Mutual Funds (3.00)

Morningstar Category	Return Rating		Risk Rating		Star Rating	
	Sector IFs	Average	Sector IFs	Average	Sector IFs	Average
Specialty-Health Care	3.00	3.00	3.00	3.00	2.00	3.00
Specialty-Real Estate	2.50	3.00	3.50	3.00	2.50	3.00
Specialty-Technology	3.75	3.00	2.25	3.00	3.75	3.00
Specialty-Utilities	3.00	3.00	3.00	3.00	3.00	3.00
Average	3.06	3.00	2.94	3.00	2.81	3.00
T-test (probability)	0.412000503		0.412000503		0.324994477	

Panel III.B: Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	Return Rating		Risk Rating		Star Rating	
	Sector ETFs	Average	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	2.00	3.00	1.50	3.00	2.50	3.00
Specialty-Financials	3.25	3.00	3.50	3.00	3.25	3.00
Specialty-Health Care	2.25	3.00	2.50	3.00	2.25	3.00
Specialty-Natural Resources	2.00	3.00	2.25	3.00	2.25	3.00
Specialty-Real Estate	3.00	3.00	4.67	3.00	2.67	3.00
Specialty-Technology	3.00	3.00	3.13	3.00	2.75	3.00
Specialty-Utilities	3.00	3.00	3.50	3.00	3.00	3.00
Average	2.64	3.00	3.01	3.00	2.67	3.00
T-test (probability)	0.064569770*		0.492979561		0.028025512**	

** Significant at the 0.05 level.

* Significant at the 0.10 level.

Table IV
Return Plus/Minus Category Average (%) and Average Annual Return (%)

Panel IV.A: Sector Index Funds vs. Category Average (Return Plus/Minus =0)

Morningstar Category	Return Plus/Minus Category Average			
	3-Year	5-Year	10-Year	15-Year
Specialty-Health Care	0.31			
Specialty-Real Estate	-1.25	-1.21	-0.33	
Specialty-Technology	-0.62	3.41		
Specialty-Utilities	-0.65	1.26	0.84	-0.02
Average	-0.55	1.15	0.26	-0.02
T-test (probability)	0.092*	0.239	0.369	

* Significant at the 0.10 level.

Panel IV.B: Average Annual Return - Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year	
	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	10.65	16.86	-4.83	-1.06
Specialty-Financials	14.12	14.06	5.69	7.48
Specialty-Health Care	4.11	8.39	-1.35	1.70
Specialty-Natural Resources	32.42	34.11	15.25	19.12
Specialty-Real Estate	26.77	25.75	19.29	19.26
Specialty-Technology	9.22	10.26	-4.80	-4.53
Specialty-Utilities	17.09	18.16	3.95	4.30
Average	16.34	18.23	4.74	6.61
T-test (probability)	0.047387148**		0.013784318**	

** Significant at the 0.05 level.

Table V
Standard Deviation (%)

Panel V.A: Sector Index Funds vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year		10-Year	
	Sector IFs	Average	Sector IFs	Average	Sector IFs	Average
Specialty-Health Care	11.95	10.87				
Specialty-Real Estate	16.02	15.14	14.49	14.11	13.99	14.28
Specialty-Technology	15.20	18.66	26.27	30.13	30.35	33.63
Specialty-Utilities	8.60	8.62	14.78	14.21	15.35	14.02
Average	12.94	13.32	18.51	19.48	19.90	20.64
T-test (probability)	0.371189323		0.285720318		0.31791434	

Panel V.B: Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year	
	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	9.99	16.46	23.85	26.28
Specialty-Financials	9.38	10.07	14.15	13.53
Specialty-Health Care	10.46	10.87	16.57	13.91
Specialty-Natural Resources	19.36	20.10	20.12	21.91
Specialty-Real Estate	16.48	15.14	15.02	14.11
Specialty-Technology	19.01	18.66	29.09	30.13
Specialty-Utilities	9.63	8.62	15.33	14.21
Average	13.47	14.27	19.16	19.15
T-test (probability)	0.225420766		0.496011686	

Table VI
Beta Coefficients

Panel VI.A: Sector Index Funds vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year		10-Year	
	Sector IFs	Average	Sector IFs	Average	Sector IFs	Average
Specialty-Health Care	0.56	0.76				
Specialty-Real Estate	0.93	0.92	0.42	0.42	0.26	0.30
Specialty-Technology	1.69	1.90	1.76	1.92	1.59	1.67
Specialty-Utilities	0.46	0.52	0.68	0.75	0.41	0.57
Average	0.91	1.03	0.95	1.03	0.75	0.85
T-test (probability)	0.061364002*		0.119821727		0.059041448*	

* Significant at the 0.10 level.

Panel VI.B: Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year	
	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	0.82	1.62	1.34	1.59
Specialty-Financials	0.91	1.00	0.93	0.83
Specialty-Health Care	0.73	0.76	0.85	0.69
Specialty-Natural Resources	1.10	1.16	0.76	0.81
Specialty-Real Estate	0.96	0.92	0.44	0.42
Specialty-Technology	1.94	1.90	1.93	1.92
Specialty-Utilities	0.28	0.52	0.64	0.75
Average	0.96	1.13	0.98	1.00
T-test (probability)	0.098240872*		0.375142201	

* Significant at the 0.10 level.

Table VII
Alpha (%)

Panel VII.A: Sector Index Funds vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year		10-Year	
	Sector IFs	Average	Sector IFs	Average	Sector IFs	Average
Specialty-Health Care	1.78	-0.30				
Specialty-Real Estate	13.20	13.96	15.09	16.02	10.25	9.95
Specialty-Technology	-6.40	-7.04	-1.96	-4.42	4.68	-0.84
Specialty-Utilities	10.17	10.20	3.50	2.12	4.81	3.08
Average	4.69	4.21	5.54	4.57	6.58	4.06
T-test (probability)	0.241513906		0.217156686		0.12373943	

Panel VII.B: Sector ETFs vs. Average of All Sector Mutual Funds

Morningstar Category	3-Year		5-Year	
	Sector ETFs	Average	Sector ETFs	Average
Specialty-Communications	1.19	0.82	-5.90	-1.56
Specialty-Financials	3.50	2.70	3.11	4.92
Specialty-Health Care	-4.06	-0.30	-3.16	-0.39
Specialty-Natural Resources	18.34	19.16	13.13	16.71
Specialty-Real Estate	14.67	13.96	16.13	16.02
Specialty-Technology	-8.27	-7.04	-4.97	-4.42
Specialty-Utilities	11.50	10.20	2.07	2.12
Average	5.27	5.64	2.92	4.77
T-test (probability)	0.294970373		0.016151989**	

** Significant at the 0.05 level.

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The Variability of Mutual Fund Performance Persistence in the Long-Run

Matt Maher and Harry White¹

Abstract

Mutual fund performance persistence has been well documented in the finance literature. This study extends the previous work by looking at a longer time period of returns over annual intervals, rather than longer time series groupings. The results document that persistence varies significantly through time, especially when the stock market turns. Clear long-term investing and trading rules based on persistence are not supported by the paper's conclusions.

Introduction

Many academic studies document mutual fund performance persistence, but differ on the implications for investors. Part of this ambiguity reflects the different time periods examined and the emphasis on the overall test results for the entire time period, with little attention given to the variability of persistence from year-to-year. This study employs the CRSP mutual fund database to examine the variability of fund persistence from 1970-2005. The longer time frame and focus on the variability of persistence extend existing work and contribute to deciding if persistence creates excess returns or is simply another risk factor.

Numerous academic studies have documented persistence in mutual fund performance. See, for example, Grinblatt and Titman (1992), Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), Malkiel (1995), Elton Gruber and Blake (1996), Carhart (1997), Detzel and Weigand (1998), and Jan and Hung (2004). Droms (2006) provides a good review of the major studies in the area. These papers report various forms of performance persistence over different time frames and the studies differ on the implications for investors. Some believe that chasing good performing mutual funds exploits market inefficiency and creates higher returns without increasing risk, thus "smart money" earns a higher return than expected given the risk incurred (positive excess return in the language of academic finance). Others argue that buying mutual funds with high past returns just trades higher returns for the higher risk that a "momentum" strategy entails.

Gruber (1996) contends that money is smart; flows are relatively higher into mutual funds that have superior future returns. But, Carhart (1997, pp. 57, 81) finds that "common factors in stock returns [value vs. growth, large cap vs. small cap, high beta vs. low beta] and persistent differences in mutual fund expenses and transactions costs explain almost all the predictability in mutual fund returns," and he warns that, "While the popular press will no doubt continue to glamorize the best-performing mutual fund managers, the mundane explanations of strategy and investment cost account for almost all of the important predictability of mutual fund returns."

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Even though other researchers have found results in line with Carhart's work, there is some recent evidence that money chasing recent strong performers is "smart" based on mutual fund managers' abilities to pick stocks. Chen, et al. (2000) find that the stocks most actively sold by mutual fund managers under-perform the ones most actively bought by over two percent per year. Wermers (2000) presents results which suggest that fund managers who trade more frequently have persistent stock picking talent.

Even more interesting for the "smart" money debate is the contention that the relationship between fund flows and managerial behavior may enhance fund persistence through a cycling of momentum strategies. Carhart (1997) finds that part of fund persistence can be explained by the fact that strong performing funds are invested in "winner" stocks that have strong price momentum. Sirri and Tufano (1998) show that consumers heavily invest in funds with strong returns in the previous year, but only weakly divest poor performing funds. Further, Wermers (2003) finds that winning managers use their large cash inflows to implement momentum based strategies more aggressively than losing managers and push up stock prices. In fact, the disposition effect, where investors have a lower propensity to sell stocks in which they have a capital loss, may account for the common findings that persistence is strongest for losers (see Grinblatt and Han, 2002, for a discussion of the disposition effect). Thus, as Sapp and Tiwari (2004, p. 2620) conclude, "when we control for stock return momentum, the smart money effect disappears." This result leads to the conclusion that an economically significant trading rule based on mutual fund persistence is difficult to construct and that a "copy-cat" strategy might be the smarter play (Myers, et al. 2002). Part of this ambiguity reflects the different time periods examined and the emphasis on the overall test results for the entire time period used in previous studies.

Another source of ambiguity may be that mutual fund persistence varies through time. The basic idea behind this paper is that if persistence is consistent through time then it should be possible to exploit with an economically significant trading rule that creates positive excess returns. But, if persistence is quite variable through time, then it should probably be considered just another risk factor, with the higher returns through time simply compensation for higher risk.

The variability of fund persistence has not been the focal point of the academic studies, they concentrate on the level of fund persistence, but there is evidence that it fluctuates significantly. For example, Wermers (2003) Table I shows that, for the twenty-year period between 1975 and 1994, persistence is reversed in five of those years, based on total net asset weighted fund returns. Even though results for the entire period show that past year winner funds average almost six percent more than losers, over the 1985-1989 five-year period losers actually outperformed winners by 1.5 percent. Further, Brown and Goetzmann (1995, p. 689) find that "the strongest evidence for repeat performance is over the late 1970s and early 1980s." Malkiel (1995, p. 560) finds similar results. Also, Detzel and Weigand (1998) find that over the 21-year period between 1976 and 1996, persistence was most prevalent over the earlier 1976-1985 period. Jan and Hung (2004) employ a longer time horizon but just report overall results with no mention of inter-temporal variability.

If variability exists in performance persistence, one factor that may be driving the variability is business and corresponding stock market cycles. In two recent articles, Avramov

and Wermers (2006) and Busse and Irvine (2006) document that persistence may be related to the business cycle. Many of the earlier published articles use data that covers business cycles and market cycles but does not examine the persistence results relative to these factors. This study uses data that includes the 1970s, a poor decade for stock returns, and more recent data, since the March, 2000 stock market downturn that allows for an examination of mutual fund persistence over both bear and bull market cycles.

Data and Methodology

The data employed in this study comes from the CRSP Survivor-Bias Free U.S. Mutual Fund Database. The importance of survivor-bias in mutual fund performance studies has been well documented (see Brown, Goetzmann, Ibbotson, and Ross (1992) for example). The monthly returns for U.S. equity mutual funds are examined for the period 1970 to 2005². Previous studies have used a variety of data sources and broken the results into decades, or other time intervals, or simply looked at the results from regressions run over the entire time frame of the data employed. Grinblatt and Titman (1992) used a data set purchased from CDA Technologies that contained 279 equity mutual funds with data from December 1974 to December 1984. They divided the results into two five-year periods for analysis. Hendricks, Patel and Zeckhauser (1993) used four different data sources to collect returns on 165 equity mutual funds from 1974 to 1988. Goetzmann and Ibbotson (1994) use data from Ibbotson Associates and Morningstar Inc. for the period 1976 to 1987. Brown and Goetzmann (1995) use data from Weisenberger Investment Companies Service for the period 1976 to 1988. Malkiel (1995) uses a data set from Lipper Analytic Service for the period 1971 to 1991. Most recent studies since Carhart (1997) (for period 1962 to 1993) have used survivor-bias free data. Jan and Hung (2004) (data through 2000) and Avramov and Wermers (2006) (data from 1975 to 2002) use the CRSP data base for their studies.

In addition to the diversity of data used and time periods covered in previous studies the methodology used has been diverse as well. The two main approaches include an examination of the “hot hand” phenomenon and scrutiny of return persistence after returns are adjusted to excess returns using one to four factor models to adjust returns. The “hot hand” approach uses the raw returns data and examines year to year results for “winners” and “losers” that are identified by dividing the sample each year by median return and the top half are the winners and the bottom half are the losers. The data are then examined the following year to see if winners repeat and losers repeat as winners and losers, respectively. The results from the studies looking at the raw data indicate that return persistence is inconsistent period to period over the time frames examined. The excess return approach adjusts returns for risk factors. Examples of this approach are Carhart (1997) and Jan and Hung (2004). The returns are adjusted for market portfolio returns and zero-investment factor mimicking portfolios for size, book to market equity and one year momentum in stock returns. The results indicate that return persistence exists but is mitigated by market factors and expense ratios.

² The equity funds were chosen using the categories if sp_style_cd in ('ACG','ACV','LCB','LCG','LCV','MCB','MCG','MCV','SCP','SCG','SCV'); OR sp_obj_cd in ('GMC','GRI','GRO','ING'); OR icdi_obj in ('AG','GI','LG','TR') OR wbrger_obj_cd in ('G','GCI','IEQ','LTG','MCG','SCG'); OR policy='CS'

This study examines raw returns over a 35-year period (1970 to 2005) that covers and extends the time periods covered by previous studies. First results on the percentage of repeat winners for the data set used is compared to the results from the data sets used by Malkiel (1995) and Brown and Goetzmann (1995) to see how return persistence indicators change across data sets. The data is then sorted each year by the median return of all funds into winners (those above the median) and losers (those below the median). The number of winner to winner, winner to loser, loser to winner, and loser to loser funds are calculated each year based on their ranking from the previous year. Percentage repeat winners and percentage repeat losers are calculated for each year as well as a Z-test on whether the percentage is significantly different from 50%. The results are reported by decade in Tables I through V and the variability of return persistence is discussed year to year and for each decade.

Results and Implications

The variety of data sets used in previous studies might suggest that return persistence could vary by data used and time frame examined. The results in Table I indicate that the raw data results from Malkiel (1995) and Brown and Goetzmann (1995) are comparable to the results from the data set used in this study. The year to year repeat winners are similar for the comparable time periods covered by all three studies. In addition the average number of repeat winners for the comparable time periods is very similar. These results indicate that return persistence is consistent across data sets used but does vary year to year and across the time frame examined.

The results in Table II show for 1970 to 1979 the year to year winner to winner, winner to loser, loser to winner and loser to loser number of funds; percentage of repeat winners; percentage of repeat losers and the Z-tests on whether the percentage of repeat winners and repeat losers are significantly different from 50% (no persistence).³ There was considerable persistence in the '70s; the Z-test is significant at the 99% confidence level for seven of the ten years documented in the table. There was a statistically significant reversal of persistence from 1970 to 1971 following a down stock market in 1969. The two years of statistically insignificant persistence were at least coincidental with turns in the market. The first was 1972 to 1973 when the market started a two-year downturn (as measured by the S&P 500 Index). The second was 1974 to 1975 when the market turned back to positive. The year in between these two insignificant persistence years (1973 to 1974) was the weakest significant persistence of the decade.

Table III reveals the same calculations for the decade of the '80s. There were three reversal years in the decade. Only five of the ten years had significant positive persistence. Two of the years were statistically insignificant at the 95% confidence level (1983 to 1984 and 1984 to 1985). The reversals occurred in 1980 to 1981, 1987 to 1988 and 1988 to 1989. All were significant at the 95% confidence level except for the repeat winners in 1988 to 1989. The 1980 to 1981 reversal occurred the year the market turned negative in 1981. The 1987 to 1988 reversal occurred the year after the market slowed to below historical average returns and the 1988 to 1989 reversal occurred the year after the market turned back to above historical average returns

³ The Z-test is calculated as described in Malkiel (1995) footnote 13, page 559.

after the 1987 slowdown. Return persistence in the 1980s was much less consistent than the previous decade.

The results for the '90s and '00s, calculated and reported in Tables IV and V, were also mixed. The 1990 to 1991 results showed an insignificant reversal as market returns were negative in 1990. The 1991 to 1992 results were positive and insignificant as the market recovered strongly in 1991. Results were positive and significant in the 1992 to 1993 year but returned to positive and insignificant in the 1993 to 1994 and 1994 to 1995 years as the market returns lagged historical averages in 1992, 1993 and 1994. Significant positive persistence existed from 1995 through 1999 as the market returns were consistently well above historical averages. Return persistence followed market momentum in this period. A strong reversal is revealed in the 1999 to 2000 data with the lowest level of persistence of the entire 35 years of data. The reversal coincides with the market reversal that started in 2000. Strong persistence returns to the data in 2000 to 2001 and 2001 to 2002 as the market momentum continues downward. Another reversal occurs in the 2002 to 2003 data as the market turns from negative returns back to positive. This is followed by two years of strong persistence in 2003 to 2004 and 2004 to 2005 as positive momentum is once again present in the market return data.

Overall, the five years examined in the 2000s showed the strongest persistence with 66.6% of winners repeating and 64.6% of losers repeating. The '80s and '90s showed the weakest persistence with between 52% and 54% of winners and losers repeating. The data from the '70s shows that between 62% and 63% of winners and losers repeat.

The results indicate that persistence is strongest when the market has momentum in a particular direction. There is, however, considerable variability in return persistence over the time period studied. Persistence tends to reverse (winners become losers and losers become winners) when the market changes direction. Statistically significant reversals (at the 95% confidence level) occurred in 1970 to 1971 after negative market returns in 1969 and returns below historical average in 1970; in 1980 to 1981 as the market reversed to negative returns in 1981; in 1987 to 1988 and 1988 to 1989 as the market moved to below historical average returns in 1987 and then back to above historical average returns in 1988; in 1999 to 2000 and the market moved to negative returns in 2000; in 2002 to 2003 and the market moved to positive returns in 2003 after three years of negative returns.

Statistically insignificant persistence (at the 95% confidence level) occurred in 1972 to 1973 as the market generated negative returns in 1973; in 1974 to 1975 as the market turned back to positive returns after two years of negative returns; in 1983 to 1984 and 1984 to 1985 as the market slowed to below historical average returns in 1984 and then move to above historical average returns in 1985; in 1990 to 1991 and 1991 to 1992 as the market moved to negative returns in 1990, then back to above historical average positive returns in 1991 and then back to below historical average returns in 1992; in 1993 to 1994 as the market moved to below historical average returns in 1994. The data suggest that persistence trading rules work well when the market has momentum in a particular direction but break down as the market returns change sign; move from above historical average to below historical average; or move from below historical average to above historical average.

Table VI shows subsequent year median returns for the top/bottom halves of equity mutual funds based on their rank (top ½ and bottom ½) from the previous year. It provides an easily interpreted economic significance to persistence on a year-by-year basis: the percentage difference between the top/bottom performers from the previous year. The results indicate that the persistence and reversals were more significant in the 1970s, the 1971-1980 average difference in top/bottom returns from the previous year was 5.3% in the following year. For the 1981-1990 period that value fell to just .9%, up to 1.9% in the 1991-2000 period, then back to 1970s levels for the smaller 2001-2005 period.

Note that biggest persistence reversal (-14.5% in 2000) was followed by the biggest persistence gain (13.1% in 2001), highlighting the relationship between persistence and stock market turns as the longest bull market in history ended in March of 2000. Though the overall 1971-2005 average difference based on previous year halves is 3.1%, there were significant reversals in 1971 (-6.1%), 1981 (-5.4%), 1988 (-4.2%), and 2000 (-14.5%). The results indicate that the performance persistence is significant for investors for some time periods in the study but is not consistent over the study and the reversals can be very significant as well.

Conclusion

While previous studies have reported mutual fund return persistence, very little work has been done on the variability of return persistence. This study documents the extent that persistence varies year-by-year with a comprehensive sample of equity mutual funds. Overall, the percentage of repeat winners was less than 50% or not significantly different from 50% in 13 of the 35 years in the study and in 6 of those years persistence reversed so that the above median mutual funds actually underperformed below median funds the following year. The paper also shows that persistence is significant for investor returns when the market has strong momentum in either direction and is significant in the opposite direction when reversals in persistence occur. The results cast doubt on trading rules based on persistence being able to capture positive excess returns: persistence is quite variable through time and tied to changes in bull versus bear stock markets, also quite difficult to predict.

Table I

Repeat Winners - shows the percentage of repeat winners (above the median return) for two comparison studies.

Year	Malkiel	Brown & Goetzman	Maher & White
1971	64.8%		68.9%
1972	50.0%		52.9%
1973	62.6%		62.1%
1974	52.1%		54.0%
1975	74.4%		72.0%
1976	68.4%	62.0%	67.7%
1977	70.8%	68.0%	68.2%
1978	69.7%	68.7%	64.3%
1979	71.8%	71.4%	71.9%
1980	36.5%	33.0%	37.7%
1981	62.0%	59.0%	63.2%
1982	56.6%	55.0%	59.9%
1983	56.1%	53.0%	55.7%
1984	53.9%	53.9%	55.9%
1985	59.5%	60.7%	61.2%
1986	60.4%	60.9%	59.3%
1987	39.3%	42.5%	38.5%
1988	41.0%		46.1%
1989	59.6%		59.2%
1990	49.4%		49.4%
1976-1987 average			
Malkiel	58.8%		
Brown & Goetzman	57.3%		
Maher & White	58.6%		

Table II
Persistence Tests 1970-1979

This table shows two-way tables of next-year total returns for equity mutual funds ranked by previous one-year intervals.

"Winners" are above the median and "losers" below.

Initial Year		Next Year		Percentage	Percentage	Z-Test	S&P 500
		Loser	Winner	Repeat Winners	Repeat Losers	Repeat Losers (Winners)	Return Repeat Year
1970	Loser	37	66		35.9%	-2.86	14.31%
	Winner	65	40	38.1%		-2.44	
1971	Loser	79	33		70.5%	4.35	18.98%
	Winner	37	82	68.9%		4.13	
1972	Loser	59	59		50.0%	0.00	-14.66%
	Winner	57	64	52.9%		0.64	
1973	Loser	76	47		61.8%	2.62	-26.47%
	Winner	47	77	62.1%		2.69	
1974	Loser	67	56		54.5%	1.00	37.20%
	Winner	57	67	54.0%		0.89	
1975	Loser	87	31		73.7%	5.15	23.84%
	Winner	28	90	72.0%		4.78	
1976	Loser	85	41		67.5%	3.93	-7.18%
	Winner	41	86	67.7%		3.99	
1977	Loser	87	39		69.1%	4.29	6.56%
	Winner	42	90	68.2%		4.18	
1978	Loser	80	44		64.5%	3.23	18.44%
	Winner	46	83	64.3%		3.25	
1979	Loser	92	34		73.0%	5.16	32.42%
	Winner	36	92	71.9%		4.96	
1970-1979	Loser	749	450		62.5%		
	Winner	456	771	62.8%			

Table III
Persistence Tests 1980-1989

This table shows two-way tables of next-year total returns for equity mutual funds ranked by previous one-year intervals.

"Winners" are above the median and "losers" below.

Initial Year		Next Year		Percentage	Percentage	Z-Test	S&P 500
		Loser	Winner	Repeat Winners	Repeat Losers	Repeat Losers (Winners)	Return Repeat Year
1980	Loser	48	80		37.5%	-2.83	-4.91%
	Winner	81	49	37.7%		-2.80	
1981	Loser	87	53		62.1%	2.86	21.41%
	Winner	49	84	63.2%		3.04	
1982	Loser	88	60		59.5%	2.31	22.51%
	Winner	57	85	59.9%		2.36	
1983	Loser	89	69		56.3%	1.58	6.27%
	Winner	70	88	55.7%		1.43	
1984	Loser	98	77		56.0%	1.59	32.16%
	Winner	78	99	55.9%		1.57	
1985	Loser	122	78		61.0%	3.11	18.47%
	Winner	78	123	61.2%		3.18	
1986	Loser	137	91		60.1%	3.05	5.23%
	Winner	103	150	59.3%		2.96	
1987	Loser	106	173		38.0%	-4.01	16.81%
	Winner	171	107	38.5%		-3.83	
1988	Loser	142	176		44.7%	-1.89	31.49%
	Winner	185	158	46.1%		-1.44	
1989	Loser	222	158		58.4%	3.27	-3.17%
	Winner	147	213	59.2%		3.49	
1980-1989	Loser	1139	1015		52.9%		
	Winner	1019	1156	53.1%			

Table IV
Persistence Tests 1990-1999

This table shows two-way tables of next-year total returns for equity mutual funds ranked by previous one-year intervals.

"Winners" are above the median and "losers" below.

Initial Year		Next Year		Percentage Repeat	Percentage Repeat	Z-Test Repeat	S&P 500
		Loser	Winner	Winners	Losers	Losers (Winners)	Return Repeat Year
1990	Loser	193	197		49.5%	-0.20	30.55%
	Winner	208	203	49.4%		-0.24	
1991	Loser	214	213		50.1%	0.04	7.67%
	Winner	227	201	53.0%		1.24	
1992	Loser	304	141		68.3%	7.72	9.99%
	Winner	156	338	68.4%		8.18	
1993	Loser	279	285		49.5%	-0.24	1.31%
	Winner	292	311	51.6%		0.79	
1994	Loser	383	347		52.5%	1.35	37.43%
	Winner	330	429	56.5%		3.58	
1995	Loser	512	393		56.6%	3.97	23.07%
	Winner	392	533	57.6%		4.62	
1996	Loser	689	375		64.8%	9.66	33.36%
	Winner	386	752	66.1%		10.86	
1997	Loser	811	595		57.7%	5.77	28.58%
	Winner	534	803	60.1%		7.39	
1998	Loser	1054	563		65.2%	12.22	21.04%
	Winner	548	1144	67.6%		14.48	
1999	Loser	468	1421		24.8%	-21.91	-9.11%
	Winner	1367	569	29.4%		-18.13	
1990-1999	Loser	4907	4530		52.0%		
	Winner	4440	5283	54.3%			

Table V
Persistence Tests 2000-2005

This table shows two-way tables of next-year total returns for equity mutual funds ranked by previous one-year intervals.
"Winners" are above the median and "losers" below.

Initial Year		Next Year		Percentage Repeat	Percentage Repeat	Z-Test Repeat Losers	S&P 500 Return Repeat
		Loser	Winner	Winners	Losers	(Winners)	Year
2000	Loser	1618	451		78.2%	25.65	-11.88%
	Winner	509	1698	76.5%		24.90	
2001	Loser	1856	666		73.6%	23.70	-22.10%
	Winner	578	1824	75.6%		25.09	
2002	Loser	1201	1422		45.8%	-4.30	28.70%
	Winner	1406	1288	47.8%		-2.28	
2003	Loser	1962	1041		65.3%	16.77	10.87%
	Winner	924	1995	68.4%		19.88	
2004	Loser	1917	1113		63.3%	14.64	4.91%
	Winner	989	1992	66.8%		18.35	
2000-2004							
	Loser	8554	4693		64.6%		
	Winner	4406	8797	66.6%			

Table VI
Median Returns for Previous Year Winner/Losers in the Subsequent Year

This table shows subsequent year median returns for the top/bottom halves of equity mutual funds based on their rank (top 1/2 and bottom 1/2) from the previous year.

Year	Median Return for Previous Year Top 1/2	Median Return for Previous Year Bottom 1/2	Difference in Top/Bottom Median Returns	Percentage Winners (from the previous year)	S&P500 Return
1971	16.7%	22.8%	-6.1%	37.5%	14.3%
1972	17.9%	10.2%	7.7%	68.9%	19.0%
1973	-21.3%	-21.9%	0.6%	52.9%	-14.7%
1974	-22.7%	-27.9%	5.2%	62.1%	-26.5%
1975	34.3%	32.9%	1.4%	54.0%	37.2%
1976	30.0%	19.5%	10.5%	72.0%	23.8%
1977	3.4%	-3.7%	7.1%	67.7%	-7.2%
1978	13.9%	7.9%	6.0%	68.2%	6.6%
1979	32.1%	22.6%	9.5%	64.3%	18.4%
1980	38.3%	27.7%	10.6%	73.0%	32.4%
	1971-1980 Average		5.3%		
1981	-4.5%	0.9%	-5.4%	37.7%	-4.9%
1982	27.7%	22.4%	5.3%	63.2%	21.4%
1983	23.0%	19.6%	3.4%	59.9%	22.5%
1984	1.5%	-1.3%	2.8%	55.7%	6.3%
1985	29.2%	28.0%	1.2%	55.9%	32.2%
1986	15.8%	13.1%	2.7%	61.2%	18.5%
1987	3.1%	-0.1%	3.2%	59.3%	5.2%
1988	12.7%	16.9%	-4.2%	38.5%	16.8%
1989	24.1%	26.1%	-2.0%	46.1%	31.5%
1990	-3.9%	-6.2%	2.3%	59.2%	-3.2%
	1981-1990 Average		0.9%		
1991	31.7%	31.7%	0.0%	49.4%	30.6%
1992	8.4%	7.9%	0.5%	53.0%	7.7%
1993	14.5%	9.4%	5.1%	68.4%	10.0%
1994	-1.3%	-1.4%	0.1%	51.6%	1.3%
1995	31.0%	30.6%	0.4%	56.5%	37.4%
1996	20.4%	18.5%	1.9%	57.6%	23.1%
1997	27.9%	22.2%	5.7%	66.1%	33.4%
1998	17.5%	11.0%	6.5%	60.1%	28.6%
1999	24.8%	11.1%	13.7%	67.6%	21.0%
2000	-9.5%	5.0%	-14.5%	29.4%	-9.1%
	1991-2000 Average		1.9%		
2001	-4.4%	-17.5%	13.1%	76.5%	-11.9%
2002	-19.1%	-27.0%	7.9%	75.6%	-22.1%
2003	29.4%	30.7%	-1.3%	47.8%	28.7%
2004	13.9%	9.9%	4.0%	68.4%	10.9%
2005	7.8%	4.9%	2.9%	66.8%	4.9%
	2001-2005 Average		5.3%		
	Overall (1971-2005) Average		3.1%		

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The Financial Games of the 2008 Olympics

George S. Swales, Jr., C. Edward Chang and John S. Bowdidge

Introduction

The standard American income statement begins with a listing of a firm's *revenues* B funds coming into the firm. At a later point in the document, there will appear *expenses* B funds leaving the firm in order to continue operations. As accounting students will remember, when *expenses* are subtracted from *revenues*, we obtain *net income*. That last figure can be positive or negative B hopefully *positive!*

Many firms would like to keep such figures within the firm, and not subject to public scrutiny. Such a protective approach is particularly true regarding the city having the honor to have staged the *Olympic Games*.

There is no way that the current study can forecast the final Income Statement for the Beijing Olympics of 2008. *But* it will be possible to begin the process of identifying *some* of the revenues and expenses of those games. A first step could well be to remember Athens.

A Quick Glance at 2004

Approximately six weeks after the close of the Athens Olympics, *Sports Illustrated*, *Associated Press* and *CNN* put these words on their website:

It's no secret that several government officials have hinted that the final cost of the Olympic Games will be much higher than what was initially projected, said Platon Monokroussos, an economist with Greece's EFG Eurobank. Figures as high as \$9.9 billion and \$12.4 billion have been suggested. We are talking about a serious overrun, since the initial budget was about \$5.7 billion (Greece 2004)

To illustrate that final figures on Olympic expenses are hard to arrive at, one month earlier than the above report, Britain's *The Economist* sketched the Athens picture with these different figures:

By 2008, China aims to have spent \$37 billion on the games, dwarfing the \$8.7 billion spent by Greece (The road 2004).

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Possibly coping with such expenses are the *geopolitical* revenues from staging the Olympic Games.

Geopolitical Revenues for Beijing

The *geopolitical* revenues that come from having your city picked for the Games cannot be measured in mere dollars. Pascal Boniface, writing in *Le Monde diplomatique* in August of 2004, applied this principle to the Games of 1936:

*...le choix de Berlin pour les Jeux de 1936 sera considéré comme la preuve que l=Allemagne est de retour sur la scène mondiale, après sa défaite en 1918. Cette décision avait été prise avant l=arrivée au pouvoir de Hitler. Ce dernier tentera d=utiliser l=événement pour montrer la supériorité du nazisme et de la *race aryenne+. (Boniface 2004) ...the choice of Berlin for the 1936 Games is to be considered as proof that Germany had returned upon the world scene, after its defeat in 1918. This decision had been made before the arrival to power of Hitler. The latter attempted to use the event to show to the world the superiority of Nazism and of the *Aryan Race+.*

Boniface went on to point out that the superiority of the *Aryan Race+ stumbled somewhat when black American athletes did so well, especially track star Jesse Owens winning four gold medals! But having the games in Berlin was a geopolitical revenue for Germany!

Then, Boniface addressed the geopolitical revenue of the Beijing choice:

Le choix de Sydney pour l=organisation des Jeux de 2000, au lieu de Pékin, fut vécu par les Chinois comme une non-reconnaissance de leur nouveau statut mondial. Affront réparé par l=attribution des Jeux de 2008, qui fut interprétée comme la consécration de la place retrouvée de la Chine comme grande puissance (Ibid.) B The choice of Sydney by the [Olympic] organization for the 2000 Games, in place of Beijing, was seen by the Chinese as a non-recognition of their new world status. This affront was atoned for by the awarding of the 2008 Games, which was interpreted as the consecration of the place found by China as a great [world] power.

But it takes something more than *geopolitical* revenues if you=re going to stage a profitable Olympic Games.

Other Revenues

It=s time to glance at dollar-denominated revenues coming to the Beijing Organizing Committee for the 2008 Olympic Games, now known worldwide as BOCOG.

A Rather Pleasant Picture

On December 22, 2005, *People=s Daily* (the official publication of the Central Committee of

the Communist Party of the People=s Republic of China) told of three categories of income to the People=s Republic:

The Marketing Program of the 2008 Olympics consists of three tiers: partners, sponsors and suppliers. Up till now, 10 partners have been signed up, namely Bank of China, China Network, Sinopac, CNPC, China Mobile, Volkswagen, Adidas, Johnson & Johnson, Air China and PICC P&C. The seven sponsors are UPS, Haier, Sohu, Yili, Tsingtao Beer, Yanjing Beer, BHP Billiton and Heng Yuan Xiang (China=s leading 2005).

Getting the first position at the top of the *sponsor* list was a well-known American firm, as reported in *Berliner Morgenpost*:

Mit der Unterzeichnung eines Abkommens am 27. Juli in Peking ist der US-Konzern UPS der erste Sponsor der Pekinger olympische Spiele geworden (UPS 2005) B With the signing of an agreement on July 27 in Beijing, the U.S. firm UPS has become the first Sponsor of the Beijing Olympic Games....

Shortly after learning this, one of the current authors met a UPS deliveryman in a doctors-building elevator and said: AWe hear your firm is a sponsor of the Beijing Olympics!@ The UPS man=s response was: AOur firm makes more deliveries in China than any other firm on earth.@ His comment confirmed what Ina Steiner had written for *Auction Bytes* in July 2005:

UPS announced Thursday it would offer express package service across much of China by September. The new UPS operation will initially link 23 major metropolitan areas with same-day service, and will expand further in the future.... The deal, reached with UPS=s long-time China partner Sinotrans, opened the way for operations in the 23 business centers to be transferred to UPS by this September (Steiner 2005).

In the category of *partner* we find another well-known American firm. Look at all the revenue this American firm is providing, according to *China Daily*:

Under the agreement, Johnson & Johnson will provide funding and services for the Beijing 2008 Olympics and Paralympic Games, BOCOG, the Chinese Olympic Committee, and for Chinese teams in the 2006 Turin Winter Olympic Games as well as the 2008 Games (Beijing Olympics 2005)

In the *sponsor* program, we have a well-known American firm B Coca-Cola. Here=s how *China Daily* wrote it up:

Forget about drinking Pepsi in the grandstands when you take in the Olympic Games, at least up to 2020. To quote the old advertising slogan, ACoke is it.@ Security guards will be asking sports fans if they are carrying Aknives, weapons or cans of Pepsi.@ Those who refuse to leave the banned refreshment at the gates will be shut out (Game Plan 2005).

The next paragraph should not be a surprise:

The company is not disclosing the value of the deal. The commitment includes cash and services from Coca-Cola in support of athletes and teams from nearly 200 countries and regions. (*Ibid.*).

Precise monetary figures are just not being announced *now* or perhaps *never*. Here's another example of that approach:

Heng Yuan Xiang, China's leading woolen wear producer, has been named non-sportswear sponsor of the 2008 Olympic Games.... According to the deal, Heng Yuan Xiang will provide funds, formal wear...and other textile products to the 2008 Olympics and Paralympics, BOCOG, the Chinese Olympic Committee and the Chinese sports delegations to the Olympic Games. Both sides refused to reveal the value of the contract (China's leading 2005).

Why is Heng Yuan Xiang limited to being a *non-sportswear* sponsor? That's because the German sportswear giant Adidas is coming in as a *partner* B the top level of the help program.

How much will all of this help the Beijing Games? Well, David Owen, writing January 16, 2005 for *Financial Times*, commented on **just one** of the categories, the *sponsors*: ACorporate sponsorship of the 2008 Olympics in Beijing is on course for a record figure of more than \$1 bn (1760m), confirming China's new-found status as a magnet for trade and investment@ (Owen 2005).

A Pessimistic Glance B from the Outside

No question about it. In the preceding paragraphs we have seen that Beijing and the BOCOG are finding enthusiastic *sponsors*, *partners*, and *suppliers* from outside the People's Republic of China. But Charles Hutzler, writing for the Associated Press from Beijing on November 8, 2005 indicated that foreign firms B including of course those from America B are not particularly interested in getting involved. Remember he's writing nearly three years before the event. Here's part of Hutzler's negative slant.

Australian and European architects, for example, are designing several venues, including the \$386 million National Stadium, the Games= signature architectural work.... But no American company has been awarded a sizable contract. What contracts foreigners have won pales in comparison with the huge sums involved: China is spending \$2.4 billion on Olympic venues alone and another \$35 to \$40 billion on remaking the city for 2008 (Hutzler 2005).

Such figures make the tiny positive involvement we've just read about by *sponsors*, *partners*, and *suppliers* seem like loose change. But the Xinhua news agency has informed us of yet another form of revenue

Expenses

Examining the Expense/Revenue Relationship

As we shall soon see, billions of dollars in *expenses* will be incurred in Beijing between now and summer of 2008. As a comforting reminder that expenses can provide for *revenues*, we offer a January 5, 2006 headline from Amsterdam=s *De Telegraaf*: AGrootste reuzenrad ter wereld in China@ (Grootste 2006), meaning: ALargest ferris wheel in the world is in China.@ The specific ferris wheel mentioned by *De Telegraaf* is in Nanchang and stands 160 meters high. But on the drawing board is another such structure set for Shanghai with a height of possibly **230** meters. Here=s the story on it from *Boston.com* and *The New York Times*:

The Shanghai Star Ferris, due to start spinning by 2008 when the Chinese capital, Beijing, hosts the Olympic Games, will stand 200 to 230 meters (656 to 755 feet), stripping the world=s tallest title from the 135-meter London Eye (Shanghai 2005).

While on a visit to China for the Olympics, why not journey down to Shanghai and ride the wheel? This impressive new structure is expected to draw 12.6 million visitors per year, according to the *Shanghai Daily* (*Ibid.*). Adult admission fee to get on the London Eye is , 12.50. That translates to \$22.12. Assuming the same fee for the Shanghai structure, multiply that by 12.6 million riders and you have a revenue figure for each year of over \$278 million.

Yes, initial *expenses* to erect a ferris wheel can indeed lead to impressive *revenues*! Now, let=s consider some of those myriad *expenses*.

Expenses B Look Out! Here They Come

Of course, there is no attempt here to list all expenses related to the 2008 Games. Just a few reports will make the point. We work through the calendar year of 2005. *Berliner Morgenpost* on January 5 reported on stadium construction:

Am Olympiastadion laufen Arbeiten wieder an. Noch keine Entscheidung über andere Sportstätten.... Die Kosten für alle 15 Bauten waren auf rd. 22 Mrd. Renminbi Yuan B 2 Mrd. Euro (Am 2005) B Work begins on the Olympic Stadium. Still no decisions over other sports stadiums.... The cost for all 15 structures will be around 22 billion Renminbi Yuan (that=s 2 billion Euros) [\$2.4 billion].

Strange as it may seem to the reader, one venue (or stadium) as early as 2001 had already been picked, according to *The Economist*. The site for Beach Volleyball matches could very conveniently be the infamous Tiananmen Square (Putting 2001).

Great Britain=s *The Economist* on June 23, 2005 related that Beijing has kept expenses as low as possible in the acquisition of real estate on which to house the Games. And the citizens who have lost their property in the process are protesting:

But protests by these relatively affluent villagers can still be an embarrassment to the government. In the village of Maxinzhuang in Shunyi, one of Beijing=s rural districts, hundreds of peasants have been protesting for the past month over compensation for the requisition of their land to build a water-sports complex for the Beijing Olympic Games in

2008. AThere are no human rights,@ muttered one protester, after local police ordered your correspondent [from *The Economist*] to stop interviewing them. Several Chinese journalists have visited the village, but their reports have not been published. The authorities are clearly anxious to avoid tarnishing the image of Beijing=s Olympics preparations (Turning 2005).

In June, 2005, Mure Dickie reported from Beijing for *Financial Times*:

Beijing has delayed the start of initial construction work for a...\$604 million...rail link between its airport and the city centre that is one of the most high-profile projects planned as part of the Chinese capital=s preparations to host the 2008 Olympic Games (Dickie 2005).

In September of 2005, we learned of special *new* security measures for the Games; such security will require the *hiring* and *compensating* of new security personnel. Here=s how *Le Quotidien du Peuple*, French-language version of *People=s Daily*, handled the matter for the 56th National Festival in 2005:

Les personnes participant aux grandes activités publiques durant la fête feront l=objet B pour la première fois B d=inspections de sécurité qui seront mises en place aux Jeux Olympiques de 2008 (Beijing mesures 2005) B People participating in the big public activities during the Festival will be the object B for the first time ever B of security inspections which will be put in place [also] at the Olympic Games of 2008.

On December 22, 2005, *People=s Daily* and *Xinhua* produced two reports indicating that construction would be starting soon on the Olympic baseball field and on the Olympic media village. Such construction, according to *Xinhua*=s French version, would give legitimacy to the following report:

Les Jeux Olympiques de 2008 à Beijing devront créer 1,28 million d=emplois pour la capitale chinoise, a rapporté mardi le journal Beijing Morning Post... (Les Jeux 2005) B The Olympic Games of 2008 at Beijing will create 1.28 million jobs for the Chinese capital...between 2004 and 2008...it was reported Tuesday by the newspaper *Beijing Morning Post*....

Creating those jobs and paying those workers will mean new expenses.

And during 2005, a whole new pocket of future expenses was revealed B the Environment.

Environmental Concerns Leading to Expenses

The Paris daily newspaper *Le Monde* way back on January 3, 2001, reported on the competition for obtaining the Olympic Games:

*Pour obtenir les Jeux olympiques d=été de 2008, pour lesquels elle est notamment en compétition avec Paris, Pékin a lancé une vaste opération séduction.... Pékin promet un air *aussi pur qu=à Paris+* (JO, 2001) B In order to get the Olympic Games of 2008, for which

it is notably in competition with Paris, Beijing has launched a broad seduction campaign... Beijing is promising air *just as pure as that of Paris+.

As 2005 arrived, it became clear that such a seduction promise may be hard to keep. On September 2 of that year, Paolo Virtuani conveyed this unhappy information in Milano, Italy=*s Corriere della Sera*:

Nube gigante di biossido d=azoto sulla Cina...in particolare sopra Pechino. Non è una buona notizia per gli atleti che parteciperanno alle olimpiadi del 2008 (Virtuani 2005) B There is a gigantic cloud of nitrogen dioxide over China...in particular over Beijing. That=s not a good sign for the athletes who will participate in the Olympiad of 2008.

Virtuani could not resist, however, indicating that the cloud of nitrogen dioxide, produced by China=s tremendous and fantastic *industrial growth*, was a positive proof of the *grande balzo in avanti*, or *great leap forward* predicted for Chinese industry by Mao.

On that same September date, the *Australian Broadcasting Corporation* and *Agence France-Presse* compared that Beijing air pollution with the same phenomenon in the U.S. and Europe:

Levels of NO₂ [that=s nitrogen dioxide]...have risen by about 50% over China over the past decade due to economic growth.... By comparison, concentrations of NO₂ have remained steady or declined over industrial parts of the US and eastern Europe (Smog 2005).

Two and a half months later, *Xinhua* announced that there would be help for Beijing from the United Nations Environment Program (UNEP) regarding the NO₂ problem:

Under the agreement, the UNEP will provide the Beijing Organizing Committee for the 2008 Olympics...with data and technical resources on environmental issues (China, UN 2005).

Is there to be *funding* with the data and technical resources? *Funding* would help! And as early as 2001, Britain=s *The Economist* told of a possible B and extremely expensive B solution to the Beijing NO₂ challenge: *Pollution...which shrouds Beijing in haze for many days of the year, is to be controlled by moving factories away from the city* (Beijing gets 2001). That would be quite an undertaking!

Conclusion

As preparation for the Beijing Games became serious and intense, International Olympic Committee President Jacques Rogge made a most optimistic statement, quoted by the Chinese news agency *Xinhua* for its issue of New Year=s Eve, 2005:

Je suis sans cesse impressionné par les efforts et la détermination de tous ceux qui sont chargés de faire de Beijing 2008 les meilleurs Jeux possibles pour les athlètes, les médias, les spectateurs et toute la famille olympique (Le président 2005) B I am over and over again impressed by the efforts and determination of all who are in charge of making Beijing

2008 the best Olympics possible for the athletes, the media, the spectators and the whole Olympic family.®

Earlier, and more directly related to the focus of the current study, *People=s Daily* and *Xinhua* provided this happy forecast on December 12, 2005:

BOCOG=s marketing campaign has been so successful that the International Olympic Committee (IOC) predicts that Beijing 2008 is likely to break the record set in Los Angeles in 1984 for the most profitable Games in history (Beijing launches 2005).

Not until autumn of 2008 can we determine the validity of this prediction!

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The Information Content of Credit Ratings for Equity Investors

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Abstract

This paper studies the question that credit rating changes of industrial companies have information content important to equity investors. The paper hypothesizes that both credit increases and credit decreases should yield statistically significant results. However, research shows that on the credit rating change announcement day, only companies being downgraded experience statistically significant movement in their stock price. The cumulative abnormal returns on stock prices for companies that were upgraded and for companies that were downgraded were statistically insignificant.

The Information Content of Credit Rating Changes

This study examines the stock price effect of credit rating changes for selected S&P 500 companies. The hypothesis is developed around the belief that credit rating changes should have a material impact on a company's fortunes and consequently be reflected in the company's stock price.

The credit rating assigned to a company by S&P is critical to a company's fortunes as it gives investors and other stakeholders an indication of the company's creditworthiness. Various rating agencies have different methods of expressing how creditworthy they deem a company to be. However, since this study's data was drawn from Compustat, a S&P service, it follows the system of assigned ratings used by S&P. Credit ratings range from a high of "AAA" to a low of "D" as shown in Table I.

Investment-grade credit risks are rated as "BBB" or better and it should be noted that each letter tier is further broken down with the addition of a plus sign, no sign, or a minus sign. For example, "BBB+" is slightly superior to "BBB" and "BBB-" is slightly inferior to "BBB". Furthermore when a company is under review for an upgrade or a downgrade, S&P will often signal that this is happening by including in their credit opinion a note that the company is under review.

The benefits of a solid credit rating can be substantial and the consequences of a low rating can be serious. Prospective borrowers that are highly rated enjoy lower interest rates and fewer, if any (depending on their rating) restrictive covenants to borrowing agreements than lower rated companies. Lower rated companies, on the other hand, face higher interest rates and more restrictions on their financial flexibility. Lenders, concerned about their capital, will likely ask for covenants from the borrower committing the borrower to maintain certain minimum financial ratios or demanding, as security, first rights to company assets.

In short, a company with a strong credit profile will pay less for its capital and have more flexibility to pursue business objectives as measured by the universe of positive net present value

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(NPV) opportunities available to it. On the other hand, lower rated companies, paying a higher interest rate and possibly coping with restrictive covenants, will have a more limited pool of positive NPV opportunities available to them.

Importance of the Study

The results of this study will give investors insights into the value of credit rating information. If this study results in significant returns as measured by stock price movements around the day of credit rating changes, investors may be able to develop profitable investment strategies.

Literature Review

There is a significant amount of research on the topic of credit ratings and stock price movements. In 2003, Elayan, Hsu and Meyer studied small market reactions to credit rating news. While they looked primarily at New Zealand, they referenced that studies of big markets like the US found only significant reactions to negative credit news while their own research showed a small market like New Zealand significantly reacts to both good and bad credit news. What is relevant to this study is the asymmetric response to rating news in big markets because it is similar to this study's results. Nayar and Rozeff studied the commercial paper market and the influence of initial commercial paper ratings on common stock returns. Interestingly, they found the same dynamics as discussed above for big markets. "Rating downgrades...produce significantly negative abnormal returns; upgrades have no effects" (Nayar and Rozeff, 1992).

In 2001, Dichev and Piotroski undertook a very comprehensive investigation of long run stock returns following bond-rating changes. Their research reveals that there are no reliable abnormal returns following upgrades, but they did find negative abnormal returns in first year following downgrades. Interestingly, a study by Followill and Martell that looked at the effects of an announcement that a company is being put under review for a credit rating change (which often happens before the actual rating change) had more of an effect than the actual change itself. In contrast to the studies previously discussed, only the announcement of review for possible downgrade had a significant negative effect on stock prices while a downgrade following the announcement a negligible impact.

Followill and Martel suggest that their contradictory findings to other research may be in part the result of the way the other tests are constructed and the presence of contemporaneous news that contaminate the results of other studies. While the authors make some interesting points about the construction of studies, it is difficult to accept their conclusions considering the volume of the other contradictory research (Followill and Martel, 1997).

Goh and Ederington accepted that a body of research showing downgrades negatively affected stock prices, but drilled down into whether or not all downgrades are "equal". They argue that downgrades that are anticipated by the market (echoing Followill and Martel) and downgrades resulting from transfers of wealth from bondholders to stockholders aren't necessarily bad news for stockholders. What they found is that downgrades resulting from deteriorating financials convey new negative information to the market while downgrades related to changes in firm leverage do not (Goh and Ederington, 1993)

Similarly, in the Glascock, Davidson, and Henderson study also finds that negative rating news is significant to stock prices, but another finding of theirs is of interest. They find that after the downgrade announcement and the initial negative stock move, the movement reverses (Glascock, Davidson, et al., 1987). This is similar to something observed in this study. While mostly focusing on the methodological approach to this kind of study, Griffin and Sanvicente replicate the results of many other studies showing that downgrades convey information to common stockholders (Griffin and Sanvicente, 1982). Barron, Clare, and Thomas studied the UK market and like most of the other studies found significant returns associated with downgrades. They also found significant returns associated with positive CreditWatch announcements (Barron, Clare, et al., 1997).

Methodology and Data

In order to do this study, several pieces of information were needed: a list of companies that have credit ratings maintained by S&P and are publicly traded, availability of historical stock prices for both individual companies and various indexes, and the date that the companies credit rating changes were announced. The Compustat database maintains list of firms that have credit ratings issued by S&P. Compustat offered various ways to sort data, so a database of credit ratings of S&P 500 component firms was selected for the date range May 2003 to May 2005. Unfortunately, the Compustat subscription held by Rutgers University, where this research was done, only offered this information on a monthly basis. Information about the exact date of the credit rating changes was found on S&P's web site. Daily historical stock price information was available on "Yahoo Finance. With this information available, the next step was to narrow the number of possible companies from the universe of firms that comprise the S&P 500 index to just manufacturing firms. This set was further broken into manufacturing companies that had their credit ratings increased and those that had their credit ratings decreased. From these two subsets 5 firms from each was randomly selected. The selected companies and dates of increase or decrease are as shown in Table II.

The question posed by this paper is what is the impact of the "good" news of improved ratings and "bad" news of lowered ratings on the stock prices of selected companies. To answer this question, an event study of stock price behavior around the announcement date of these changes was conducted. Event studies are premised on the idea that markets can evaluate and "price into" a stock price the effect of new information on a company's fortunes. Therefore, the first question that needed to be posed is just how efficient is the stock market? Given the ease with which technology can disseminate information and the sophistication of U.S. financial markets, for the purposes of this paper the assumption is that markets are at least semi-strong efficient.

Hypotheses

With the forgoing in mind this study proposes to test the following hypothesis:

HO1: Credit rating announcements have information value and the release of news regarding credit ratings have a material impact on the financial prospects of a company and should be accompanied by statistically significant movements in a company's stock price on the day of the news release.

An event study to test these hypotheses requires 5 steps (Dasgupta, 1998):

- 1) Identification of the event of interest and a definition of the event window.
- 2) Selection of the sample set of firms to include in analysis.
- 3) Prediction of a normal return during the event window in the absence of the event.
- 4) Estimation of the abnormal return within the event window where the abnormal return is the difference between the expected, normal return and the actual, abnormal return.
- 5) A test to determine whether or not the abnormal return is statistically significant.

Identification of the Event of Interest

As previously described, the event of interest is the behavior of stock prices around the date of announced credit rating changes by S&P. The specific event window used is from 10 days prior to the event through 5 days following the event.

Selection of Sample Set

This was addressed in a previous section. Beginning with the universe of companies that comprised the S&P 500 index and had credit ratings maintained by S&P, industrial companies that had either credit rating increases or decreases between May 2003 and May 2005 were selected. Finally, random selection was used to come up with 10 firms. Five had credit rating increases and 5 had decreases.

Prediction of the “Normal” Return

The market model, basically a linear equation that decomposes a firm’s return into market and firm-specific components, is used in this study:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

Where,

- R_{it} is the expected return of security i at time t .
- α_i corresponds to the intercept of the model.
- β_i corresponds to the slope of the model.
- R_{mt} corresponds to the return on the market, in this case the S&P 500 index.
- e_{it} is the firm specific factor, which constitutes the random walk. An assumption needing to be made for the purpose of this study is that this variable is expected to have a mean of zero with respect to given levels of market performance (Bodie, 1993).

The strength of this model is that it is basically a regression equation, which is the process used to determine what is the normal, or expected return, for a security given a market return. Before discussing the regression analysis itself, it is necessary to discuss the time frames used to study the event. Each of the 10 companies that comprise this sample had their credit ratings changed on different dates. In order to make cross sectional comparison possible the date of change was designated as time “0” and the day prior to this as day “-1” and the day prior to that day “-2” and so forth. Similarly, the days subsequent to the change are designated day “+1”, “+2” and so forth. In order that the regression equation used to calculate “normal” returns during the event at day 0 isn’t clouded by the event itself, a regression of each firm’s return against the market return from day -110 to -11 was done. Ten separate simple regressions were performed, one for each firm. Although the assumption earlier that markets are semi-strong efficient and the

information made public on day 0 shouldn't be reflected in the stock price until day 0, days -110 to -11 were used to be conservative. The raw data used for the group of companies that had their credit ratings increased is displayed in Appendix 1 and the data for those whose credit rating was decreased is contained in Appendix 2.

Results and Analysis

Regressing the individual stock returns versus market returns yielded the results shown in Tables III-VII for the firms with raised credit ratings and Tables VIII-XII for the firms with lowered credit ratings. The regression analysis with the Bausch & Lomb (rating raised) returns as the dependent variable and the S&P 500 returns as the independent variable explain a moderate portion of variance, $R^2=.104$, $F(1,99)=11.41$ (Morgan, 2002). The regression analysis with the Dell (rating raised) returns as the dependent variable and the S&P 500 returns as the independent variable explain a sizeable portion of variance, $R^2=.280$, $F(1,99)=38.15$ (Morgan, 2002).

The regression analysis with the Phelps Dodge (rating raised) returns as the dependent variable and the S&P 500 returns as the independent variable explain a sizeable portion of variance, $R^2=.174$, $F(1,99)=20.68$ (Morgan, 2002). The regression analysis with the Kellogg (rating raised) returns as the dependent variable and the S&P 500 returns as the independent variable explain a sizeable portion of variance, $R^2=.258$, $F(1,99)=34.15$ (Morgan, 2002). The regression analysis with the Harley-Davidson (rating raised) returns as the dependent variable and the S&P 500 returns as the independent variable explain a moderate portion of variance, $R^2=.131$, $F(1,99)=14.86$ (Morgan, 2002). The regression analysis with the Clorox (rating lowered) returns as the dependent variable and the S&P 500 returns as the independent variable explain a sizeable portion of variance, $R^2=.154$, $F(1,99)=17.84$ (Morgan, 2002).

The regression analysis with the Kerr McGee (rating lowered) returns as the dependent variable and the S&P 500 returns as the independent variable explain a moderate portion of variance, $R^2=.116$, $F(1,99)=12.97$ (Morgan, 2002). The regression analysis with the Pitney Bowes (rating lowered) returns as the dependent variable and the S&P 500 returns as the independent variable explain a very large portion of variance, $R^2=.345$, $F(1,99)=51.64$ (Morgan, 2002). The regression analysis with the GM (rating lowered) returns as the dependent variable and the S&P 500 returns as the independent variable explain a sizeable portion of variance, $R^2=.147$, $F(1,99)=16.89$ (Morgan, 2002). The regression analysis with the Clorox (rating lowered) returns as the dependent variable and the S&P 500 returns as the independent variable explain only a small portion of variance, $R^2=.017$, $F(1,99)=1.71$ (Morgan, 2002).

The average R^2 for the regressions of companies with declining credit ratings is .156 and the average R^2 for the regressions of companies with improving credit ratings .190.

Recall that the market model is :

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

The assumption is that e_{it} has a mean of zero.

One can therefore rearrange the market model as a linear equation, inputting the coefficient and X variable derived from the regression results for each sample firm. Using this

equation one can calculate “expected” or “normal” return for the stock, given the day’s market return. For each company, the derived regression equation shown in Table XIII.

Estimation of the Abnormal Return

The next step is to calculate the abnormal return over the period of the event window. The abnormal return is the difference between the normal return and the actual return. The event window for this study will be from day -10 to day $+5$. The expected return for each stock i can be expressed as:

$$E(R_{it}) = \alpha + \beta_i R_{mt}$$

Abnormal returns, therefore, can be calculated by rearranging the expected return equation as follows:

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$$

Where AR_{it} is the abnormal return for stock i at time t .

For each of the stocks in each group, the abnormal return during the event window is shown in Tables XIV and XV. Next, across all stocks in each group, for each day -10 to $+5$, the average abnormal return was taken resulting in Table XVI.

Statistical significance of Abnormal Returns

The final step is determining the statistical significance of the abnormal returns. To do this, a comparison of the average abnormal return for the event day (day 0) to the abnormal returns for the comparison period, day -110 to day -11 was done. Across all stocks in each group for the period -110 to -11 the average abnormal return is shown in Table XVII. Recall that the averages of the abnormal returns for the event day (day 0) for the group that had its credit rating lowered and the group that had its credit rating raised were $-.016$ and 0 respectively. The test for statistical significance is how many standard deviations from the mean of the comparison period does this fall. For the group that had its credit rating lowered, the average abnormal return of $-.016$ falls 3 standard deviations from the mean of the comparison period, days -110 to -11 , clearly a statistically significant result. For the group that had its credit ratings raised, the average abnormal return of 0 fell only $.08$ standard deviations from the mean of the comparison period, days -110 to -11 . This is not a statistically significant result.

Conclusion

This research studied the question that credit rating changes of industrial companies have information content important to equity investors. It was hypothesized that both credit increases and credit decreases should yield statistically significant results. However, this study demonstrates that on the credit rating change announcement day; only companies being downgraded experience statistically significant movement in stock their price. This result makes sense as a downgrade may trip existing loan covenants and make borrowing more expensive; adversely affecting a company’s fortunes. Therefore, HO1 for downgraded companies is accepted but rejected for upgraded companies.

Companies whose credit rating improved had no significant stock movement on the day of the announcement. Although the companies can likely borrow on improved terms, the increase may accrue only marginal benefits.

Table I

Highest Quality Credit → Lowest Quality Credit									
AAA	AA	A	BBB	BB	B	CCC	CC	C	D

Table II

	Date of Increase		Date of Decrease
Harley-Davidson.	10/15/2004	Molson	3/1/2005
Dell.	01/21/05	Coors	10/07/04
Kellogg	08/11/04	Clorox	04/14/05
Phelps Dodge	02/09/05	Kerr McGee	04/14/05
Bausch & Lomb	04/08/05	Pitney Bowes	8/3/2004
		General Motors	05/05/05

Tables III-VII Regression Results – Credit Rating Raised

Bausch & Lomb								
Regression Statistics								
Multiple R	0.323							
R Square	0.104							
Adjusted R Square	0.095							
Standard Error	0.012							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.001	0.001	0.901	0.370	-0.001	0.004	-0.001	0.004
X Variable 1	0.669	0.198	3.378	0.001	0.276	1.063	0.276	1.063

Dell								
Regression Statistics								
Multiple R	0.529							
R Square	0.280							
Adjusted R Square	0.273							
Standard Error	0.008							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.001	0.001	1.111	0.269	-0.001	0.003	-0.001	0.003
X Variable 1	0.803	0.130	6.177	0.000	0.545	1.060	0.545	1.060
Harley Davidson								
Regression Statistics								
Multiple R	0.363							
R Square	0.132							
Adjusted R Square	0.123							
Standard Error	0.011							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.001	0.001	0.849	0.398	-0.001	0.003	-0.001	0.003
X Variable 1	0.640	0.166	3.855	0.000	0.310	0.969	0.310	0.969

Kellogg								
Regression Statistics								
Multiple R	0.508							
R Square	0.258							
Adjusted R Square	0.251							
Standard Error	0.008							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.003	0.001	3.329	0.001	0.001	0.004	0.001	0.004
X Variable 1	0.597	0.102	5.844	0.000	0.394	0.800	0.394	0.800

Phelps Dodge								
Regression Statistics								
Multiple R	0.418							
R Square	0.174							
Adjusted R Square								
Standard Error	0.018							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.002	0.002	0.895	0.373	-0.002	0.005	-0.002	0.005
X Variable 1	1.267	0.278	4.548	0.000	0.714	1.819	0.714	1.819

Tables VIII-XII Regression Results – Credit Rating Lowered

Clorox								
Regression Statistics								
Multiple R	0.392							
R Square	0.154							
Adjusted R Square	0.145							
Standard Error	0.007							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.000	0.001	-0.394	0.695	-0.002	0.001	-0.002	0.001
X Variable 1	0.467	0.111	4.224	0.000	0.248	0.686	0.248	0.686

Kerr McGee								
Regression Statistics								
Multiple R	0.342							
R Square	0.117							
Adjusted R Square	0.108							
Standard Error	0.014							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	0.002	0.001	1.488	0.140	-0.001	0.005	-0.001	0.005
X Variable 1	0.794	0.220	3.603	0.000	0.357	1.231	0.357	1.231

Pitney Bowes								
Regression Statistics								
Multiple R	0.587							
R Square	0.345							
Adjusted R Square	0.338							
Standard Error	0.008							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95	Upr 95	Lwr 95%	Upr 95%
Intercept	0.000	0.001	0.356	0.723	-0.001	0.002	-0.001	0.002
X Variable 1	0.757	0.105	7.186	0.000	0.548	0.966	0.548	0.966

General Motors								
Regression Statistics								
Multiple R	0.384							
R Square	0.147							
Adjusted R Square	0.138							
Standard Error	0.014							
Observations	100							
	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	-0.004	0.001	-2.724	0.008	-0.007	-0.001	-0.007	-0.001
X Variable 1	0.875	0.213	4.111	0.000	0.453	1.298	0.453	1.298

Molson Coors								
Regression Statistics								
Multiple R	0.131							
R Square	0.017							
Adjusted R Square	0.007							
Standard Error	0.013							
Observations	100							

	Coeff	Std Error	t Stat	P-value	Lwr 95%	Upr 95%	Lwr 95%	Upr 95%
Intercept	-0.001	0.001	-0.667	0.507	-0.003	0.002	-0.003	0.002
X Variable 1	0.257	0.196	1.311	0.193	-0.132	0.645	-0.132	0.645

Table XIII

Credit Rating Increased		Credit Rating Decreased	
Harley-Davidson.	$R_{it} = .001 + .640 R_{mt}$	Molson Coors Brewing	$R_{it} = -.001 + .251 R_{mt}$
Dell.	$R_{it} = .001 + .803 R_{mt}$	Clorox	$R_{it} = 0 + .467 R_{mt}$
Kellogg	$R_{it} = .003 + .597 R_{mt}$	Kerr McGee	$R_{it} = .002 + .794 R_{mt}$
Phelps Dodge	$R_{it} = .002 + 1.267 R_{mt}$	Pitney Bowes	$R_{it} = -.004 + .757 R_{mt}$
Bausch & Lomb	$R_{it} = .001 + .669 R_{mt}$	General Motors	$R_{it} = -.004 + .875 R_{mt}$

Table XIV

Companies Having Credit Rating Raised					
Day	Bausch & Lomb AR	Dell AR	Harley Davidson AR	Kellogg AR	Phelps Dodge AR
+5	0.000	0.008	-0.006	0.005	-0.003
+4	-0.018	0.009	-0.010	-0.002	-0.001
+3	0.011	-0.010	-0.003	-0.003	-0.001
+2	-0.005	0.000	-0.014	-0.004	-0.001
+1	-0.004	-0.001	-0.003	-0.003	-0.001
0	0.002	0.002	-0.010	0.009	-0.004
-1	-0.004	0.008	-0.003	0.003	-0.002
-2	0.013	0.001	-0.007	-0.012	0.002
-3	-0.002	-0.001	-0.001	0.006	-0.003
-4	-0.001	-0.005	0.004	0.003	-0.002
-5	-0.014	-0.007	-0.003	0.002	-0.002
-6	-0.017	-0.015	-0.005	-0.004	-0.001
-7	0.012	0.014	0.004	0.002	-0.002
-8	-0.014	0.017	-0.008	0.002	-0.002
-9	-0.006	-0.009	0.024	-0.009	0.001
-10	0.004	-0.011	-0.017	-0.002	-0.001

Table XV

Companies Having Credit Rating Lowered					
Day	Clorox AR	Kerr-McGee AR	Pitney Bowes AR	GM AR	Molson Coors AR
+5	0.008	0.006	0.003	-0.006	0.032
+4	0.002	-0.001	0.007	-0.023	0.003
+3	0.003	-0.004	-0.004	0.018	0.001
+2	-0.012	-0.008	-0.005	0.017	-0.002
+1	0.014	0.007	0.011	0.002	0.025
0	-0.003	-0.020	0.001	-0.054	-0.005
-1	0.007	-0.013	0.006	0.068	0.016
-2	-0.002	-0.009	0.009	0.008	0.003
-3	-0.007	0.016	0.003	0.016	0.008
-4	0.010	-0.003	-0.001	-0.010	-0.007
-5	0.009	-0.023	0.001	0.017	-0.020
-6	-0.004	-0.009	-0.006	0.021	-0.007
-7	0.004	-0.038	-0.005	0.003	-0.003
-8	-0.009	-0.032	-0.004	-0.005	0.016
-9	-0.002	0.019	-0.008	0.045	-0.001
-10	0.004	0.003	0.004	-0.018	-0.013

Table XVI

Average Abnormal Returns		
Day	Credit Ratings Lowered	Credit Ratings Raised
+5	0.008	0.001
+4	-0.002	-0.004
+3	0.003	-0.001
+2	-0.002	-0.005
+1	0.012	-0.002
0	-0.016	0.000
-1	0.017	0.000
-2	0.002	-0.001
-3	0.007	0.000
-4	-0.002	0.000
-5	-0.003	-0.005
-6	-0.001	-0.008
-7	-0.008	0.006
-8	-0.007	-0.001
-9	0.011	0.000
-10	-0.004	-0.005

Table XVII

Average Abnormal Returns and Standard Deviations, Day -110 to -11			
Lowered Credit		Raised Credit	
Average AR, Day -110 to -11	0	Average AR, Day -110 to -11	-.00032
Standard Deviation, Day -110 to -11	.00528	Standard Deviation, Day -110 to -11	.00385

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