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Using Rubrics to Teach and Assess Financial Education

Mark A. Wrolstad

Abstract

Rubrics can be useful tools for teaching business finance courses. They can make certain types of assignments less burdensome for the instructor while providing students with meaningful feedback on their work. This paper provides examples of rubrics currently in use and provides guidelines for creating new rubrics. The potential for using rubrics in the assessment of learning outcomes is also discussed.

I. Introduction

How many teachers have listened to students complain that they had worked very hard on a report and were shocked when they received a D or F grade on the project? The likely answer to this question is that most of us have had this experience at some point during our careers. Since most instructors dearly want their students to be successful, upon hearing this we question whether we bear some of the responsibility for the misunderstood assignment. Perhaps more clear and complete oral or written instructions would have prevented this misunderstanding. On the other hand, most students did just fine with the information in the syllabus and the instructions given orally in class. Plus, the class had been given ample opportunities to ask questions about any aspect of the assignment that they felt was unclear. Still the question lingers, is it reasonable to provide even more extensive guidance to future students to prevent this from happening again?

Some years ago this author discovered a tool that has helped minimize the occasions where students have to be given the bad news that they had done the assignment incorrectly. The tool identified is the Arubric≅. Simply defined, rubrics are a set of scoring guidelines that seek to evaluate students= work based upon the sum of a full range of Acriteria≅, rather than providing students with a single numerical or letter score. Well-constructed rubrics differentiate among levels of performance within each criterion and serve as a ratings chart.

As discovered more recently, there are the added benefits of using rubrics for assessment purposes. Accreditation requirements typically call for assessing various aspects of academic programs and using the information to make changes that will improve the quality and effectiveness of the program. Useful assessment information can be obtained by including key assessment criterion in the rubrics of class assignments throughout your academic program.

When rubrics set forth specific criteria, define precise requirements for meeting those criterion, and assign numerical scores to each level of performance, teachers are provided with an effective, objective and authentic assessment tool for evaluation of students= work (Walvoord, 2004). When handed out before the assignment begins, a rubric can serve as a working guide for students to think about the criteria on which their work will be judged. Also, rubrics can be useful for tracking each student's progress and achievement when similar repetitive assignments are used in a course.

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II. Why use Rubrics?

There are a number of reasons that rubrics are useful. First, many educators are uncomfortable making subjective judgments about the quality of students= work. Well-constructed rubrics reflect specific criteria and precisely define the requirements for meeting those criteria (Andrade, 2005). Secondly, rubrics can help improve student performance by defining quality performance. Thirdly, when students receive rubrics beforehand, they understand how they will be evaluated and can prepare accordingly (Weimer, 2002). Rubrics help students judge the quality of their own work and therefore help increase their knowledge and performance. Fourth, rubrics alleviate the burden of teacher assessments by reducing the amount of time spent grading each assignment. Students will clearly see where and why points were deducted from their final grade without the instructor writing extensive, time-consuming explanations. Finally, when it is easier and takes less time to grade, more instructors will be willing to assign projects that will significantly enhance student's ability to apply their classroom learning to real world situations and data.

III. Potential Assignments Graded Using Rubrics

The types of finance assignments in which using rubrics might be useful way to evaluate the performance of students include, but are not limited to:

-Individual homework assignments
-Performance in simulation exercises
-Class participation
-Team projects like case presentations
-Term papers/projects

IV. Examples of a Rubrics Used in Finance Courses

To understand rubrics, a good place to begin is with an example from a basic corporate finance course. The project is called a Financial Analysis and has students apply information they have learned in the course to the analysis of a for-profit corporation of their choosing. They are warned to avoid picking regulated financial institutions, regulated utilities, and very diverse companies that would make comparisons to industry averages difficult or relatively meaningless. As you can see in evaluation form shown in Figure 1, students are asked to overview the company, do both cross-sectional and trend ratio analysis, analyze the Statement of Cash Flows, offer an opinion of the company=s future growth plans, and offer a brief summary and conclusions of their significant findings about the company. To prevent students from simply cutting and pasting Internet information, a strict page limit is enforced which forces students to write the paper themselves in order to cover the required topics and meet the page limit. Besides the content described above, a good share of the points on the project are from the ability to write well and to present data in an attractive format that is easy for the reader to understand. The rubrics used in the evaluation of the project are shown in Table 1.

Figure 2 shows an evaluation form/rubric from a bank simulation exercise called the

Stanford Bank Game that is used in a commercial bank management course. In this evaluation form, the rubrics are very straight forward and are contained right on the evaluation form.
Rather than the instructor filling the rubric out, students are required to evaluate themselves and their teammates. The form is part of the final report that students hand in at the end of the simulation. Each student puts a completed form in a sealed envelope and includes it with the group report that is handed in at the end. When students submit this form, it becomes clear to the instructor which members of the simulation team performed effectively in the exercise (and hopefully got the most out of the learning experience). This survey is handed out at the beginning of the course so students know what they need to do during the simulation in order to effectively support their team. The instructor uses this information to help determine a student=s class participation grade for the course.

V. Assessment

Although not a major focus of this paper, Figure 1 gives a hint as to the usefulness of rubrics in assessing student=s understanding and performance in an introductory corporate finance course. Note that the figure divides the various dimensions of the paper into two parts. The first is the ability to convey content in understandable, professional way. The various items included evaluate both the understanding of various topics covered in the course as well as the student=s ability to convey their understanding in an effective way. The second section evaluates the student=s ability to write and clearly present data. The subscores of the two sections would effectively assess the student=s understanding of the material and the student=s proficiency in writing reports. Well constructed rubrics can perform the dual function of grading students and assessing programmatic goals (Weimer, 2002).

VI. How to Create an Original Rubric

It does take some time to learn how to create original rubrics. Once this process has been done several times, it becomes much easier to do. Especially with large sections and/or repetitive assignments, the ultimate time savings can be substantial. The following is an ten step process for developing a rubric (Drewes-Stoen&Wright, 2006):

Step 1: Determine the concepts to be taught. What are the essential learning objectives?

Step 2: Select the appropriate type of rubric for your purpose. Types of rubrics include:
- -numerical point scale - the more points the better the performance (more problems worked, more relevant references found, etc.)
- -holistic rating scale - summary evaluation (useful for a term project)(White, 1994)
- -analytical rating scale - levels of performance in a variety of aspects of the assignment (useful for grading improvement during a course)
- -checklist - did they forget anything? (yes or no)

Step 3: Choose the criteria to be evaluated. Analyze the performance task and list the knowledge, skills, and qualities that an individual who has attained the desired outcome will possess. Identify the evidence to be produced (Broad, 2003). Develop a grid by putting these elements in the first column. Try to include as many dual purpose items as possible, ones that

evaluate student performance and assess programmatic goals.

Step 4: Determine how many levels of performance are desired. Try to avoid an odd number so that there is no Amiddle≅ or neutral ranking. Use descriptive, rather than neutral terms. (Examples: rarely, seldom, novice, usually, veteran, distinguished, attempted, admirable, proficient, mastered, awesome, accomplished, professional, etc.)

Step 5: Write the standards for judging performance for each of the levels in each category. Start with the desired level of achievement and then identify lower levels of achievement(see Table 1).

Step 6: Collect student and expert samples. Use what you learn to distinguish effective work from ineffective work.

Step 7: Use the information learned in step 6 to modify the standards and eliminate overlapping descriptions between levels as much as possible.

Step 8: Conduct a pre-test of your assessment tool. Make sure that by using the instrument you can reliably and accurately make judgments on student performance. Revise the rubric as needed.

Step 9: Consider weighting the rubric. An analytical rubric may contain certain aspects of the assignment as being more important than other aspects. Use weights to put more emphasis on the more significant aspects of the assignment. (See item number 2 in Figure 1)

Step 10: Share the rubric with students when the assignment is made. This will allow the students to learn what is expected of them. Students will gain a sense of responsibility for their own learning.

VII. Analytic vs. Holistic Rubrics

Analytic rubrics are used with formative assessments where students can use the feedback to do a better job on the next assignment. Students can see how their performance is rated with regard to each of the descriptors identified in the criteria. The descriptors associated with the qualitative rubrics provide students with an opportunity to see what they must do to move up to the next level. When students have a good idea about how to improve, students are typically more motivated to improve their work and achieve a higher level of performance (Carrithers, Ling & Bean, 2008).

Holistic rubrics are typically used for summative (final) assessments where students have no chance to go back and improve performance. These are used to make a single judgement about the quality of a student=s work. While they provide the student with some insight as to strengths and weaknesses of their submitted work, these are not as detailed and as time consuming to create and score as analytical rubrics (Carrithers & Bean, 2008).

VIII. Reliability and Validity

For an evaluation measure to be considered reliable, there needs to be a consistency of scores among raters or within the same rater over a period of time. A greater degree of reliability occurs when the standards are clear and examples for each level of performance are collected and analyzed. Referring to these examples often helps ensure scoring consistency over time (Harrison, et al., 2001).

Validity occurs when an instrument measures what it is intended to measure. The attributes being measured should be meaningful for students and focus on important aspects of the skill or knowledge being taught. Explicit standards help increase the validity of your instrument. Validity is especially important if you are going to use the results for assessment purposes. Since assessment information is used to modify and improve programs, the validity of the assessment is essential.

IX. Summary and Conclusions

Rubrics can be very helpful tools to quickly grade assignments, provide students with information to understand their grades and make future improvements, and to assess the achievement of teaching objectives. The attributes of Agood≅ rubrics include:

1. They address all relevant content and performance objectives
2. They define standards and help students achieve them by providing criteria with which they can evaluate their own work
3. If done well, they are easy to understand and use
4. They provide all students with an opportunity to succeed at some level
5. They yield consistent results, even when administered by different scorers.

When pedagogical considerations demand assignments from students and time pressures make it challenging to offer feedback to larger classes, rubrics can be a way to provide helpful feedback to students in a time-effective way. When blank rubrics/evaluation forms are handed out before the assignment is due, students are given helpful information about the aspects of the project that will be graded. It also serves as a checklist to make sure that important topics are not overlooked in the typical rush to complete the work that too often characterizes student work. The push by many universities to achieve and maintain higher levels of accreditation make the use of rubrics even more useful. The ability to meet teaching responsibilities and collect relevant assessment information at the same time, make rubrics a very timely and effective tool for teaching college courses in finance and other disciplines.

Figure I

Financial Analysis Project Scoring Sheet

Finance 360 - Corporate Finance

Performance

Content of Paper	Needs Improvement			Average		Professional
1. Company Overview	0	1	2	3	4	5
2. Industry Ratio Comparisons	0	2	4	6	8	10
3. Ratio Trend Analysis	0	1	2	3	4	5
4. Cash Flow Statement Analysis	0	1	2	3	4	5
5. Future Capital Needs Analysis	0	1	2	3	4	5
6. Summary and Conclusions	0	1	2	3	4	5
7. Bibliography/Citations	0	1	2	3	4	5
8. Overall quality of analysis	0	1	2	3	4	5
Form of paper						
9. Spelling/Punctuation	0	1	2	3	4	5
10. Professional appearance	0	1	2	3	4	5
11. Ratio Calculation and Presentation	0	1	2	3	4	5
12. Academic tone/Grammar	0	1	2	3	4	5
13. Overall quality of presentation	0	1	2	3	4	5

Additional Comments: Paper Grade = 30 +_____ = _____ points

Table I
Financial Analysis Assignment Rubrics

Criteria	Needs Improvement	Average	Professional
1. Overview	Incomplete or non-existent information	Covers what company does and where they do it	Covers what company does, where they do it, and provides some supporting data
2. Ratio cross-sectional comparisons	Minimal or missing data and analysis	Reasonable analysis but various requirements are not met.	Covers calculated ratios, comparison ratios, and offers plausible explanation of comparison results
3. Ratio trend comparisons	Missing or very minimal discussion of ratio trends	Limited discussion of ratio trends	Discussed ratio trends for an appropriate number of ratios
4. Cash Flow Statement analysis	Did not address any of the three questions	Missed addressing one or two of the questions	Addressed all three questions concerning the statement
5. Future capital needs analysis	Did not address future capital needs	Covered only one of the two issues	Offered informed opinion about the future growth plans and potential source of funds to accomplish corporate goals
6. Summary and conclusions	Incomplete or non-existent summary and conclusions	Provided miscellaneous facts and no summary statement	Identified key findings and expressed informed judgment about the likelihood of future corporate success
7. Bibliography	Does not meet the minimum standards for research sources	Meets minimum standards for research sources	Exceeds the minimum number of citations in proper academic form
9. Spelling and punctuation	Numerous problems with spelling and word usage	Some errors in spelling and proper word usage	No spelling errors and uses proper words (ex. there-their, effect-affect, etc)
10. Professional appearance	Identifies you as someone who is not	Identifies you as a new college grad that	Look of the paper identifies you as a up and coming

	serious about their professional reputation	needs additional training	professional
11. Calculations/Data Presentation	Does not meet minimum data documentation requirements	Meets minimum data documentation requirements	Meets all data documentation requirements, well organized, and easy to read and understand
12. Tone/Grammar	Seldom uses proper academic tone and good grammar	Uses proper academic tone and grammar much of the time	Consistently uses proper academic tone and good grammar
13. Overall Quality of writing and presentation	Paper is generally poorly written--writing center help or additional course work is recommended	Paper is generally well written but has significant problems in places	Paper is well organized, clearly written, and easy to understand

Figure II

Example Rubric for Teamwork in Simulation Exercise

Evaluator=s Name: _____

Class: Finance 404 - Commercial Bank Management
Stanford Bank Game

	Performance Aspects						Total Points
Person Being Evaluated	A	B	C	D	E	F	
Yourself						N/A	

Points: 3 = Always, 2 = Usually, 1 = Sometimes, and 0 = Seldom

Performance Aspects:
A. Attendance at team meetings.
B. Contribution of ideas.
C. Contribution to getting things done.
D. Was well-prepared for meetings.
E. Showed leadership when needed
F. Overall desirability to work with this person again.

Comments:

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Survey and Synthesis of Practices in Estimating Cost of Capital of Non American Firms

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Abstract

The purpose of this paper is to presents anecdotal evidence of how financially sophisticated Multi National Corporations (MNCs) estimate cost of capital. This paper differs from its predecessors in several aspects. The previously published surveys are based on written, closed–end surveys. The questionnaires were sent to a large sample of firms in a specific country or region. The questionnaires often covered a wide array of topics and commonly used multiple-choice or fill-in-the blank questions. So, the questionnaires provided for a limited opportunity to explore subtleties of the topic. The US surveys for obvious reasons do not survey MNCs headquartered outside the US. This paper is an attempt to address that deficiency. Our survey is based on results of telephonic survey method. Another important feature of our survey is that it identifies some ambiguities in the application of cost of capital theory in global environment.

Our survey targeted global firms headquartered outside the United States of America. We used the New York Bank's directory of American Depository Receipts (ADR) listed in the New York Stock Exchange (NYSE). The list in October 2006 included 335 companies. We used the random sampling in the Excel© to get a list of 25 companies that we surveyed. The list consisted of 11 European, 2 Russian, 2 Far Eastern, 2 Central American, and 8 South American companies. During the following months 9 representatives of the 25 companies agreed to be interviewed.

The findings confirm, that theoretical framework taught in today's business schools in the USA is used by the MNCs. Interestingly, many of the practices also fill in the gaps in our knowledge of the practices of the MNCs headquartered outside of the USA.

Background

In recent decades, globalization has become reality for many enterprises. Benefits of globalization are many and vary widely depending on a firm's mission and strategic goals. Some reasons for globalization are necessity to expand their markets, reduce cost of inputs, and gaining advantage in various financial securities offered in international financial markets. In a word firms are multinational in scale and scope. A multinational corporation (MNC) evaluates investment opportunities in many continents and countries, performance of its subsidiaries, and/or executive performance by a variety of techniques and methods (Maduro 2005). Techniques such as, Net Present Value, Internal Rate of Return, and other firm specific techniques are used.1 This makes the estimation of cost of capital and its components important.

Just as technology and resources differ across countries, so does the cost of capital. MNCs

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1 See the questionnaire in Appendix A.

will seemingly have a positive Net Present Value projects because their nominal cost of capital is could be lower depending on the security market were the MNC floats its financial securities.2 A MNC operating and selling securities in a country with seemingly higher nominal cost of capital may be forced to decline projects that might be feasible for a MNC operating and selling securities in a country with lower nominal cost of capital.

Our research focuses on the subject of best practices in estimating the cost of capital for global firms headquartered outside of the United States of America. Many researchers have conducted studies on estimating the cost of capital. Block (2003) surveyed 298 *Fortune* 1000 companies and the use of divisional cost of capital. He found that while 85.2 percent utilize the concept of weighted average cost of capital less than 50 percent use divisional cost of capital. Ferson and Locke (1998) in their article "Estimating the Cost of Capital through Time: An analysis of the Sources of Error" found that great deal of error in estimating the cost of equity capital is found in the risk premium. The reliance on a standard market index is found to bear the brunt of this error. A smaller error is due to the risk measure (beta). Ferson and Locke finally cast doubt on the reliance on the Capital Asset Pricing Model (CAPM) for practitioners needing estimates of the cost of capital. A development in capital cost estimating was discussed by Bierman (1984) in the research titled "We Cannot Measure the Cost of Equity Capital Exactly". Bierman discusses measurement errors due to having to rely on forecasted values. The market price-book value ratio is presented as an alternative in estimating the cost of capital. "Estimating Cost of Capital using Bottom-up-Betas" (Beneda, 2003) discusses difficulties computing the cost of capital for a growth company. One alternative for the risk measure in CAPM is to use the bottom-up beta approach. Stulz (1995) argues in the paper titled "the Cost of Capital in Internationally Integrated Markets: The Case of Nestle" that the cost of capital for firms in small countries should be estimated using the global CAPM rather than a local CAPM. The choice of which market portfolio to use in the regression calculating betas is of great importance (See, Bruner et.al. 2008) for further empirical observations how practitioners should calculate beta on securities in various developed and emerging markets.

Bruner (1998) surveyed 27 financially sophisticated US firms on how they estimate capital costs. The initial size of Bruner's sample was 50 firms. 18 were headquartered outside North America and five declined to be interviewed. One of the reasons Bruner excluded firms headquartered outside of North America was the increased difficulty of obtaining interviews from these firms. Bruner mentions that the enlargement of a survey to firms from other countries is a subject worthy of future study. This paper is an attempt to fill the gap and follows the structure and outline of the Bruner survey. This paper however, differs from its predecessors in several aspects. Existing published evidence is based on written, closed–end surveys sent to a large sample of firms, often covering a wide array of topics and commonly using multiple-choice or fill-in-the blank questions and provides limited opportunity to explore subtleties of the topic.

Our survey is based on results of telephonic survey allowing us to expand on the answers.

2 Nominal cost of capital means that the cost is not adjusted for country specific risk, business risk, or expected inflation.

Another feature of our survey is that we are interested in those areas of cost-of-capital estimation where finance theory is silent or ambiguous and practitioners are left to their own devices. This paper is not focused on reintroducing theoretical ways of estimating cost of capital. In the survey results section we will make references to the theory when necessary

In the section titled sampling we explain the methodology in selecting the firms in the sample. The survey instrument is also discussed.

Sampling

We started with the list of the companies from the directory of New York Bank whose American Depository Receipts (ADR) were listed in the New York Stock Exchange (NYSE).3 The list in October 2006 included 335 companies. We used the random sampling in the Excel© to get a list of 25 companies that we surveyed. The main rationale for limiting the sample size to 25 companies was the estimated cost of making international calls lasting for hours. The list consisted of 11 European, 2 Russian, 2 Far Eastern, 2 Central American, and 8 South American companies. Following the search on the internet of each company's home page, we sent a letter to the Chief Financial Officer and to the Investment Relations Office of each of the companies. The purpose of the letter was to arrange to have a telephone interview with a representative of each company. After the second mailing, followed by an e-mail reminder, 9 companies (36 percent response rate) agreed to an interview. Out of the 9 companies, 4 were European (36 percent response rate), 2 were South American (25 percent response rate), 1 Far Eastern, 1 Russian, and 1 Central American (50 percent response rate for each group). We called the representative of each company at the prearranged time in the headquarter location outside the U.S. Each interview lasted from 35 minutes to about an hour. In the following section we review the results.

Survey Findings

My research assistant arranged for the telephonic interview. Because the companies were located in 9 different countries we made the telephone calls at all hours of the day. We discussed each of the 20 questions with a representative of the company. The participants responses were recorded (with their approval) and I listened to the conversation (the respondents knowing this). Our survey findings showed that all companies use discounted cash flow (DCF) techniques to evaluate investment opportunities. Similarly, all companies surveyed use weighted average cost of capital as the discount or the hurdle rate in evaluating domestic and international projects. Roughly 60 percent of the respondents said they use the same cost of capital (WACC) worldwide. 40 percent "tweaked" the rate depending on their expectations of future economic developments in the country or region in were the projects are. More about the way the companies estimate expected risks later. Roughly 80 percent said the weight is based on target capital structure. One respondent used market value for equity (common shares) but book value for debt component. Generally, the target capital structure does not deviate much from the actual

3 New York Bank is the trustee for the original shares of the companies whose shares are traded as ADRs on the exchange.

one. There seems to be only a small difference between the target and the current market structure. A wide variety of international debt and other financial securities are included to finance projects. One of the companies had a unique combination which includes the equity, long term borrowing and the pension liabilities. The reason for including the pension liabilities is based on the local accounting requirements. Another unique combination included a hybrid bonds along with equity. Hybrid bonds for the company seem to include a wide variety of convertibles, putable bonds, and some derivative type of instruments.

Next we asked the companies how they estimate the company's before tax cost of debt. About half of the respondents said they use the 10 year US government bond yield plus credit default SWAP spread. Two companies use a combination of 10 year risk free rate (US government or their local government) plus an actual funding spread. Two companies use a long term debt rate based on their credit rating. When asked about "what tax rate do you use", almost uniformly the answer was either marginal rate, statutory rate, or country specific marginal rate.

Survey results show that when estimating the cost of equity capital the companies use CAPM. A specific risk associated with one project or other might be different from the risk faced by the entire group. Our concern was if and how the companies adjust the calculations in order to accommodate for the country specific difference in risk. The survey findings show that most of the companies did made the adjustment either in the discount rate or the forecasted cash flows generated by a particular project or a subsidiary. Sixty percent of the companies said that they make adjustments in the cost of capital to show that it reflects the actual risk that the division or the project is exposed to. Forty percent of the companies responded that they would make the adjustment in the cash flow so that it reflects the actual risk that the division/subsidiary or the project is exposed to. One company responded that it adjusts the estimated cash flow when a project is exposed to a vastly different risk than the company overall. Furthermore, the estimated cash flow is discounted using their industry specific cost of capital.

All the companies responding to the survey said they recalculate their cost of capital annually and necessary changes are made. The same cost of capital is used for the divisional performance evaluation. One of the companies claimed they discount the operating profit using the WACC in order to evaluate the division performance. In estimating the risk premium we found a variety of different methods. The majority of the surveyed companies use a global market index to proxy the market return and deduct the LIBOR (London Interbank Offering Rate) or a similar rate from it to find the risk premium. Another method is to use a global market index and deduct the rate the company's bank rate or the company's bank credit line rate from it. The European companies in our sample indicated that at times they are using the European Central Bank rate as proxy for the theoretical risk-free rate. One unique way of calculating the market risk premium was using the funding spread which is calculated internally by the respective company. This funding spread was added to the risk free rate, and then the market risk rate was deducted form it to give the risk premium.

According to our survey findings, most of the companies that we surveyed use the group betas. Few companies utilize the average beta of the group beta of the companies which have

similar risk associated with it. These betas are regularly published by the publishers like Bloomberg, Value line and Standard and Poor's.

Conclusion

Survey findings are largely consistent with the theoretical teachings of the business schools in the USA during the last 30 years if the text books correctly indicate what finance professors teach. However there are some interesting deviations or variations from the modern finance theory as discussed in the section about survey findings. Our sample size for practical reasons such as cost, time, and availability of CFOs was small. The main limitation of the survey, therefore, is that one should not necessarily generalize our findings to the MNCs.

Appendix A Questionnaire

1.Do you use DCF techniques to evaluate investment opportunities?
2.Do you use any form of a cost of capital as your discount rate in your DCF analysis?
3.For your cost of capital, do you form any combination of capital cost to determine a WACC?
4.What weighting factors do you use? Target vs. Current debt/equity, market vs. book weights?
5.How do you estimate your before tax cost of debt?
6.What tax rate do you use?
7.How do you estimate your cost of equity?
8.As usually written the CAPM version of the cost of equity has three terms: a risk free rate, a volatility rate or beta factor, and a market-risk premium. Is this consistent with your company's approach?
9.What do you use for the risk free rate?
10.What do you use as your volatility or beta factor?
11.What do you use as your market risk premium?
12.Having estimated your company's cost of capital, do you make any further adjustments to reflect the risk of individual investment opportunities?
13.How frequently do you re-estimate your company's cost of capital?
14.Is the cost of capital used for purposes other than project analysis in your company?
15.Do you distinguish between strategic and operational investment? Is cost of capital used differently in these two categories?
16.What methods do you use to estimate terminal value? Do you use the same discount rate for the terminal value as for the interim cash flows?
17.In valuing a multidivisional company, do you aggregate the values of the individual divisions or just value the firm as whole? If you value each division separately, do you use a different cost of capital for each one?
18.In your valuations do you use any different methods to value synergies or strategic opportunities?
19.Do you make any adjustment to the risk premium for changes in market conditions?
20.How long have you been with the company? What is your job title?

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Capital Budgeting in Nepal and the US

Jason Lin, Susan Pradhan and Paul Fellows

Abstract

Capital budgeting is one of the most significant topics in corporate finance. Companies use capital budgeting to make investment decisions that add to the firm's value. It is important that they make the right investments to define strategic direction and sustain both product market and capital market flexibility. Hence it is imperative that they use the right capital budgeting technique ("CBT"). CBTs have evolved over time and most companies in the US now use techniques that coincide with the recommendations of the literature, mainly discounted cash flow techniques ("DCF"). Although DCF techniques might be considered the preferred approach in principle, we will see that it is not always so in practice. In this article we study CBTs used in Nepal and find that they differ from the preferred approaches.

I. Introduction

Previous research has indicated that Nepalese companies have been known to use a higher percentage of non-DCF techniques. However, with a growing economy and a booming IT industry, companies in Nepal may have progressed and now use more DCF techniques when making capital budgeting decisions. If they have done so, what percentages of these progressive companies use DCF techniques? The answer to this question is significant because it gives us current information about the way companies make investment decisions. Companies may be more likely to use specific techniques depending on various characteristics. For example bigger companies may be more likely to use DCF or other sophisticated techniques than others because they may have more resources at their disposal. This paper investigates whether companies in Nepal are moving towards using more sophisticated CBTs.

The paper is divided into four main sections: a literature review, a description of the methodology and data, a discussion of the results and a brief conclusion.

II. Literature Review

Recent findings in the fields of finance and accounting have suggested that business entities in the US are moving towards more sophisticated forms of capital budgeting including DCF techniques (Oblak and Helm, 1980). But how do businesses in a developing economy like Nepal's compare to businesses in the US? According to a survey of Nepalese businesses conducted in 2006, just 41 percent of the respondents used capital budgeting techniques for all their projects while the rest implemented CBTs selectively depending on the project (Poudel, 2006).

Capital budgeting has been defined as the identification, evaluation and selection of the long term (fixed) assets that will increase shareholder's value (Du Toit, Newland & Oast, 1997). The methods used by companies are usually divided into two categories (Hakka, Gordon

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and Pinches, 1985).The categories are non-DCF techniques, which the authors designate as "naïve" techniques, and DCF techniques which use risk factors and cash flows, as "sophisticated" techniques (Hakka, et al, 1985). Divided between these two categories are the individual methods that companies utilize. For example, in the article "Capital Budgeting Practices in Corporate Canada", the most common of these methods cited by the authors (Jog and Srivastava, 1995) were:

- Payback Period ("PBK")
- Internal Rate of Return ("IRR")
- Average Accounting Return ("AAR")
- Net Present Value ("NPV")

It should not be assumed that the above mentioned methods are the only CBTs. In the book *Fundamentals of Corporate Finance* other methods such as discounted payback period, the profitability index and the modified IRR are also included under CBTs (Ross, Westerfield and Jordan, 2008). Among the DCF techniques used by companies, there seems to be a hierarchy of preferred methods. Studies show that managers seemed to prefer IRR to NPV because of the simplicity of having to look at a percentage and make comparisons (Evan and Forbes, 1993).

There is really no definite answer as to which technique is the best technique. Literature suggests "sophisticated" methods as being better because they take into account risk and cash flows as opposed to non-DCF methods (Ross, et al., 2008). However, many companies still incorporate non-DCF techniques.

In the article, "Capital Budgeting Methods Used by Multinational Companies", a higher percentage of multinational corporations ("MNCs") were found to be using DCF. However, this was not always the case. Other research has indicated that corporations have preferred non-discounted techniques in the past, implying a recent shift made towards DCF techniques (Ryan & Ryan, 2002). In a survey conducted by the National Association of Accountants in 1988, only 65 percent of the Fortune 500 used DCF analysis (as quoted in Dulman, 1989). In fact, the trend to use DCF techniques was first pioneered by a railroad engineer to evaluate the profitability of various projects in the late nineteenth century (Dulman, 1989). Furthermore, Dulman states that the prominence of discounted cash flow analysis started vigorously around the 1980s (Dulman, 1989). This illustrates an inclination towards the preferences of literature discussed earlier.

However, the advances made in the Western world should not be generalized to include other parts of the world. This important fact is highlighted in Poudel's research which concluded that outdated techniques in the US were still being employed by Nepalese companies (Poudel, 2006). In fact, according to Poudel's research, only 43 percent of major commercial banks, 36.4 percent of finance and insurance companies, 40 percent of major manufacturing companies and 18 percent of other companies used CBT for certain investments showing that CBTs were used selectively and not often (Poudel, 2006). Overall, only 41 percent of the respondents in the author's survey used capital budgeting for all investment decisions and the

remaining 59 percent used it for only certain types of investments (Ramji, 2006). This is contrary to the trend in the United States. For example, 99.5 percent of Fortune 1000 companies surveyed used CBT (Ryan and Ryan, 2002).

Along with surveying what CBT were being used by American companies, surveys also investigated how the discount rate was set. In a survey carried out in the "Survey and Analysis of Capital Budgeting Methods", 46 percent of the respondents used WACC and the rest used a variety of methods which included cost of debt and past experience (Schall, Sundem, and Geijsbeek, 1978). Similarly, among Nepalese companies, 76 percent of the companies surveyed used WACC to set the discount rate (Poudel, 2006).

However, the question is "what drives companies to choose the method that they use?" What factors could be involved in choosing the technique? The simple fact that more resources could mean more complicated techniques makes us wonder if size of the company could play a huge part in using a certain technique. Accordingly, Schall, et. al. confirms that size could in fact be a factor that affects the decisions of the firm. Along the same lines, size of the capital budget was also considered to be a significant determinant in choosing a CBT (Ryan and Ryan, 2002).

III. Methodology and Data

We form our model based on the assumption that companies in Nepal are moving towards DCF and that the chances of the company using DCF techniques could be dependant on the size of the capital expenditures, which is measured by the total assets of the company and the age of the company. Our model is

$$\mathbf{Y = \beta_O + \beta_1 X_1 + \beta_2 X_2 + e}$$

Where Y = 1, if DCF is used and Y= 0 if a non-DCF technique is used

X_1 = Size of the company

X_2 = Age of the company

e is an error term in our regression, and

β_o, β_1 and β_2 are regression coefficients.

Based on this model, we form our hypotheses:

H0: $\beta_1, \beta_2 = 0$

H1: $\beta_1, \beta_2 \neq 0$ $\alpha = 0.5$

A sample of 52 Nepalese firms was selected. CFOs of these companies were asked to fill out a questionnaire on the capital budgeting techniques that their companies implement, the required investment level in order to employ capital budgeting, their financial background, risk, and financial objectives of using capital budgeting methods. Questionnaires included open ended and close ended questions, with the majority being multiple choice questions where more than one answer could be selected. The survey is based on the previous research done by Poudel (2006) on Nepalese companies. All of these companies have been in existence for more than a year. The stability and profitability could be a bias towards the results and may not reflect the trend of other companies.

Some of the biases that we can expect in surveys are those Sundem and Schall (1978)

label response bias in their sample. The bias refers to the expectation that companies using sophisticated CBTs would be more willing to fill out the survey than firms that do not use them (Sundem and Schall, 1978). The companies selected for the survey were spread among the banking and finance industry (forty-four companies), manufacturing industry (seven companies) and service sector (one hotel company). Although industry bias could exist, the ultimate goal of this project is to investigate the trend of use of CBT among all companies in Nepal.

Fifty-two surveys were distributed out of which forty-eight responded resulting in a response rate of 92.3 percent. Because the response rate is high in this survey, we can expect there to be less response bias than Sundem et.al (1978) discussed. Since these surveys were completed by an individual from each company, a respondent's view may not be reflect the views of other members of the company creating another possible bias (Ryan and Ryan, 2002).

One other problem or limitation of this study involves the concealment or unavailability of data. These cases usually involved numerical data. For these case secondary sources had to be utilized.

IV. Empirical Results

A. Descriptive Statistics

Table I below shows the percentage of Nepalese companies that use some form of capital budgeting for various investment levels. From the 48 companies, only one company reported using CBTs for all their projects and one company reported never using CBTs. Additionaly, 46.8 percent answered that they used formal capital budgeting for projects starting at NRs 1 million to NRs 10 million, 29.8 percent used CBTs for projects from NRs 10 million onwards, 10.64% started their analysis from 50 million and only 8.33% used CBT only for projects greater than a 100 million. (Note: Nepalese Rupees (NRs. / Rs.) is the currency of Nepal.) These percentages show that not all companies use formal CBT for all projects that they undertake.

Table I: Percentage of Companies Start Using CBT at Various Investment Levels

Investment (NRs.)	% Usage
All	2.13%
1 mil. To 10 mil.	46.81%
10 mil. To 50 mil.	29.79%
50 mil. To 100 mil.	10.64%
Greater than a 100 mil.	8.51%
Never	2.13%

These results are similar to the results of Sundem, et.al. In their research, 41 percent of the American companies surveyed used CBT for all their investments, 39 percent for certain types and 20 percent were using them for investments over a $100,000. *(*Sundem, et.al., 1978*)* A more recent study conducted by Ryan and Ryan (2002) found 48.5 percent of the companies that they surveyed required a formal analysis for investments below $100,000 and 50 percent using

them for above $100,000 which indicates slightly higher percentages than Sundem's results.

Depending on where they needed a formal analysis, the respondents were asked to mark the most preferred CBT. Surprisingly, the results were evenly distributed and not skewed considering the fact that NPV and IRR are the most preferred methods in literature. From Table II below we can see that out of 48 responses, 16.67% chose AAR. 20.83% chose IRR, 16.67% chose Payback period, 25% chose NPV, 14.58% chose a combination of CBTs and 6.25% did not respond to the question.

Table II: Percentage of Companies Using Various CBT

CBT	Percent
ARR	16.67%
IRR	20.83%
Payback	16.67%
NPV	25.00%
Combination	14.58%
N/A	6.25%

It is surprising to see that approximately 17% chose ARR which does not use the discounted cash flow approach and is usually less preferred by literature. Jog and Srivastava (1995) conducted research on "Capital Budgeting Practices in Corporate Canada" and noted that ARR was also one of the most highly used non-DCF CBT. However, in Poudel's results for Nepalese companies, NPV was most preferred, followed by the payback period and internal rate of return in the third position. ARR and profitability index techniques were ranked lower.

Overall, we can see in Table II that only one-fourth of the companies used NPV. This may be the largest category in our sample, but when compared to Ryan and Ryan (2002) where 85.1% of the respondents frequently used NPV, the percentage of Nepalese companies that use NPV is still very low. Also, when asked about how the cash flows were estimated for the DCF methods, 27.08% replied "Subjective", 20.83% used an expert opinion and 22.92% used quantitative methods to come up with the cash flows. Similarly, 29.17% chose WACC to estimate their discount rate, while 17% used the cost of funds, 15% used management defined rates and historical rates of the company, and the rest chose industry specific rates.

In order to understand the motives for the specific capital budgeting methods used, respondents were asked to state their reason for the techniques selected. Companies that selected payback and ARR stated simplicity as being the major reason; whereas companies that selected NPV stated that NPV was scientifically sound and accurate. IRR, on the other hand, was used because of the simplicity of "looking" at just a percentage. Importantly, the results in Table II are along the same lines as Poudel's research wherein he stated that a significant number of companies in Nepal were using non-DCF techniques. We can see that not a lot has changed since 2006 (Ramji, 2006).

Table III: Correlation of CBT Used Between Companies Younger and Older than 15 Years

CBT	Age>15	Age=<15
AAR	23.08%	8.33%
IRR	19.23%	20.83%
PBK	11.54%	20.83%
NPV	26.92%	20.83%
ARR & IRR	3.85%	-
IRR & PBK	3.85%	-
IRR & PBK & NPV	3.85%	8.33%
IRR & NPV	3.85%	4.17%
N/A	3.85%	16.67%
Correlation	-0.07408	

In order to obtain a better idea of the variation in CBT used by companies in Nepal, a simple correlation is determined between different groups of companies. Table III shows the CBT used by companies that are below 15 years of age and above 15 years and indicates that the age of a company and the CBT they use are minimally related. Thus, we conclude that older companies and newer companies are almost equally likely to use NPV and AAR.

A similar analysis for banks and non-banks is shown in Table IV. Based on this grouping the correlation is again close to zero. This indicates that the choice of techniques used is not correlated with the industry grouping involved.

Table IV: Correlation of CBT Used Between Banks and Non-Banks

CBT	Banks	Non-Banks
ARR	20.83%	12.50%
IRR	12.50%	29.17%
PBK	29.17%	4.17%
NPV	20.83%	29.17%
ARR & IRR	4.17%	4.17%
IRR & PBK	-	4.17%
IRR & PBK & NPV	8.33%	8.33%
N/A	4.17%	8.33%
Correlation	-0.150931079	

When companies make capital budgeting decisions, there are quantitative as well as qualitative factors that need to be considered. Quantitative factors would include the IRR and NPV of a particular investment. However, there are other qualitative factors that Nepalese companies may take into account. The survey asked respondents to state the qualitative factors that were significant to them. Table V shows the results:

Table V: Qualitative Factors that affect CBT Used

Factor	Percentage
Image	11.11%
Management Goal	42.22%
Employee Morale	4.44%
Employee Safety	4.44%
Legal Issues	4.44%
Environmental Safety	4.44%
Others	2.22%
Combination	27.00%

We can see that management's goals are one of the leading qualitative factors considered to be significant in capital budgeting and that image is also an important factor.

B. Regression Analysis

In order to do a regression analysis, we use the age of the company as one of the independent variables and the size of the firm as another independent variable. The natural log of total assets was used to measure the size of the company. Our dependant variable is qualitative and has been assigned a 1 if a company uses any kind of DCF and a 0 if it uses a non-DCF method. A company that uses any form of DCF method along with a non-DCF method was assigned a 1 since it does use a DCF method. As our dependant variable is qualitative, a PROBIT regression was conducted to get the probability for a company to use DCF and non-DCF techniques under various values of total assets and age of the companies. Although, the response rate was almost 100 percent, 36 percent of the companies were hesitant to indicate quantitative data about their respective companies. The results of the PROBIT regression are shown below:

Variable Name	Estimated Coefficient	Standard Error	T-Ratio
X_1	0.18507	0.21122	0.87622
X_2	-0.20360E-01	0.29062E-01	-0.70057
Constant	-2.1744	3.7821	-0.57491

X_1 refers to the natural log of total assets and X_2 refers to the age of the company. The natural log was used in order to avoid having a skewed data set and to enable easier comparison. Because the PROBIT model is based on the probability density function, we can compute the probability a company will use DCF under various values of the independent variables. We assume that:

$\hat{y} = 1, p>0.5$

$\hat{y} = 0, p=<0.5$

A hypotheses test was carried out on the entire model and also to test the significance of the coefficients.

Based on the probability computed and the significance test, we can conclude that a unit change in the company's assets will be negligible to a company's decision to use a different

method from the current one. One explanation for this result is that the size of a company has little effect on the CBT that a company uses. This is realistic because most companies use DCF techniques regardless of the size of the company. The most important factor to be considered when choosing a method should be the accuracy of the method and its ability to bring about a profitable investment decision.

Assuming the total assets of the company remained constant, if the age of the company increased by 1 year, the results of the PROBIT regression imply the probability that the company would use DCF methods would be .3685, and there would not be a significant change in a company's decision to use a different method.

Our coefficients are insignificant at $\alpha = .05$ level; therefore we conclude that age and size of a company are not variables that determine a company's decision to use DCF.

V. Conclusion

Capital budgeting in Nepal is in fact different from the United States. US companies prefer DCF techniques to other techniques as shown by the recent research done by Ryan and Ryan (2002) and bigger companies in the US have moved on to more complicated techniques including computer simulations. Among the CBT, the most preferred among companies in Nepal were NPV, IRR followed by AAR and payback. The percentage of companies using AAR was high which does not correspond to recommendations in the literature.

Regarding the methods that the companies choose, age and size (total assets of the company) were assumed to affect a company's choice of CBT. However, our regression results indicate that the age of the company had little or no influence on a company's decision to choose a certain technique as our coefficient was close to zero. Similarly, size was also assumed to have an effect on a company's decision because bigger companies tend to use more sophisticated methods and are more likely to exhibit that in the questionnaire. However, size was not a strong variable affecting a company's decision. As mentioned previously, the results are consistent with the literature which advocates DCF as a more accurate and detailed method of making an investment decision and also indicates many companies are willing to utilize DCF in order to make an accurate decision.

Besides age and size, there could be other qualitative and quantitative variables affecting a company's decision. However, measuring qualitative variables like managers' attitudes could be a challenge. In countries like Nepal there may be other factors, such as the availability of resources and other restrictions, affecting a company's ability to make decisions; these factors may act as constraints on a company's interest in investing. These restrictions and qualitative factors can be an excellent topic for future research that would supplement this project to help us better understand CBTs used in Nepal.

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The Effect of Subprime Lending on Residential Housing Investment: Evidence from the 2006 HMDA Loan Access Register

Jane Sung and Steve Bosworth

Abstract

This paper empirically examined the effects of economic variables on the residential housing transaction with more emphasis on the subprime issues. The results support the easiness of lending will lead to more housing transaction.

Introduction and Background

As we are left to pick up the pieces of the mortgage crisis, we can only but ask 'how did we get here?' What role did exotic subprime mortgages play in the housing boom and bust? This most recent cycle upturn has been marked by a set of concomitant trends whose association in economic theory gives support to a causal relationship. Rising prices tracked expanding credit, especially to parts of the population previously without access to mortgages. We look for empirical evidence of the opening of this credit market, and find support in the literature that such an expansion contributes to bubble-like behavior in housing markets.

Former Federal Reserve Governor Edward Gramlich explains the boom in subprime lending as the result of more sophisticated appraisal, pricing, and allocation of risk in his book Subprime Mortgages: America' Latest Boom and Bust. Credit scoring algorithms can now be run in a matter of minutes; these rely on actuarial models that predict an individual's probability of repayment based on credit score, income stream, expected interest rates and macroeconomic conditions, etc. One benefit of such mechanistic risk assessment is that overt discrimination in lending is no longer necessary (where ethnicity can act as a screen to ration credit by). Automation however, may have caused some lenders to act carelessly, or not verify the information provided by the applicant. Algorithms may obscure the risk assessment to the broker making the loan. Second, the rollback of usury laws has allowed loans with greater degrees of risk to be priced accordingly higher and hence enabling these markets to better clear (the rationing described above is now done by *price*) One such important regulatory shift was the Depository Institutions Deregulation and Monetary Control Act of 1980, which eliminated rate ceilings on all first liens and set the pace for further liberalizations at the state level. Expansion of the value of possible loan transactions should naturally increase demand for its complementary good, housing. Furthermore, the pool of capital available to finance home purchases has deepened significantly for the subprime market. The secondary mortgage market was created and for years dominated by the Federal National Mortgage Administration, or Fannie Mae, founded as a government agency in 1938. In 1968 Fannie Mae was officially (if not implicitly) privatized and given competition in the similarly-chartered Federal Home Loan Mortgage Corporation, or Freddie Mac in 1970. The Government Sponsored Enterprises (Fannie, Freddie and Ginnie Mae, which underwrites FHA and VA guaranteed loans) would not purchase nor securitize mortgages failing to meet certain standards indicative of the loan's repayment likelihood (i.e. subprime loans) Mortgage securitization has since become a profitable opportunity for the private sector, and subprime loan securitizations have become good business for hedge funds and investment banks. Securitization of mortgage assets improves liquidity,

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since risk can now be broken down into smaller parts and traded to a diffuse set of investors. Credit scoring and generally favorable ratings by the likes of Standard and Poor's, Moody's, etc. made subprime mortgage paper look like a good investment; and indeed hedge funds and investment banks were soon supplying much of the capital for the residential housing market. Indeed, the GSEs' share of total home financing seems to have dropped off sometime in 20034 as they were outpaced by private financing, typically with more lax underwriting standards. What did not change about the nature of real estate investment however, is that the underlying asset (a house) is illiquid and has a long maturity horizon. Hence a leveraged investment operation can quickly find itself insolvent when the value of its mortgage-backed holdings declines because of foreclosures.

We observe an expansion of the available supply of capital as well as a greater degree of market clearing for higher risk loans. These factors should alone contribute to rising house prices, but there may be some positive feedback at work in real estate cycles. Since a house embodies a large fraction of a family's wealth, the possibility of quick capital gains may have been pulling families into mortgages that would otherwise be unaffordable. One, this essentially lowers the opportunity cost for non-performance of a loan, since the house can be re-sold to exit the loan without significant financial loss. This situation may not apply to families taking out subprime mortgages, which often carry large prepayment penalties (and given high loan-to-value ratios, interest-only payments, etc., these families will have accumulated next to no equity in their houses). The corresponding incentives faced by the lender however, make this issue mostly distributional. If the borrower decides to walk away and the lender is forced to foreclose on the mortgage, an appreciated home value can ameliorate the lender's losses (or indeed she may come out ahead) and thus encourage more risky lending to begin with. For example, Abreu and Brunnermeier (2003) model how investors will 'ride' a bubble hoping to divest while the market is still pricing assets above fundamentals.

Model Design

The most detailed source of freely available housing market data is through the Home Mortgage Disclosure Act. The Act, passed in 1974, requires lenders to report specified details about every mortgage they make. It was passed with the intent of documenting discrimination in the lending market. Hence, this study contains detailed information about the race, ethnicity, sex and income of the borrowers, but unfortunately omits several important factors pertaining to the fundamentals of each loan. These include credit score, loan-to-value-ratio, and any cut-and-dry definition regarding whether a loan is considered subprime. We are somewhat limited by the availability of good subprime mortgage data, but there are precedents in the housing literature that will allow us to cope. Since our model will want to capture the cyclical impact of subprime credit on housing demand; but is constrained by the greater availability of cross-sectional HMDA data (only 2006 is freely distributed), we can model the *number* (relative to population) of home-purchase loan transactions based on income by state or Metropolitan Statistical Area to capture the relative "hotness" of real estate markets. While housing investment accelerated across the board during 2001-2006, there were a select few "hot" markets that saw the greatest appreciation and the most activity. These areas were often characterized by coastal locations, booming local economies, and most critically, affluence. Stein (1995) first documents a tendency

4 http://economistsview.typepad.com/economistsview/2008/07/did-fannie-and.html

of not only prices, but also number of housing transactions to rise in a booming housing market. Ortalo-Magné and Rady explore this relationship in greater depth and develop a theoretical framework in a series of papers from 1998 – 2004. Transactions rise with prices and incomes because the liquidity of the housing market is constrained by down payment requirements. Stein rationalizes the down payment requirement as a response to adverse selection in the housing market; without a down payment requirement there will always be incentive for a borrower to default at any given rate of interest. Down payments offset this incentive since borrowers stand to lose substantial equity in a foreclosure. Indeed, high loan-to-value ratios may have provided the moral hazard necessary to turn the first subprime mortgages bad and "pop" the housing bubble.

The primary focus of the down payment literature, however, is on how this requirement creates feedback loops that turn exogenous shocks into booms and busts. If say, first time homebuyers gain access to subprime credit and can buy "starter homes" previously unavailable to them, the prices of starter homes will appreciate. Existing homeowners experience a wealth shock because the equity in their homes is now worth more, and this in turn allows these homeowners to meet a previously unattainable down payment on a "trade-up" home. Ortalo-Magné and Rady summarize:

> Caplin, Chan, Freeman and Tracy (1997, p. 31) argue "it is almost impossible for a household to buy a home without available liquid assets of at least 10% of the home's value". It is this effective wealth requirement that we want to capture with the credit constraint in our model. (p.463)

Income effects and credit constraints dictate that most transactions will occur in a booming market. We can thus identify booming markets using the proxy variable of high transaction volume.

Likewise, incomes can play a role in housing bubbles since higher-income buyers are less likely to be credit-constrained.

> ... if the effect of capital gains or losses on the housing demand of constrained repeat buyers is strong enough to generate price overreaction, the level of prices, the cross-sectional variance of prices, and the number of transactions move with income. (Ortalo-Magné & Rady p.460)

Subprime borrowers are distinguished by low incomes, high debt-to-income ratios, low credit scores, and a need to borrow a high proportion of a home's value. These subprime borrowers must of course pay higher interest rates for access to the housing market, but low income will no longer present as daunting a barrier to home purchase. In the aggregate then, we expect higher-cost subprime loans to weaken the linkage between high incomes and price bubbles (via housing transactions). Our focus will be whether the coefficient of income's effect on transaction velocity significantly different for high cost vs. low cost loans. If yes, then we can support the claim that the subprime lending contributed to the housing bubble by boosting the purchasing power of a modest income.

Despite the existence of many theoretical models of housing liquidity and transaction volume, little empirical work has been done on the subject. Genovese and Mayer (1997) take a sample of condominiums in the Boston area and find a positive relationship between loan-to-value ratios, asking prices, and time on the market. Credit-constrained *sellers* are more susceptible to an insufficient sale price failing to meet the debt obligations outstanding on their property. Homeowners who already have sufficient equity in their houses (they test this for equity shares >20%) can better afford to pay off the debt on their house with a lower price either because they have less interest to service or losses are merely personal capital losses rather than defaults. We may reasonably infer that the high prepayment penalties faced by many subprime borrowers would amplify these sale-side liquidity constraints.

Methodology

We take the raw Home Mortgage Disclosure Act Loan Application Register5 and aggregate along 56 of the nation's Metropolitan Statistical Areas. Only conventional (non FHA or VA guaranteed) loans intended for home purchase and originated in the year 2006 are examined. For each metropolitan area, two regressand observations are calculated, one total for all loans issued with rate spreads of less than 3% with comparable treasury securities, and one for all 'subprime' loans with rate spreads at or exceeding 3%. This cutoff seems rather arbitrary, but it is the cutoff below which the HMDA does not require reporting of the rate spread of a loan. Furthermore, the Federal Reserve has recently proposed to bring all such loans under the provisions of the Home Ownership and Equity Protection Act6. Each regressand observation is then divided by the population of the corresponding metro area as estimated for 2006 by the Census Bureau and then multiplied by 1000 to aid computability. The regressors are as follows: respective Consumer Price Indices (base 1982 = 100) for Urban Consumers as published by the Labor Department7; the metropolitan housing price index as published by the Office of Federal Housing Enterprises Oversight8; an indicator for whether the aggregated loan total was of prime or subprime loans (high spread loans were assigned a '1'); the median income of the borrowers of each aggregated population; a squared income term to capture the relative dearth of very affluent areas9; the interaction between income and subprime status; and a metropolitan area rent variable constructed from Housing and Urban Development data10. For subprime borrowers, the rent for the second lowest quintile was taken, while for conventional homebuyers, the rent for the second *highest* quintile was used for comparison. Rent was included partly as a curiosity; to investigate whether rental and owner-occupied housing are gross substitutes or whether their prices for a given area reflect a common underlying scarcity of housing. Either scenario would suggest a rent variable improves model specification regardless. All variables are relevant to the year 2006 and were averaged where available only in quarterly increments. In equation form, the model can be written:

$$\#\text{Transactions / Population} = \beta_0 + \beta_1 \text{ CPI for MSA} + \beta_2 \text{ housing price index for MSA} + \beta_3 \text{ Rate spread high or low} + \beta_4 \text{ med. income} + \beta_5 \text{ income}^2 + \beta_6 \text{ income x rate spread} + \beta_7 \text{ Rent}$$

5 http://www.ffiec.gov/hmdafeedback/hmdaproducts.aspx
6 http://www.federalreserve.gov/newsevents/press/bcreg/20071218a.htm
7 http://www.bls.gov/CPI/
8 http://www.ofheo.gov/media/hpi/1q08hpi_cbsa.csv
9 Just as fewer subprime loans are made than prime loans, there are far more 'middle income' markets and these more prosaic markets tend to be larger. Note that income was divided by 1000 before squaring to aid model computability.
10 http://www.huduser.org/datasets/50thper/FY2006_Area_50th.xls

Results

The coefficients of the equation were estimated using ordinary least squares, but the results of this regression indicated non-constant error variance. Selected statistics from that estimation are listed here:

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 104 DF	P-VALUE	PARTIAL CORR.
CPI	-0.53966E-01	0.1437E-01	-3.755	0.000	-0.346
HPI	0.26979E-01	0.9980E-02	2.703	0.008	0.256
SUB	-7.7910	2.510	-3.104	0.002	-0.291
INC	0.25866E-03	0.1055E-03	2.453	0.016	0.234
INC2	-0.10436E-02	0.3618E-03	-2.885	0.005	-0.272
INCSUB	-0.37649E-04	0.2948E-04	-1.277	0.204	-0.124
RENT	-0.71965E-02	0.2605E-02	-2.763	0.007	-0.261
CONSTANT	14.749	5.003	2.948	0.004	0.278
R-SQUARE = 0.6819					
R-SQUARE ADJUSTED = 0.6605					

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	2599.9	7.	371.41	31.855
ERROR	1212.6	104.	11.659	P-VALUE
TOTAL	3812.4	111.	34.346	0.000

Graphs shown in Figure 1 and Figure 2 showing the spread of the residuals falling with income, which are supported by the Chow statistic (=4.024) and Goldfield-Quandt statistic (=2.23) obtained by partitioning the data evenly. Some way of correcting for proportional heteroskedasticity in our model is needed then. Despite the variance problems discussed, the model is free of other problems such as autocorrelation and misspecification. The Durbin-Watson statistic (=1.9459) for the unrestricted OLS falls well within d_U and 4 - d_U. Due to the cross-sectional nature of this study, no autocorrelation was expected. Furthermore, the Ramsey regression specification error tests do not support significant evidence of model misspecification.

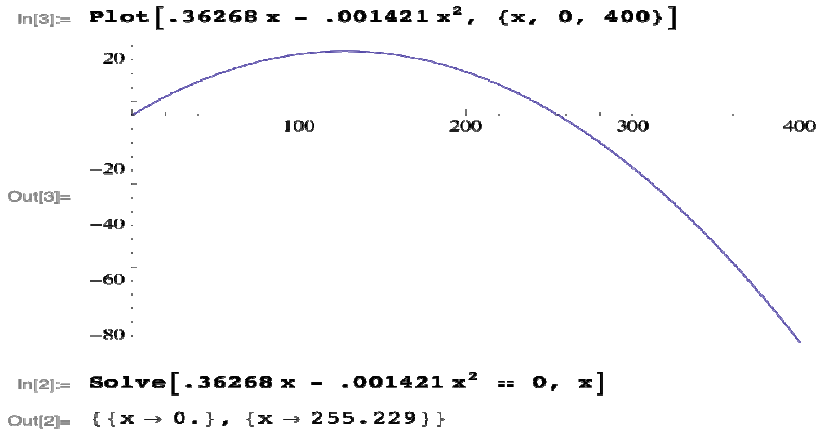
To correct proportional heteroskedastic error terms, a generalized least squares model was estimated using the assumption that the error variance was proportional to income. The results of that estimation are given in the following table:

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 104 DF	P-VALUE	PARTIAL CORR.
CPI	-0.51715E-01	0.1485E-01	-3.483	0.001	-0.323
HPI	0.25054E-01	0.1019E-01	2.458	0.016	0.234
SUB	-5.5102	2.690	-2.048	0.043	-0.197
INC	0.36268E-03	0.1107E-03	3.278	0.001	0.306
INC2	-0.14210E-02	0.4006E-03	-3.547	0.001	-0.329
INCSUB	-0.63536E-04	0.3345E-04	-1.900	0.060	-0.183
RENT	-0.78860E-02	0.2742E-02	-2.876	0.005	-0.271
CONSTANT	9.4178	5.318	1.771	0.079	0.171
R-SQUARE = 0.6905					
R-SQUARE ADJUSTED = 0.6696					

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	0.31248E-01	7.	0.44641E-02	33.142
ERROR	0.14008E-01	104.	0.13469E-03	P-VALUE
TOTAL	0.45256E-01	111.	0.40772E-03	0.000

The results appear consistent with the theoretical literature. A negative coefficient -.0517 for consumer prices indicates a downward sloping indifference curve between housing and non-housing goods. Specifically, a 1-point rise in the urban consumers CPI will generate an average of .0517 fewer housing transactions per 1000 people in a metro area. Housing prices and housing transactions are indeed correlated, although whether this is demand's effect on prices or prices' effect on demand is still murky. A one point HPI increase is correlated with .0251 more housing transactions per 1000 people on average. Income is positively correlated for low to moderate levels of income, but negatively for very large median incomes. This appears puzzling but perhaps there is a threshold above which households earn enough to be unfazed by down payments. Consider the following graph that shows only the income components of the estimated equation (both terms have here been scaled to thousands of dollars):



The overall effect of median income on housing transactions is positive up to roughly

$255 thousand. As this is a rather high median income, it is safe to conclude that there exists a positive correlation between median incomes and housing transactions at reasonable median incomes. The interaction term inc*sub estimates the difference in marginal effect of income depending on the status of sub (0 or 1). The significance of this estimated coefficient supports that high rates of interest do indeed weaken the effect of income on housing purchases. Since income has a coefficient of .00036268 for prime loans (sub=0) and a coefficient of .00036268 - 0.000063536 = .0000299144 for subprime loans (sub=1); we can say that subprime loans cut off about 17% of the marginal effect that income has on housing loan transactions. This would not itself indicate a stunning deluge of new credit, but explains at least a part of the wider bubble. The negative coefficient on rent is the only puzzling result of the estimated equation. Rent and housing demand should generally track each other from city to city to the extent that they reflect a scarcity of dwellings, given demand. The finding is however consistent with historically low rent-to-home price ratios. The desertion of rental for owner-occupied housing is an oft-touted statistic of the bubble discussion11. This might explain its counter-intuitively negative coefficient.

Concluding

Overall, the model performs very well and supports anecdotal and theoretical explanations for housing market behavior. Given the level of aggregation at work in our data set, the equation explains a large and significant share of the variation among geographic and socioeconomic housing markets. Possible directions for future research in this vein are numerous and intriguing. For example, access to other years' HMDA loan application registers would allow a time series regression to examine how the relationship between income, interest rates, and home values changed over the pivotal 1990s. More years would also reveal how individual markets heated up over time. The individualized and disaggregated nature of the HMDA data also lends itself to logistic estimation of a much more fine-grained probabilistic equation. As more housing market data from post-bubble years becomes available, it will be possible to examine whether credit really has become expanded to lower-income borrowers in the long term.

11 http://www.cbo.gov/ftpdocs/88xx/doc8876/12-05-HBCMacroTestimony.pdf, see figure 4

Figure 1

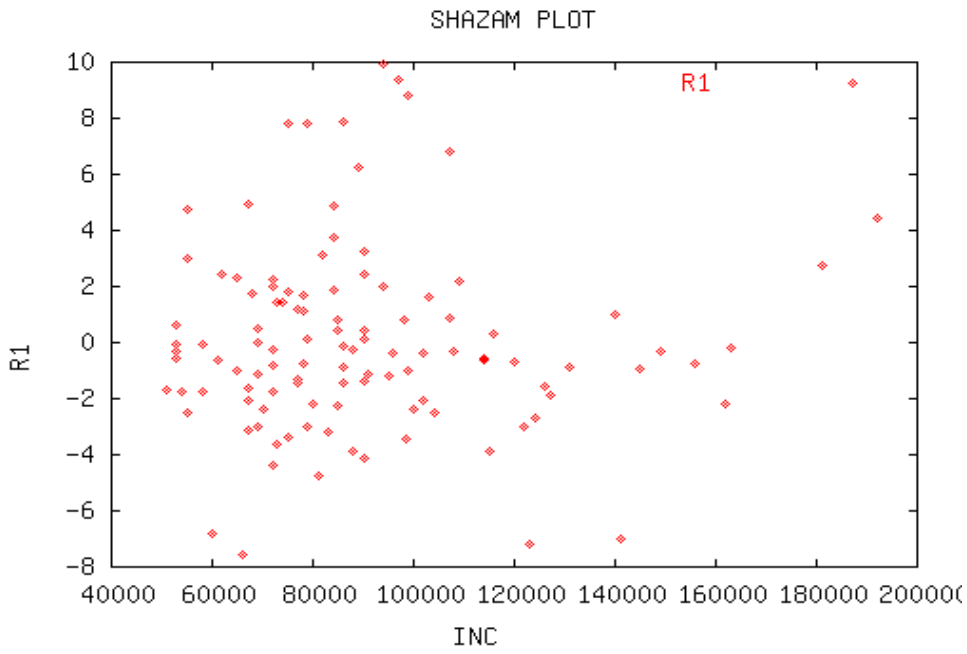
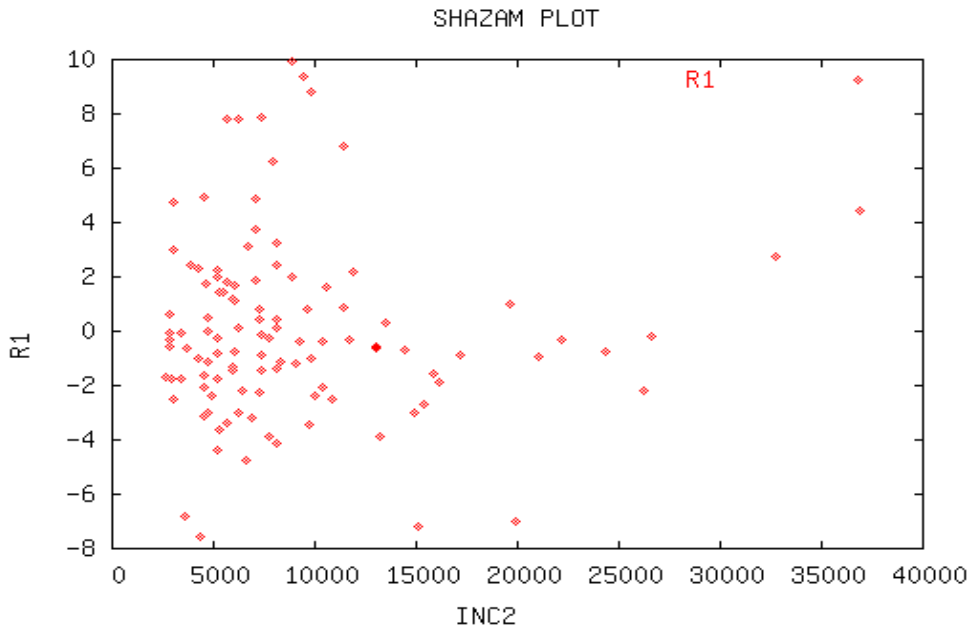


Figure 2



Metropolitan Statistical Areas Examined

Akron, OH	*Philadelphia-Camden-Wilmington, PA-NJ-DE-MD*
Anchorage, AK	Camden, NJ
Ann Arbor, MI	Philadelphia, PA
Atlanta-Sandy Springs-Marietta, GA	Wilmington, DE-MD-NJ
Atlantic City, NJ	Phoenix-Mesa-Scottsdale, AZ
Baltimore-Towson, MD	Pittsburgh, PA
Boston-Cambridge-Quincy, MA-NH	Portland-Vancouver-Beaverton, OR-WA
Boston-Quincy, MA	Racine, WI
Cambridge-Newton-Framingham, MA	Riverside-San Bernardino-Ontario, CA
Rockingham County-Strafford County, NH	St. Louis, MO-IL
Boulder, CO	Salem, OR
Bremerton-Silverdale, WA	San Diego-Carlsbad-San Marcos, CA
Chicago-Naperville-Joliet, IL-IN-WI	*San Francisco-Oakland-Fremont, CA*
Chicago-Naperville-Joliet, IL	Oakland-Fremont-Hayward, CA
Gary, IN	San Francisco-San Mateo-Redwood City, CA
Lake County-Kenosha County, IL-WI	San Jose-Sunnyvale-Santa Clara, CA
Cincinnati-Middletown, OH-KY-IN	*Seattle-Tacoma-Bellevue, WA*
Cleveland-Elyria-Mentor, OH	Seattle-Bellevue-Everett, WA
Dallas-Fort Worth-Arlington, TX	Tacoma, WA
Dallas-Plano-Irving, TX	Tampa-St. Petersburg-Clearwater, FL
Fort Worth-Arlington, TX	*Washington-Arlington-Alexandria, DC-VA-MD-WV*
Denver-Aurora, CO	Bethesda-Gaithersburg-Frederick, MD
Detroit-Warren-Livonia, MI	Washington-Arlington-Alexandria, DC-VA-MD-WV
Detroit-Livonia-Dearborn, MI	
Warren-Troy-Farmington Hills, MI	
Flint, MI	
Greeley, CO	
Honolulu, HI	
Houston-Sugar Land-Baytown, TX	
Kansas City, MO-KS	
Los Angeles-Long Beach-Santa Ana, CA	
Los Angeles-Long Beach-Glendale, CA	
Santa Ana-Anaheim-Irvine, CA	
Miami-Fort Lauderdale-Miami Beach, FL	
Fort Lauderdale-Pompano Beach-Deerfield Beach, FL	
Miami-Miami Beach-Kendall, FL	
West Palm Beach-Boca Raton-Boynton Beach, FL	
Milwaukee-Waukesha-West Allis, WI	
Minneapolis-St. Paul-Bloomington, MN-WI	
New York-Northern New Jersey-Long Island, NY-NJ-PA	
Edison, NJ	
Nassau-Suffolk, NY	
Newark-Union, NJ-PA	
New York-White Plains-Wayne, NY-NJ	

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The Five Year Low as a Trading Strategy: The Kitchin Cycle Revisited

Eddie J. Ary and Marshall J. Horton

Abstract

Consistent with the Kitchin inventory cycle, MSN Money routinely reports the five-year low stock price as a standard investment parameter. This paper analyzes quarterly returns to the strategy of buying a stock at its five-year low price and compares them with comparable returns to investing in either the S&P 500 Index or NASDAQ Composite Index. Consistent with the weak form of the Efficient Markets Hypothesis, the authors find no value in using the five-year low as a buying strategy. However, the five-year low appears to have considerable merit as a tool for short sellers.

Introduction

The allure of low priced stocks has fascinated investors since stocks became publicly traded. Many an investor has dreamed of buying stocks and later selling them for five, ten, twenty, or even one hundred times the initial purchase price. John Templeton, one of the most famous investors of all times, got his start by investing $100 in 1939 in each of the 104 companies selling on the New York and American stock exchanges for $1 or less. Four years later, Templeton's investments were worth almost four times what he had paid for them.

Even though this study doesn't deal directly with stocks priced as low as those purchased by John Templeton during the early years of his investment career, it does explore the investment implications of investing in stocks whose prices have reached a five-year low. Given that the five-year low price is reported as a standard investment measure by a major information source and that it corresponds to a fundamental business cycle measure, would a strategy of buying a stock when it hits the five-year low lead to better returns than simply investing in an index such as the S&P 500? Or if the five-year low would not be beneficial to an investor buying long, would it have value to an investor selling short? These are the questions which this study attempts to answer.

Literature Review

Technical analysis, or the use of past trends in prices, volume, etc., to predict future prices in an effort to discern turning points and thereby buy low and sell high, has a long history in finance. Early efforts in determining business cycles such as Mitchell (1927), gave rise to trading rules used by speculators to "time the market." Technical analysis manuals including Pring (1991) and Arnold (1993) are at odds with the weak form of market efficiency espoused by Cootner (1964), Fama (1965, 1970), and Malkiel (1973), among others. More recently, researchers have claimed that perhaps technical analysis is capable of producing excess returns
Why do we consider the five-year low in particular in this paper? The five-year low price is intriguing because it is the regularly reported measure from MSN Money that comes closest to

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After all (see Bessembinder and Chan 1998, Avramov, Chordia, and Goyal 2006, and Hong, Stein, and Yu 2007).

approximating a purchase strategy in a Kitchin cycle (Kitchin 1923). The Kitchin cycle is a three to five-year cycle that has been the subject of much speculation in the stock trading literature (see DeStefano 2004 and Wall 2001). Joseph Kitchin, a British statistician who first observed the cycle, found that the price level and short term interest rates in the United States and Great Britain during the period from 1890 to 1922 tended to move together through 40 month cycles on average, even though individual cycles varied dramatically (Glasner 1997). Kitchin offered little explanation for the 40-month cycles; however, modern economists theorize that they occur due to the excessive investment and the subsequent disinvestment in business inventories.

Joseph Schumpeter (1939) later referred to the 40-month cycle discovered by Kitchin as the "Kitchin cycle." Over time the Kitchin cycle became a stock market technical indicator focusing on the time from when the market reaches a low, recovers from the low, and later plunges below the low established at the beginning of the cycle. Technicians have found such cycles to average three to five years. However, some advocates of technical analysis believe the Kitchin cycle has been lengthening during the past few decades (see Berentson (2002, p. 1), Branson (2002, p. 2), and Pring, (1991, pp. 255-258) so that the five-year parameters are now consistent with the Kitchin cycle. Our own investigation of the Kitchin cycle, the period between stock market lows, indicates that the average period for the cycle during the past 47 years has been four years and three months, with the individual cycles shown in Table I (displayed after the conclusion to this paper). Using S&P 500 data, we found no convincing lengthening of the cycle, but did observe lengths of about five years. Fama and French (1988) found evidence of mean reversion in stock prices in three-to-five year intervals, consistent with the Kitchin cycle, although Fama and French did not link the two and our own research indicates that the cycle is not always stationary. Certainly the last two Kitchin cycles using the S&P 500 Index have been stationary, indicating mean reversion.

Data Collection and Analysis

In spite of the lack of value afforded technical analysis by the Efficient Market Hypothesis, there has been increasing interest over the past several years in technical analysis as a method of selecting stocks. As a result, more and more Web sites have begun to offer tools designed to expedite technical analysis. One such site is moneycentral.msn.com. Through what it calls its "Power Searches," MSN Money offers several fundamental and technical analysis screens. This study utilizes one of the technical analysis screens, "New 5-Year Lows." The five-year low screen, as well as many others, can be found by accessing the Web address, http://moneycentral.msn.com/investor/research/welcome.asp, and clicking on "Stock Power Searches."

To test the hypothesis that the five-year low price may be used to earn high returns, the authors collected data from the "New 5-Year Lows" screen posted each trading day from June 27, 2007 to September 10, 2007. The first time a company appeared its name, symbol, and market capitalization were entered in a spreadsheet; subsequent listings were ignored as it was assumed an investor monitoring the "New 5-Year Lows" screen would buy a stock upon first observing it in the screen.

In the midst of the gathering of data, it was discovered that not all stocks listed in the "New 5-Year Lows" screen had five years of trading history. For example, Blackstone Group, which went public on June 23, 2007, was listed in the results of the screen on June 26, 2007. Of the 310 stocks listed in the screen during the term of the study, only 129 actually had five years of trading history and therefore truly set five-year lows. The historical quote feature at the Yahoo Finance website was used to determine if five years of trading history were available. Only the 129 companies with five years of trading history were ultimately included in the study. Pink sheet companies and over-the-counter bulletin board companies were excluded from the study since most investors would not be interested in investing in them; closed-end investment companies and real estate investment trusts were excluded also.

For the purposes of this study, an assumption was made that an investor would buy the stock at a price equal to an average of the high and low price during the first trading day following its inclusion in the screen. This was felt to be a reasonable assumption since very few investors would be able to consistently buy stocks at the opening price due to the constraints of work and other activities. Plus, several of the stocks in the study were thinly traded and therefore might not begin trading for several hours into the market session.

Three, six, nine, twelve, fifteen, and eighteen months following the assumed date of purchase, the price of each stock was calculated in the same manner. The Yahoo Finance historical quote feature was used as the basis for determining these prices. If price data on a particular stock was not available at Yahoo Finance, the historical databases at the Big Charts or MSN websites were utilized. Three month intervals, rather than monthly and weekly periods, were selected due to the enormity of the task of gathering prices on the stocks in the sample (a database from which the prices could be easily retrieved was not available to the authors).

Results

Table II compares the performance of the sample from one quarter to the next. For example, the Quarter 2 results were found by comparing the price of each stock after being held for three months to the price which prevailed after a six-month holding period. The table clearly demonstrates that the chances of realizing gains, at least after the first quarter, would have been approximately three to four times greater for an investor shorting the stocks rather than buying long (an exception is Quarter 3). Of course, this result must be tempered by the fact that the NASDAQ Composite Index over the entire period of the study (June 28, 2007, the first day an investment would have been made, to March 11, 2009--the day on which prices were recorded for the last few stocks invested in eighteen months earlier) lost 47.35%. The NASDAQ Composite Index was cited since only fourteen of the companies in the study had a market capitalization of $1 billion or more.

Table III shows the cumulative statistics for the sample at the end of each of the six quarters. For instance, Quarter 6 figures were derived by comparing the initial purchase price of each stock with its price eighteen months after purchase. The table illustrates very vividly the potential for gains from shorting the sample stocks rather than buying them long; by the end of

Quarter 6, 119 of the 129 stocks (92 percent) had fallen in price. Of course, as was mentioned earlier, the NASDAQ Composite Index fell 47.35 percent, thus greatly contributing to the downward trend in sample share prices. However, the 119 stocks which lost value plummeted 70.35 percent, an almost 50 percent greater decrease than the market in general.

Table IV provides mean cumulative returns, along with the standard deviations and coefficients of variations of the excess returns of both large cap and small and medium cap stocks over the appropriate market index. Since all these results would prove disastrous for an investor who added only stocks reaching their five-year lows to a portfolio, it appears that the five-year low is a better sell signal than it is a buy signal.

In addition to the analysis portrayed in Tables II, III, and IV, the three, six, nine, twelve, fifteen, and eighteen month holding period returns of each stock were compared to the returns on either the S&P 500 Stock Index or NASDAQ Composite Index. Figures I through XII plot the returns on stocks minus the comparable returns for appropriate stock indices over the six quarters following the buy decision. Figures I through VI show the excess returns for large cap stocks from the sample (versus the S&P 500 Index over the same periods). Figures VII through XII show the excess returns for small and mid-cap stocks from the sample (versus the NASDAQ Index over the same periods). Each figure shows that an evenly-weighted portfolio of either type of stock would have fared worse over the time period evaluated than would the simple strategy of shorting a stock market index.

Conclusion

Of course, the time period under consideration matters. Fortunately, this study which ran from June 28, 2007 to March 11, 2009 captured returns in both a bull and bear market. However, an examination of sample stock performance during the great rally subsequent to March 9, 2009 (when the major indexes reached their lows in this bear market cycle) would have further tested the validity of the five-year low buying strategy. The five-year low in combination with other buying strategies should probably also be analyzed.

Notwithstanding these considerations, the results of this paper affirm the weak form of market efficiency and do not support the use of the five-year low as a stock trading strategy for an investor buying long. A larger implication of this result is the finding that Kitchin cycles either do not appear to be useful in characterizing stock prices or that their periodicity is considerably different than five years. Nevertheless, the results of the study do support the five-year low as a method for earning excess returns through short selling over the time period sampled.

Table I – Length of Kitchin Cycles Using S&P 500 Index, 1962-2009

Beginning Low Date	Ending Low Date	Years Elapsed
October 2002	March 2009	6.41
October 1998	October 2002	4.02
December 1994	October 1998	3.80
October 1990	December 1994	4.17
October 1987	October 1990	2.98
August 1982	October 1987	5.19
February 1978	August 1982	4.45
October 1974	February 1978	3.40
May 1970	October 1974	4.36
October 1966	May 1970	3.63
June 1962	October 1966	4.28

Table II - Comparison of Stocks with Positive and Negative Returns on a Quarterly Basis (N = 129)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6
Number and Percentage of Stocks with Positive Returns	43 (33%)	23 (18%)	59 (46%)	31 (24%)	21 (16%)	30 (23%)
Range of Returns	66.37% to .50%	61.72% to .29%	232.67% to 2.01%	89.58% to 1.71%	495.16% to .78%	351.35% to .47%
Average Return	14.79%	18.82%	28.66%	22.47%	40.86%	43.43%
Number and Percentage Not Changing	1 (1%)	0 (0%)	2 (2%)	4 (3%)	2 (2%)	4 (3%)
Number and Percentage of Stocks with Negative Returns	85 (66%)	106 (82%)	68 (52%)	94 (73%)	106 (82%)	95 (74%)
Range of Returns	-.63% to -93.87%	-.67% to -94.22%	-.1.18% to -73.64%	-.67% to -97.93%	-1.46% to -100%	-.34% to -100%
Average Return	-27.34%	-24.67%	-26.25%	-30.10%	-44.45%	-40.98%

Table III- Comparison of Stocks with Positive and Negative Returns on a Cumulative Basis (N = 129)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6
Number and Percentage of Stocks with Positive Returns	43 (33%)	23 (18%)	33 (26%)	22 (17%)	18 (14%)	10 (8%)
Range of Returns	66.37% to .50%	58.59% to .16%	87.03% to .65%	119.92% to 1.54%	70.21% to .97%	70.21% to 2.42%
Average Return	14.79%	19.72%	26.39%	35.53%	19.92%	25.88%
Number and Percentage Not Changing	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Number and Percentage of Stocks with Negative Returns	85 (66%)	106 (82%)	96 (74%)	107 (83%)	111 (86%)	119 (92%)
Range of Returns	-.63% to -93.87%	-.80% to -99.11%	-.35% to -99.74%	-1.10% to -99.72%	-3.64% to -100%	-1.30% to -100%
Average Return	-27.34%	-36.54%	-44.31%	-51.56%	-65.24%	-70.35%

Table IV – Comparison of Large and Small/Mid-Cap Stocks with Market Indexes

Excess Returns from Using 5-Year Low to Buy Stocks Versus Buying S&P 500 Index							
		One Quarter Return	**Two Quarter Return**	**Three Quarter Return**	**Four Quarter Return**	**Five Quarter Return**	**Six Quarter Return**
LARGE CAP n = 15	**Mean**	-16.08%	-30.08%	-27.68%	-30.36%	-32.04%	-28.97%
	Standard Deviation	20.36%	25.42%	34.87%	35.21%	26.07%	24.79%
	Coefficient of Variation	-79.00%	-118.32%	-79.38%	-86.24%	-122.90%	-116.86%

Table V

Excess Returns Using 5-Year Low to Buy Stocks Versus Buying NASDAQ Index							
		One Quarter Return	**Two Quarter Return**	**Three Quarter Return**	**Four Quarter Return**	**Five Quarter Return**	**Six Quarter Return**
SMALL / MID CAP n = 114	**Mean**	-17.80%	-17.29%	-18.06%	-21.54%	-19.17%	-19.54%
	Standard Deviation	27.42%	32.49%	40.75%	55.26%	42.17%	40.17%
	Coefficient of Variation	-64.92%	-53.22%	-44.31%	-38.99%	-45.46%	-48.64%

Figure I - Excess Returns One Quarter Later--Large-Cap

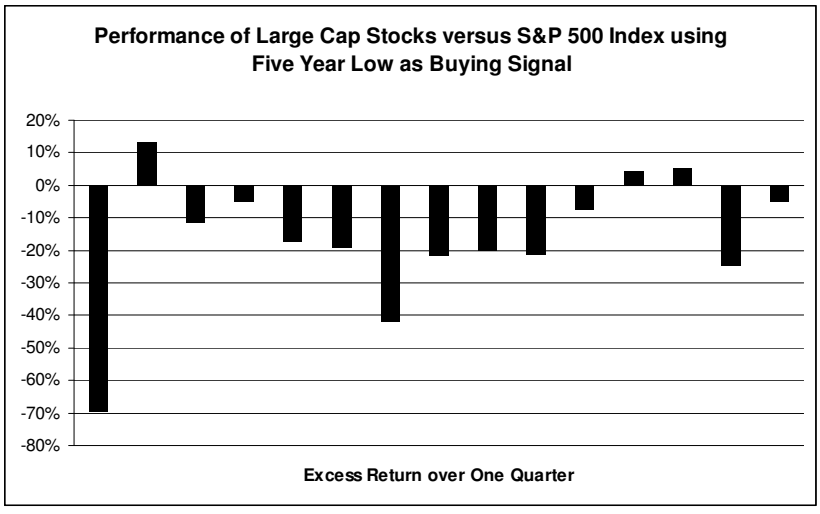


Figure II – Excess Returns Two Quarters Later—Large Cap

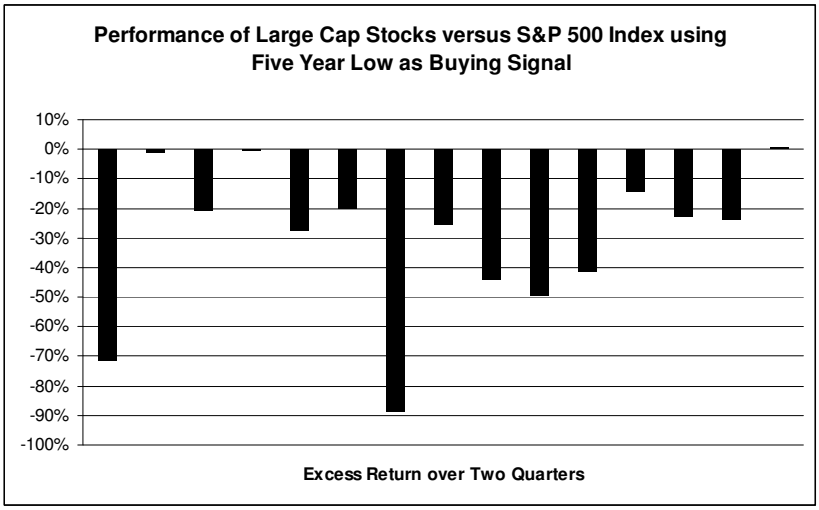


Figure III – Excess Returns Three Quarters Later—Large Cap

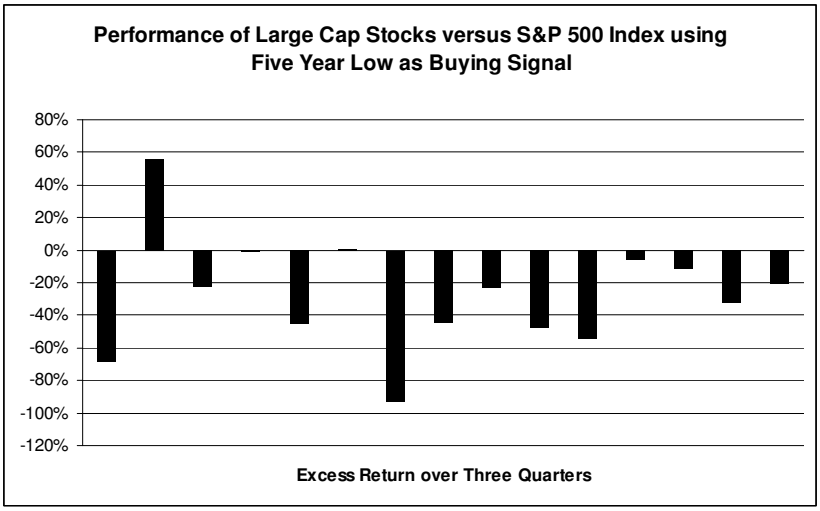


Figure IV – Excess Returns Four Quarters Later—Large-Cap

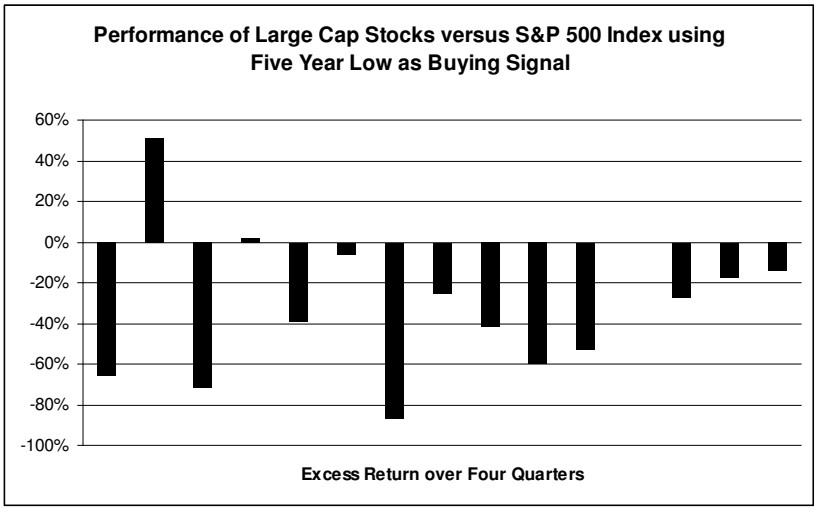


Figure V – Excess Returns Five Quarters Later—Large-Cap

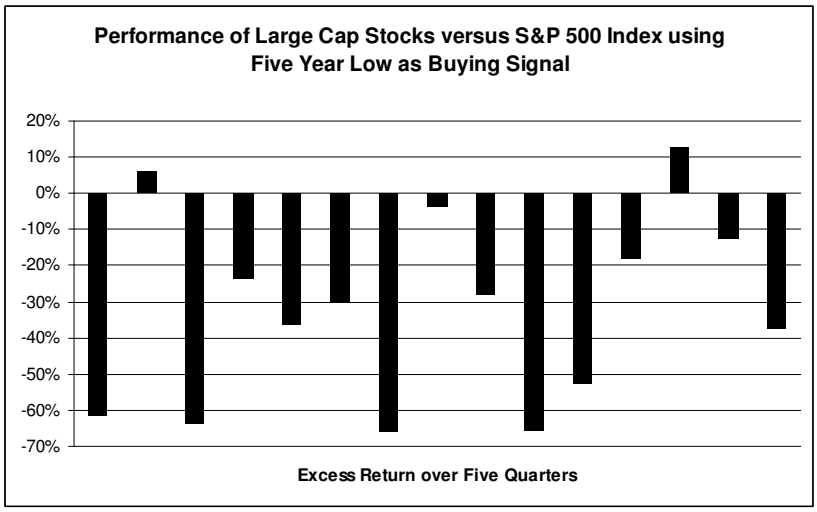


Figure VI – Excess Returns Six Quarters Later—Large-Cap

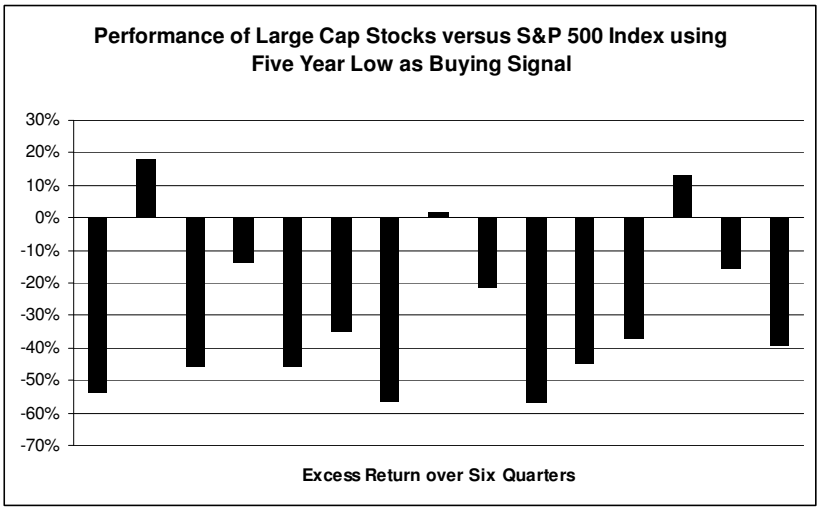


Figure VII – Excess Returns One Quarter Later—Small and Mid-Cap

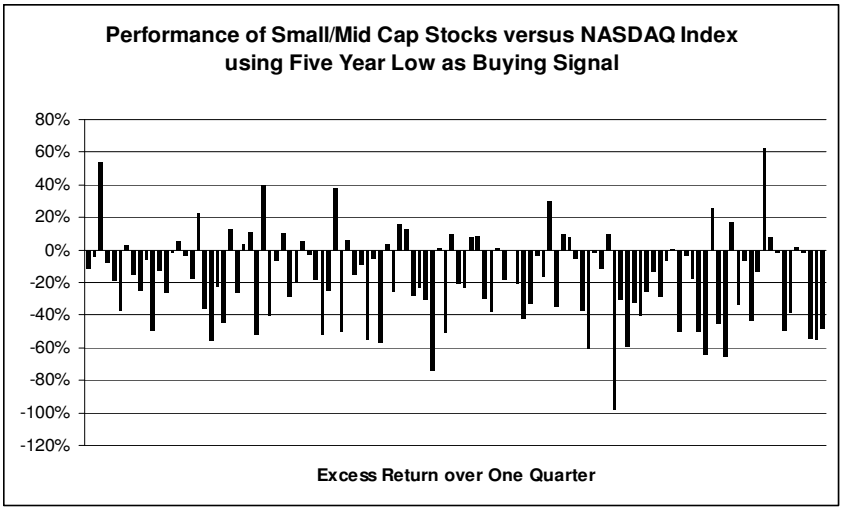


Figure VIII – Excess Returns Two Quarters Later—Small and Mid-Cap

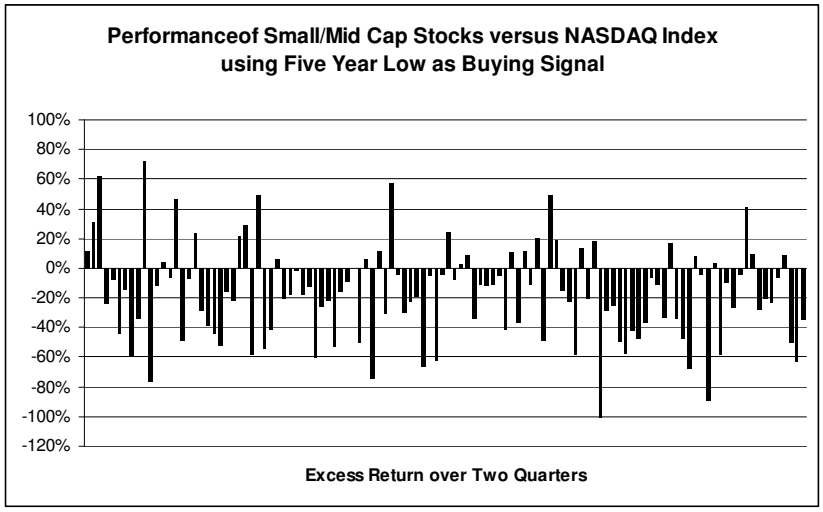


Figure IX - Excess Returns Three Quarters Later—Small and Mid-Cap

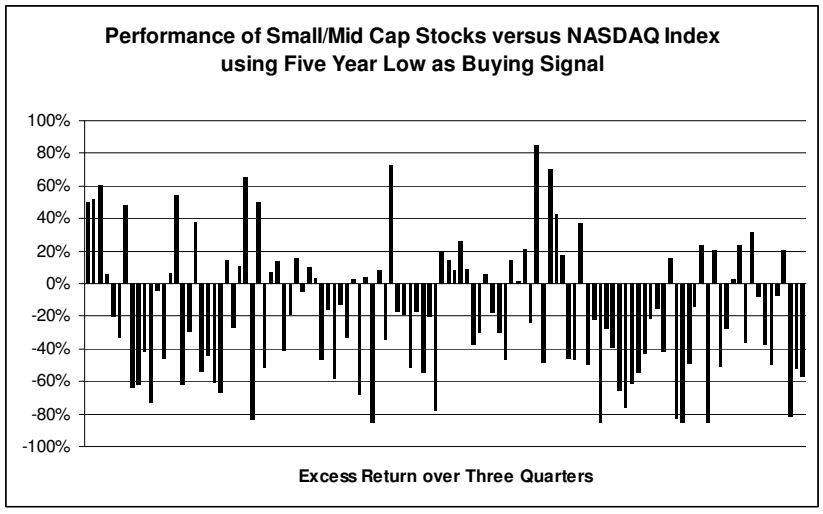


Figure X - Excess Returns Four Quarters Later—Small and Mid-Cap

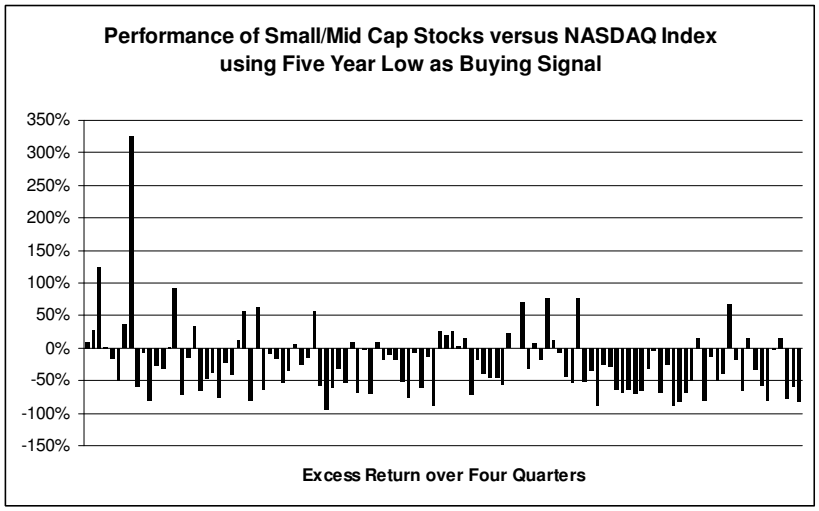


Figure X1 - Excess Returns Five Quarters Later—Small and Mid-Cap

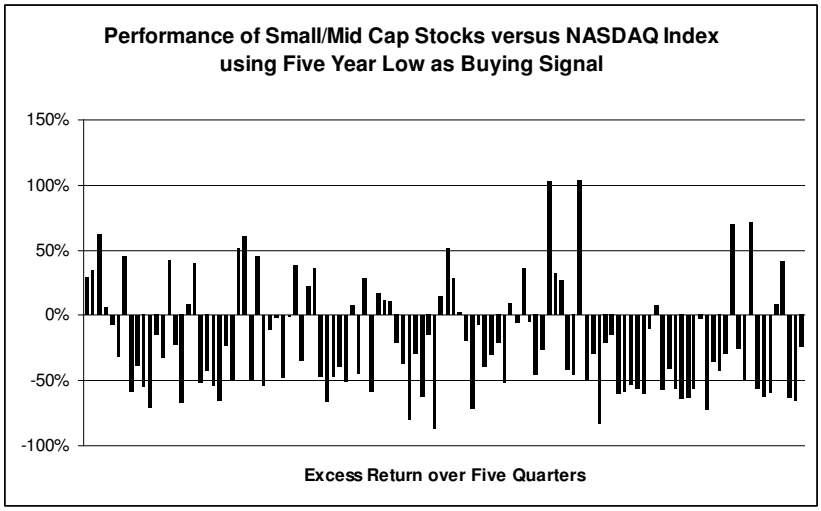
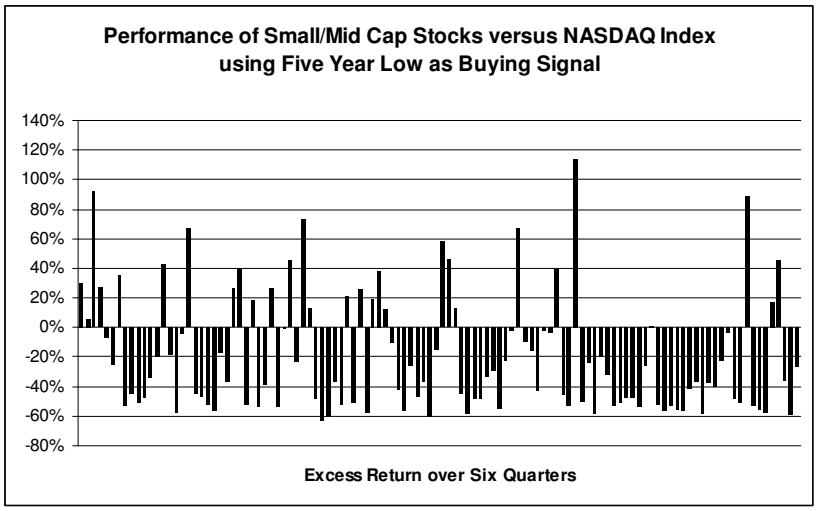


Figure XII - Excess Returns Six Quarters Later—Small and Mid-Cap



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Switching Strategies for Individual Investors: Recent Evidence from the Self-directed Family of CREF Retirement Accounts

Charles R. Rayhorn, Kenneth R. Janson, and James W. Drosen

Abstract

Systematically moving an investment balance from one account to another, and then back again, with the hope of generating returns that exceed those from a buy-and-hold alternative, is the essential description of a switching strategy. In this study, month-end switching is examined within the funds available to TIAA-CREF retirement plan participants. Data are reviewed through the end of 2008. While the transaction cost and tax acceleration hurdles that typically disadvantage switchers are mooted with the CREF strategy, institutional and regulatory impediments have remained daunting. While a simulated CREF Stock/Money Market switching strategy has yielded a positive *wealth relative* when compared to buy-and-hold over the period of study, the window of opportunity for this particular switching implementation has been closed by a recent SEC rule change. Nevertheless, opportunities to profitably implement switching appear to remain plausible through self-directed retirement brokerage accounts.

I. Introduction

Investment strategists have long sought to discover trading algorithms which might boost returns over those attainable through simple buy-and-hold approaches. One class of promising algorithm involves the systematic switching of account balances between or among two or more investment vehicles. Investigations have focused on the opportunities for enhanced returns faced by both institutional and individual investors. In historical data, researchers have identified many candidate strategies which promise premium return opportunity, but those higher gross returns have been achievable only with measurable additional cost. Generally, a switching strategy must overcome three obstacles before it can compete successfully on a net return basis with a buy-and-hold baseline. First, a switching strategy implies transaction costs – to be viable, a switching algorithm must out-perform buy-and-hold by at least the measure of these incremental direct costs. Historically, high transaction cost hurdles have been a particularly daunting deterrent for individual investors who might wish to switch. Second, in accounts where realized gains and losses are currently taxable events, switching strategies have the potential to expose the investor to significant current incremental tax burdens and, at a minimum, increased tax reporting and compliance costs. Third, in some of the sponsored investment product lines where switching strategies have been feasible to implement, institutional and regulatory barriers have, from time-to-time, checked the active individual investor's ability to switch.

One systematic switching strategy that has received some research attention involves a perceived turn-of-month (TOM) effect purported to exist in the returns of U.S. equity securities. Equity indices are, it is has been shown, highly unstable generators of returns. Market volatility is such that, for any reasonably long holding period, there will be many days with positive returns and many days with negative returns. The system trader's challenge is to identify an actionable pattern in the returns, and trade accordingly. For myriad hypothesized reasons, indices such as the Dow Industrial Average or the Standard & Poor's 500 are thought to

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systematically display higher returns in the few days surrounding each monthly calendar change, with more modest returns experienced during the remainder of the month. A TOM switching strategy establishes a long position in the equity index or a diversified basket of stocks just prior to the month-end, maintains the position over the calendar change, and liquidates it shortly thereafter. Liquidation proceeds are invested at money market rates for the ensuing weeks until a second foray into the equity index is launched at the next TOM. The investment returns to such a switching strategy, after transaction costs have been deducted, are compared to the indicated returns from a simple buy-and hold strategy.

Under the tax-code, investment gains of individuals are generally deferred until realized through the ultimate sale of an investment position. Thus, gains accruing in a buy-and-hold portfolio escape current taxation while gains that are realized through a switching algorithm might face hefty current tax levies. The potential acceleration of tax obligations is a second hurdle that aspiring switchers must clear.

While a switching strategy can certainly be implemented with a simple brokerage account, some investment plan sponsors provide families of investment opportunities and permit the movement of fund balances among their various funds. Administrative considerations influence the feasibility of switching strategies utilizing such sponsored investment plan accounts. Regulatory and sponsor-imposed rules that limit in-and-out transactions constitute a third hurdle for a successful switching strategy.

II. The Literature

Systematic switching strategies have been developed to exploit calendar based effects thought to be present in the return streams of U.S. equities. Wachtel (1942) first described a January effect which attributed above average returns to the first month of the year – a December sell-off, motivated by desires to create tax-losses for the previous year, is generally regarded as a leading enabler of the January effect. Kunkel and Compton (1998) summarize the January effect literature, noting the finding by Riepe (1998) that opportunities to exploit the effect have diminished.

Cross (1973) first documented the existence of a negative Monday effect in the returns of equities. Kamara (1997) shows that the intensity of the purported Monday effect, and by extension it's potential as a profitable basis for a switching strategy, has diminished over time.

Ariel (1987) described a month-end pattern in the returns of stock portfolios. He found that returns for the first half of the month exceed, on average, returns for the latter half. Subsequent studies (Lakonishok and Smidt, 1988) and (Ogden, 1990) narrowed the range for superior returns to the few days surrounding month-end, and supported two hypotheses that liquidity issues motivated those returns. First, institutional investors seek to reposition portfolios before month end, resulting in a concentrated month-end sell-off of some positions. Second, near month-end in-flows of investable funds to the household sector stimulates a short-lived surge in demand for investments at the beginning of the next month. Henzel and Ziemba (1996) found that this TOM effect could be profitably exploited by switching between an S&P 500 portfolio and a money market account. They examined the S&P 500 from 1928 to 1993 and determined that average daily returns were positive during TOM (defined in this study to be the last trading day of the month plus the first four trading days of the next month) and the first half

of the month. The second half of the month was negative. They concluded that "the cumulative wealth effects of investment during various time periods magnify the effects. The results indicate that the total return from the S&P 500 over this sixty-five-year period was received mostly during the turn of the month. The strategy of being long the S&P 500 during the TOM or the FH and long T-bills otherwise has very high total returns (exceeded only by small stocks). When risk is considered, this strategy dominates all the strategies considered, including small-stock investment."

Kunkel and Compton (1998) examined the CREF Stock fund to see if academicians can exploit TOM to earn a higher return while reducing overall risk. By being in the CREF Stock Account from day -4 to day +2 (four trading days before the end of the month through the second trading day of the next month) and in the Money Market Account the rest of the time their CREF Stock and Money Market portfolio earned an average annual return of 17.7% compared with a 15.6% annual return for a buy-and-hold strategy in the CREF Stock portfolio. For reference, buy-and-hold in the CREF Money Market portfolio yielded 5.8% over the period studied.

McConnell and Xu (2008) found that in U.S. equities, the effect is "found to be so powerful in the 1926-2005 period that, on average, investors received no reward for bearing market risk except at turns of the month. The effect is not confined to small-capitalization or low-price stocks, to calendar year-ends or quarter-ends, or to the United States… (They found) that it occurs in 31 of the 35 countries examined. Furthermore, it is not caused by month-end buying pressure as measured by trading volume or net flows to equity funds. This persistent peculiarity in returns remains a puzzle in search of an answer."

III. Institutional and Regulatory Environment

TIAA-CREF is a retirement plan trustee and investment management company that serves individuals in the fields of higher education, medicine, the arts and research. TIAA-CREF is the primary custodian for employer sponsored retirement plans for University faculty in the United States. A notable characteristic of the TIAA-CREF system is its long history of progressively embracing the concept of self-direction of retirement savings by individual participants. Several investment vehicles are available through TIAA-CREF and account owners are permitted to frequently re-allocate their savings among the funds. Historically, transfers among the various funds have been affected at net-asset-value, which is calculated daily. This costless-transfer feature has virtually eliminated the transactions cost hurdle that aspiring switchers must first confront. Further, as a retirement plan, gains and losses that are realized when transferring out of one TIAA-CREF fund and into another are deferred until the plan owner begins to withdraw retirement income. The second hurdle, addressing potential current tax exposures, is also cleared when switching is implemented within a retirement plan such as TIAA-CREF. It is within this protected environment that Kunkel and Compton (1998) first found their significant results.

On May 23, 2005, the Securities and Exchange Commission issued rule 22c-2 under the Investment Company Act of 1940. The new regulation became effective on October 16, 2007. Essentially, the rule addresses a perceived free-rider problem that plagues managers of mutual funds. By law, mutual fund investors must be able to remove their investments and receive their pro-rata shares of fund assets. For long-term investors, this requirement is not burdensome, but when investors frequently trade in and out of a fund, they generate administrative costs for the

fund that, through reduced net returns, all investors must share. While not mandating redemption fees on short-duration investments in mutual funds, the SEC rule did empower fund trustees to apply such redemption fees when, in their judgment, such action was in the fund's best interest. Further, the rule prohibits certain short-duration redemptions:

> Rule 22c-2 prohibits a fund from redeeming shares within seven days after the share purchase unless the fund meets three conditions. First, the board of directors must either (i) approve a redemption fee, or (ii) determine that imposition of a redemption fee is either not necessary or not appropriate. Second, the fund (or its principal underwriter) must enter into a written agreement with each financial intermediary under which the intermediary agrees to (i) provide, at the fund's request, identity and transaction information about shareholders who hold their shares through an account with the intermediary, and (ii) execute instructions from the fund to restrict or prohibit future purchases or exchanges. Third, the fund must maintain a copy of each written agreement with a financial intermediary for six years. (SEC, 2005)

IV. The Studies

While several researchers have documented the erosion of opportunities to exploit some calendar effects, notable the January and so-called Monday effects, the persistence of TOM noted by McConnell and Xu (2008) motivates a revisiting of the CREF switching strategy first examined by Kunkel and Compton (1998). We find that TOM is still present in the CREF stock account at the end of 2008, but is no longer directly exploitable through a CREF based multiple account switching strategy. That opportunity was closed administratively by the implementation of SEC rule 22c-2 on October 21, 2007.

We examine the relative performance of a buy-and-hold investment in the CREF stock account and a switching strategy utilizing the CREF stock and money market accounts. We also examine the relative performance of static and switching strategies based upon the Dow Jones Industrial Average.

V. Data and Methodology

Daily data for CREF Stock and Money Market were obtained from TIAA-CREF (2009a) and (2009b). Daily data for the DJIA was obtained from yahoo.com (2009). The time period for the study is from 3 January 1992 through 31December 2008.

T-Values test the null hypothesis that average daily return is not significantly different than 0.00 for each of the 3 data series for 9 trading days before and after the end of the month. The test is applied for the period 3 January 1992 through 31 December 2007 and again from 2 January 2008 through 31 December 2008. The second interval was one of the worst years in recent history for the stock market. The results of these tests determined the TOM interval for the studies. Money market returns were always significantly different from zero, but returns in the two equity market series were clustered significantly around the TOM. Our analysis proceeded with a TOM interval from day (-4) to day (+2). Wealth Relatives were then calculated for 1992-2007, for the year 2008, and for two 7 year sub- periods, 1992-1999 and 2000-2007. The purpose for the 7 year calculations was to compare and contrast performance during a largely bullish market with performance that was first bullish and then very bearish.

VI. Results

Table 1 shows the average daily returns during various periods for trading days -9 through 9. For the 1992-2007 period CREF exhibits only three significant trading days -2, 1 and 7 (day 7 is at the 10% level), while the DJIA shows only one significant day, trading day 1. Not surprisingly all trading days for the Money Market are highly significant.

For the 1992-1997 time period, a period similar to the Kunkel and Compton study, CREF exhibits 7 significant trading days (one more than the Kunkel and Compton study)—but three of these days are at the 10% level. The DJIA shows significance at day 1, compared with two days (1 & 2) for the Kunkel and Compton study. All days are highly significant for the Money Market series.

For the 1998-2007 time period, CREF and the DJIA exhibit two significant trading days. All days are highly significant for the Money Market series.

For 2008 CREF experiences one trading day (-4) that is significant at 10%. The DJIA experienced no trading days that were significantly different than 0. All trading days were significant and positive for the Money Market, but days -9 and -8 were at the 10% level.

The same TOM time period that Kunkel and Compton used (-4 to 2) is used in this study. For all of the four panels in Table I most of the TOM trading days were positive regardless of whether they are significantly different than 0. This will help explain the better, albeit negative returns exhibited by the switching portfolios in 2008.

Figure I Panel A shows a graph of the wealth relatives (for those of us in Finance, the FVIF) for 2008. The wealth relatives for the CREF & MM, DJIA & MM, CREF, DJIA, and the Money Market are 0.78, 0.82, 0.60, 0.66, and 1.02 respectively. This increase in compounded return comes with some reduction in risk as measured by standard deviation. The Coefficients of Variation for the CREF & MM, DJIA & MM, CREF, and DJIA, are -14.45, -15.80, -15.34, and -17.66 respectively. The Money Market, while not a risk-free asset has a CV of 1.29.

Figure I Panel B shows a graph of the wealth relatives (for those of us in Finance, the FVIF). The wealth relatives for the CREF & MM, DJIA & MM, CREF, DJIA, and the Money Market are 8.98, 6.47, 4.48, 4.12, and 1.87 respectively. This increase in compounded return comes with a large reduction in risk as measured by standard deviation. The Coefficients of Variation for the CREF & MM, DJIA & MM, CREF, and DJIA, are 10.51, 13.35, 22.06, and 24.94 respectively. The Money Market, while not a risk-free asset has a CV of 1.43. Remember CV is the amount of risk per unit of return. The lower the CV numbers the better.

VII. Conclusion

While opportunities to exploit more celebrated calendar effects such as the January effect and the week-end effect have waned in recent years, the Turn-of-Month (TOM) effect remains a fruitful area for seeking excess returns. The clever CREF account switching strategy proposed by Kunkel and Compton remains viable in theory, but recent mutual fund redemption fee rule changes mandated by the SEC seem to have closed this window to practical application. We find compelling evidence that a TOM motivated switching strategy can be profitably applied to a

broad based market index. Ever more cost effective brokerage opportunities suggest that a TOM motivated strategy might overcome the transaction cost hurdle in a self-directed retirement brokerage account. That question motivates our continuing inquiry into TOM phenomena.

Table I

Average Daily Returns during the Turn of the Month Period

*****1%, **5%, *10% levels for t-test where the null hypothesis is the return is not different than 0**

		1992-2007				1998-2007	
	CREF	DJIA	MM		CREF	DJIA	MM
Day	Return	Return	Return	Day	Return	Return	Return
-9	-0.003%	-0.060%	0.016%***	-9	0.059%	-0.031%	0.015%***
-8	-0.025%	-0.069%	0.014%***	-8	-0.043%	-0.127%	0.014%***
-7	-0.073%	-0.071%	0.014%***	-7	-0.108%	-0.099%	0.013%***
-6	-0.025%	-0.005%	0.014%***	-6	-0.009%	0.016%	0.013%***
-5	0.010%	0.036%	0.019%***	-5	0.005%	0.012%	0.017%***
-4	0.068%	0.044%	0.017%***	-4	0.033%	-0.003%	0.014%***
-3	0.082%	0.055%	0.014%***	-3	0.053%	0.049%	0.013%***
-2	0.137%**	0.090%	0.015%***	-2	0.126%	0.088%	0.013%***
-1	0.080%	-0.121%	0.014%***	-1	0.069%	-0.135%	0.013%***
1	0.255%***	0.320%***	0.021%***	1	0.298%***	0.329%***	0.019%***
2	0.056%	0.057%	0.015%***	2	0.002%	0.014%	0.014%***
3	0.020%	0.060%	0.015%***	3	-0.039%	0.044%	0.014%***
4	0.084%	0.063%	0.015%***	4	0.137%	0.094%	0.013%***
5	-0.016%	0.030%	0.016%***	5	0.004%	0.059%	0.015%***
6	-0.084%	-0.045%	0.019%***	6	-0.134%	-0.093%	0.017%***
7	-0.109%*	-0.068%	0.014%***	7	-0.186%**	-0.157%*	0.013%***
8	0.028%	0.066%	0.014%***	8	0.010%	0.064%	0.013%***
9	0.040%	0.040%	0.014%***	9	0.001%	-0.020%	0.013%***
		1992-1997				2008	
	CREF	DJIA	MM		CREF	DJIA	MM
Day	Return	Return	Return	Day	Return	Return	Return
-9	-0.107%	-0.110%	0.018%***	-9	0.060%	-0.087%	0.006%*
-8	0.006%	0.026%	0.015%***	-8	-0.338%	-0.274%	0.011%*
-7	-0.020%	-0.024%	0.016%***	-7	-0.944%	-0.630%	0.008%***
-6	-0.050%	-0.040%	0.016%***	-6	-0.859%	-0.732%	0.008%***
-5	0.019%	0.077%	0.021%***	-5	0.105%	0.148%	0.008%***
-4	0.128%*	0.121%	0.021%***	-4	1.849%*	1.560%	0.009%***
-3	0.130%**	0.066%	0.015%***	-3	0.095%	0.048%	0.009%***
-2	0.154%**	0.092%	0.017%***	-2	0.080%	0.083%	0.009%***
-1	0.101%*	-0.096%	0.015%***	-1	0.443%	0.372%	0.013%***
1	0.184%**	0.306%***	0.024%***	1	-0.575%	-0.487%	0.013%***
2	0.147%*	0.131%	0.016%***	2	-0.146%	-0.020%	0.012%***
3	0.120%*	0.088%	0.017%***	3	-0.846%	-0.758%	0.011%***
4	-0.006%	0.012%	0.017%***	4	-1.057%	-0.907%	0.014%***
5	-0.050%	-0.018%	0.018%***	5	-0.289%	-0.378%	0.011%***
6	-0.001%	0.034%	0.021%***	6	-0.276%	-0.098%	0.010%***
7	0.019%	0.082%	0.016%***	7	-0.578%	-0.572%	0.007%***
8	0.059%	0.068%	0.015%***	8	-0.604%	-0.643%	0.007%***
9	0.105%	0.140%	0.016%***	9	1.416%	1.272%	0.011%***

Day represents the trading days around the turn of the month, with -1 being the day before and 1 being the first day of trading, etc.

Figure I Panel A

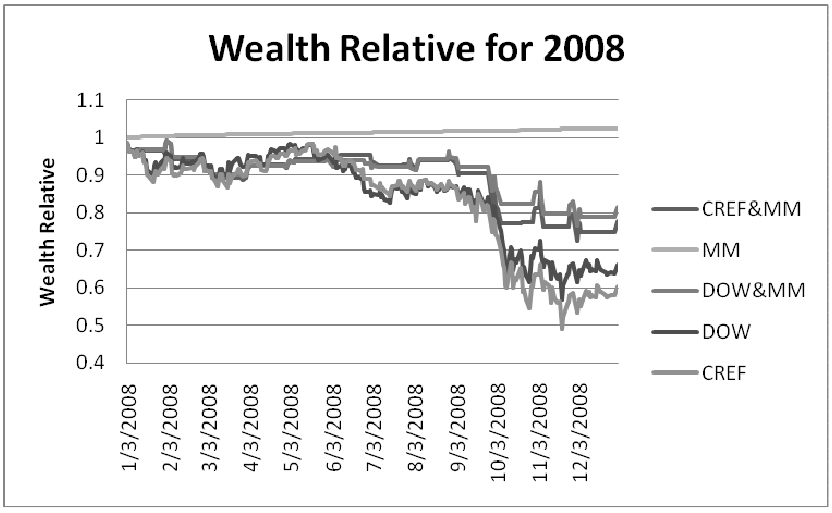
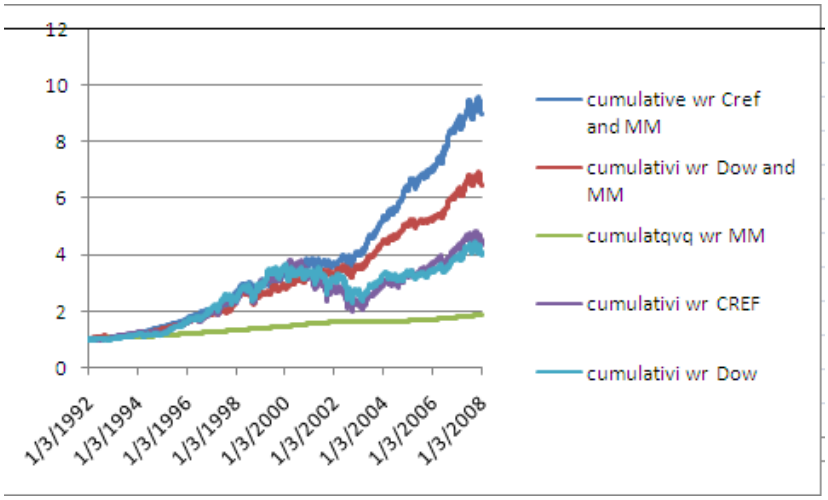


Figure I Panel B

Wealth Relatives for 1992-2007



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Geometric or Arithmetic Mean: A Reevaluation

Raja Bouzouita, Amandeep Singh Saini, and Arthur J. Young

Abstract

This study evaluates two competing forecasting models of rates of returns and recommends the preferable model for academicians and practitioners. In the first model, which was developed by Jacquier, Kane, and Marcus (2002), the forecast is a weighted mean between the geometric mean and the sum of the geometric mean and half the variance, where the weights are determined by the relative importance of the estimation period and the forecasting period. The second model, which is an adaption by Bodie, Kane, and Marcus (2008) of the first model, where the arithmetic mean is substituted for the sum of the geometric mean and half the variance. This substitution is not explained or justified in any way. The purpose of this paper is to explore the statistical significance and impact on forecasts of this substitution. In theory, these two models could be the same in large samples generated from normally distributed returns. However, the relative ability of these two competing models to forecast for small samples of actual returns is unknown. In this study, we use three approaches to compare these two models. First, we compare the inputs, the arithmetic mean and the sum of the geometric mean plus half the variance, of the two competing models. Next, we compare the forecasts of the two competing models. Last, we compare the forecasting errors of the two competing models. We find statistically significant differences in the inputs and the forecasts, but no meaningful difference in the models' performance of forecasts as indicated by forecasting errors. In light of these results, despite the statistical differences, we find no economic difference between the forecasting errors of the two models and recommend the simpler of the two models which uses the arithmetic mean.

I. Introduction

When academicians develop competing models without testing the differences between the models, then practitioners and other academicians are uncertain which model is better to use. This problem is all the more confusing when two of the authors are the same for both models. Jacquier, Kane, and Marcus (2002) develop the first model as a weighted mean between the geometric mean and the sum of the geometric mean and half the variance, where the weights are determined by the relative importance of the estimation period and the forecasting period. The second model is developed by Bodie, Kane, and Marcus (2008) is a similar model except the arithmetic mean is substituted for the sum of the geometric mean and half the variance. Although the second model references the first, no justification for the substitution is given. This situation raises the question of the statistical significance and economic impact of this substitution. The empirical exploration of this question in small samples of various short-term time horizons is the focus of this paper.

Theoretically, in large samples with normally distributed returns that are independently and identically distributed through time, the arithmetic mean is exactly equal to the sum of the geometric mean and half the variance. Hence, in theory, there should be no difference between these two forecasting models. However, in small samples of real data, the distribution rates of return can change over time and exhibit serial correlation through time. This leads to four

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questions. First, in small samples of actual rates of return, is the estimate of the arithmetic mean equal to the sum of the estimates of the geometric mean and half the variance? Second, are forecasts generated by these two competing models equal to each other? Third, if forecasts are generated from a variety of historical data, then are there economically significant differences in the forecasts of the two models? Finally, given the analysis of the first three questions, then which model is preferable? In this paper, we analyze the first three questions and then recommend the model of overall preference.

II. Literature Review

For decades there has been recurring interest in forecasts of long-term portfolio returns. Should the geometric or the arithmetic mean of past returns be used to forecast future returns of individual investments and portfolios? The existence of significant differences between the two measures, as some authors suggest, may have important implications on the valuation of assets, and the extent of the equity –bond premium (long-run difference return advantage of stocks over government bonds). The debate over arithmetic and geometric means started with the birth of portfolio theory. Markowitz (1952) first developed portfolio theory in terms of mean/variance optimization which assumed higher moments were zero. This symmetrical distribution is consistent with normally distributed rates of return, not lognormally distributed rates of return. The mean used by Markowitz was the arithmetic mean.

However, Latane (1959) showed that, if investors want to select the portfolio with highest terminal wealth, they would select the portfolio with the highest geometric mean return. Elton and Gruber (1974 a) derive optimal portfolio theory for lognormally distributed returns. Then in Elton and Gruber (1974 b), the authors show that if returns are lognormally distributed, then maximizing the geometric mean maximizes expected utility.

Damodarian (2002) states "Conventional wisdom argues for the use of the arithmetic mean. In fact, if annual returns are uncorrelated over time, and our objective was to estimate the risk premium for the next year, the arithmetic mean is the best unbiased estimate of the premium. In reality, however, there are strong arguments that can be made for the use of geometric means. First, empirical studies seem to indicate that returns on stocks are negatively correlated over time. (See Fama and French 1988). Consequently, the arithmetic mean return is likely to overstate the premium. Second, while asset pricing models may be single-period models, the use of these models to get expected returns over long periods (such as 5 or 10 years) suggests that the single period model may be much longer than a year. In this context, the argument for geometric mean premiums becomes even stronger."

In contrast, when considering which is the superior measure of investment performance, the arithmetic mean or the geometric mean, Bodie, Kane, and Marcus (2002) state the following. "The geometric average has considerable appeal because it represents the constant rate of return we would have needed to earn in each year to match actual performance over some past investment period. It is an excellent measure of *past* performance. However, if our focus is on future performance, then the arithmetic average is the statistic of interest because it is an unbiased estimate of the portfolio's expected future return (assuming, of course, that the

expected return does not change over time). In contrast, because the geometric return over a sample period is always less than the arithmetic mean, it constitutes a downward-biased estimator of the stock's expected return in any future year." Their example uses returns that are independent over time. This statement does not consider any possible bias in the forecasting of terminal portfolio value that was first described by Blume (1974). Although Blume considered this bias, his assumption of normally distributed returns did not result in a measure of this bias.

Jacquier, Kane, and Marcus (2002) start with lognormal distributed stock price returns and state the simple mathematical fact that if the distribution of returns is known for certain, then the expected value of the distribution is the arithmetic mean. However, if the true distribution of returns is not known, then sampling from the lognormal distribution with a right-hand skew introduces a bias that varies with the ratio of the length of the forecasting period and the length of the estimation period. They propose a compound growth rate that provides unbiased estimates of future portfolio values as the following:

$$G\,(F/E) + (G + 1/2\sigma^2)(1 - (F/E)) \qquad (1)$$

where G is the historical geometric mean of stock price returns, F is the forecast horizon, and E is the estimation period.

Based on this research article, Bodie, Kane, and Marcus (2008), in their popular MBA investment textbook, have the forecast of cumulative returns equals:

$$G\,(F/E) + \mu\,(1 - (F/E)) \qquad (2)$$

where μ is the historical arithmetic mean of stock price returns. In the above expression, the authors Bodie, Kane, and Marcus substituted the arithmetic mean for the geometric mean plus half the variance. Jacquier, Kane, and Marcus state that for more volatile investments the difference in the arithmetic and geometric mean is larger than half the variance. This calls into question the substitution of the arithmetic mean into the forecasting model in the textbook by Bodie, Kane, and Marcus. What is the impact of this substitution on the forecast of long term returns? Additionally, Jacquier, Kane, and Marcus present only long term forecasts of large samples. Practitioners are also interested in the accuracy of both forecasting models with short-term forecasts in small samples. Therefore, this paper proposes to compare the equivalence of these two models and the comparative accuracy of each model in a variety of settings.

III. Data

Our objective is to explore differences in sampling distributions characteristics of the forecasting models in a variety of settings. Therefore, we perform similar analysis on three different data sets. The first set uses rolling samples of the monthly returns of 10 randomly selected companies representing the different sectors in the economy from 1995 through 2007 covering financial services, manufacturing, and technology sectors. The companies returns used in this study with their ticker symbol in parentheses are: General Electric (GE), International Business Machines Corp. (IBM), Bank of America Corp (BAC), AT & T Inc (T), Texas

Instruments, Inc (TXN), The Boeing Co (BA), Dell Inc. (DELL), Walt Disney (DIS), American International Group Inc. (AIG), and Exxon Mobil Corp. (XOM).

The second set consists of rolling samples of the rates of return on five asset classes (Treasury bills, intermediate–term Treasury bonds, long-term Treasury bonds, large cap stocks, and small cap stocks) from 1926 through 1995 given in Bodie, Kane, and Marcus (2002). The first estimation period is 15 years covering 1926-1940 and subsequent15-year samples are repeated until 1995 resulting in 56 samples.

The third data set starts with the second data set to generate rolling samples of mean-variance optimized portfolios for given levels of risk aversion for each five year sample with ending date in 1935 through 1995. The mean variance framework of the third data set requires knowledge of expected returns. The implementation uses historical returns. Mean-variance optimization framework efficiently allocates wealth to the five asset classes: small cap stocks, large cap stocks, long–term Treasury bonds, intermediate-term Treasury bonds, and treasury bills for different levels of investor preferences for high expected returns. The procedure entails first computing the means and covariance matrix from actual sample of historical returns of the five asset classes. The sample size is set to be 10 years. The optimization is performed for five different levels of risk preferences: (1) minimum, (2) conservative, (3) moderate, (4) aggressive, and (5) maximum. We calculate minimum variance subject to maximum return, which is the highest mean return of asset class for the given period, by changing the weight of portfolio. Then we calculate returns on conservative, moderate, and aggressive portfolio plans. We set the risk aversion coefficient (A) as 1, 5, and 10 and keeping them constant we calculate expected returns, where A=1 is aggressive risk aversion coefficient and A=10 as conservative. We simultaneously calculate the utility ($U= E(R) - 1/2\sigma^2A$) and expected returns.

The use of rolling samples from these diverse data sets is intended to reveal the sampling distribution characteristics of these two models in small samples with different short-term forecasting horizons. The issue of possible differences in sampling distribution properties between the estimates of the arithmetic mean and the sum of the geometric mean plus half the variance is the underlying reason for questioning the substitution of the first statistic for the second statistic by Bodie, Kane, and Marcus. Additionally, the variation in the impact on forecasting errors from this substitution becomes apparent in the contrasting data sets.

IV. Methodology

To analyze the differences in the sampling distribution characteristics, we perform three types of tests on each of the three data sets. First we test if the estimate of the arithmetic mean is equal to the estimate of the sum of the geometric mean plus half the variance.

Sampling the monthly stock returns of 10 randomly selected companies from February 1995- December 2007, we estimate the arithmetic mean, geometric mean and the variance using 96 rolling samples of 60 months. Using the average of the statistics of the 96 rolling samples, we calculate the difference between the estimate of the arithmetic mean and the estimate of the sum of the geometric mean and half the variance. We perform similar test on the second sample covering five asset classes (Treasury bills, intermediate–term Treasury bonds, long-term

Treasury bonds, large cap stocks, and small cap stocks). The estimation period is 15 rolling years starting with the first sample covering 1926-1940. We estimate the arithmetic mean, geometric mean and the variance using rolling samples which gives us 56 estimates. We conduct similar test on the third data set of returns generated from optimized portfolios over 46 rolling samples from 1936-1995.

Next, we forecast future returns using Jacquier, Kane, and Marcus (2003) proposed weighted average and Bodie, Kane and Marcus (2008) with the substitution of the sum of the geometric mean and half the variance for the arithmetic mean. For the first data set, we calculate monthly forecast returns over 1 year and 7 year horizons, based on 5-year estimation periods for 10 randomly selected individual company stocks returns. Two forecast periods are chosen to see the influence of the difference between the forecast and estimation periods on the forecasted returns as the models by Jacquier, Kane, and Marcus (2003) and Bodie, Kane, and Marcus (2008) are weighted averages of geometric and arithmetic means with the weights measured by the relative importance of the forecast and estimation periods. For the second data set, using 15 year-estimation periods with annual returns of the five asset classes, we forecast future returns over a short term horizon of 10 years, and a long term horizon of 20 years. By using 15- year estimation periods, we end up with 56 rolling samples for the 10-year forecasts and the 20-year forecasts. Similar estimation period short term (10 years) and long term (20 years) forecast horizons are used for the third data set comprising optimized portfolio annual rates of returns. We have 36 rolling samples for the short-term and the long term forecasts. We calculate the difference of the sample mean forecasts of the two models and perform a t-test for statistical significance in the difference. This test allows us to determine whether both models yield similar forecasts.

For the third hypothesis of the economic significance of any difference in the forecasts of the two models, our criterion is that one model has low forecasting error when the other has high forecasting error. The procedure for testing this hypothesis is to first estimate the forecasting errors using Jacquier, Kane and Marcus (2003) formula and actual returns and forecasting error using Bodie, Kane, and Marcus (2008) formula and actual returns. We apply this procedure to all data sets. We test for economic significance in the difference in forecasts over long-term and short-term time horizons. We want to explore small sample properties in different time horizons.

V. Results

Table 1 reports the results pertaining to the first hypothesis whether it is appropriate to substitute the arithmetic mean for the sum of the geometric mean plus half the variance. We test this hypothesis with a series of t-tests of the difference between the estimate of the arithmetic mean of rates of return and the estimates of the sum sample geometric mean plus half the variance. With the first data set covering monthly returns of ten randomly selected individual stocks, nine out of the ten there was statistically significant difference in the estimates. With the second data set, we find statistically significant difference between the estimates using annual rates of return of five asset classes. With the third data set, we find statistically significant difference between the estimates using annual rates of return generated from five optimized portfolios with varying degrees of risk aversion. Therefore, based on these statistically significant differences in three different samples, we conclude that the arithmetic mean is not

equivalent to the sum of the geometric mean plus half the variance in small samples.

Table 2 shows the results of the second hypothesis whether the forecasts generated from the two models are the same. We test this hypothesis with a series of t-tests in the mean difference in the forecasts. With the first data set, eighteen out of twenty differences in forecasts were statistically different. With the second and the third data set, all the differences in the forecasts, short-term and long-term, are statistically significant. Therefore, based on these statistically significant differences in three different samples, we conclude that the two models yield different forecasts.

Table 3 reports the results for the hypothesis of the economic significance of any difference in the forecasts of the two models. For economically significant difference in the forecasting models, our criterion is that one model has low forecasting error when the other has high forecasting error. For data set one, the estimation period is 5 years and the forecast periods are 1 and 7 years. The two forecasting errors are strikingly similar. Over the short-term forecast horizon, the difference between the actual return and forecast is statistically significant for five individual stocks. However, over the longer horizon forecast period, 7 years, nine out of ten individual stock returns forecast error is statistically significant and negative (Table 3a). For data set two, using five asset classes annual rates of return, the forecasting errors are negative and statistically significant for the five asset classes for the short-term forecast (10 years). Similar results are found for the long-term forecasts (20 years) except that the forecasting error for small stock is no longer statistically significant (Table 3b). The third data set, using returns from optimized portfolios, the forecasting errors are statistically significant for three out of the five optimized portfolios. Overall, by the criterion stated above, the two models forecasting ability has no economically significant difference.

V. Conclusion

In conclusion, we evaluated the differences between two competing forecasting models of rates of return. The first model by Jacquer, Kane, and Marcus (2002) is a weighted mean between the geometric mean and the sum of the geometric mean and half the variance, where the weights are determined by the relative importance of the estimation period and the forecasting period. The second model by Bodie, Kane, and Marcus (2008) is a similar model except the arithmetic mean is substituted for the sum of the geometric mean and half the variance. Academics and practitioners are interested in choosing between these two competing models.

Theoretically, in large samples with normally distributed returns, the arithmetic mean is exactly equal to the sum of the geometric mean and half the variance. So, in theory, there should be no difference between these two forecasting models. However, when we used small samples of actual rates of returns from three different data sets, (ten individual stocks, five asset classes, and five optimized portfolios), our analysis finds there is a statistically significant difference between estimates of the arithmetic mean and estimates of the sum of the geometric mean and half the variance. This difference between these estimates results in a statistically significant difference in forecasts generated by the two models. Looking at forecasting errors of the two

models in a variety of data, we find that the forecasting errors are very similar, and that generally when one model works well, so does the other. So while there are statistically significant differences in forecasts of these two models, there is no economically significant difference in their forecasting errors. As the second model is more compact, simpler, and performs as well as the first, it is the preferable forecasting model to use.

Table I

Test for the difference between the sum of the geometric mean plus half the variance and arithmetic mean of the rates of return, (*t* test statistics with significance in italics).

$$DIFFERENCE = (G + 1/2\sigma^2) - \mu$$

Data Set One

For ten individual companies, the mean difference in monthly percent return.

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
0.01 *15.10****	0.013 *26.17****	-0.013 *-10.3****	-0.001 *-3.36****	0.060 *14.35****	0.001 *1.23*	0.01 *10.99****	0.023 *21.8****	0.037 *8.95****	0.01 *30.26****

Data Set Two

For five asset classes, the mean difference in annual percent return.

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
0.0023 *6.27****	0.0263 *5.86****	0.0298 *6.95****	0.2245 *17.36****	1.9810 *8.10****

Data Set Three

For five optimized portfolios, the mean difference in annual percent returns.

Minimum	Conservative	Moderate	Aggressive	Maximum
0.002 *5.81****	0.015 *18.05****	0.018 *13.26****	0.041 *15.0****	0.038 *16.2****

Table II

Test for the difference between forecasted return by the original forecasting model by Jackier, Kane, and Marcus minus the simplified forecasting model by Bodie, Kane, and Marcus, (*t* test statistics with significance in italics).

$$DIFFERENCE = [\ G\ (F/E) + (\ G + 1/2\sigma^2\ )(\ 1 - (F/E)\ )\ ] - [\ G\ (F/E) + \mu\ (\ 1 - (F/E)\ )\ ]$$

Data Set One

For ten individual companies, the difference of forecasts based on monthly percent return.

Short-term forecast

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
0.005	0.011	-0.013	-0.002	0.046	0.001	0.006	0.020	0.030	0.005
*15.1****	*31.57****	*-10.3****	*-4.06****	*14.35****	*-1.23*	*13.25****	*26.28****	*10.8****	*30.26****

Long-term forecast

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
-0.0025	-0.0054	0.0052	0.001	-0.043	-0.0004	-0.0028	-0.010	-0.0148	-0.002
*-15.1****	*-31.5****	*10.27****	*4.06****	*-14.3****	*1.23*	*-13.2****	*-26.3****	*-10.8****	*-30.2****

Data Set Two

For five asset classes, the difference of forecasts of annual percent return.

Short-term forecast

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
0.0008	0.0088	0.0099	0.0748	0.6603
*6.27****	*5.86****	*6.95****	*17.36****	*8.10****

Long-term forecast

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
-0.0008	-0.0088	-0.0099	-0.0748	-0.6603
*-6.27****	*-5.86****	*-6.95****	*-17.36****	*-8.10****

Data Set Three

For five optimized portfolios, the difference of forecasts of annual percent return.

Short-term forecast

Minimum	Conservative	Moderate	Aggressive	Maximum
0.0003	0.0044	0.0047	0.0122	0.0111
*5.08****	*17.8****	*16.0****	*12.9****	*13.1****

Long-term forecast

Minimum	Conservative	Moderate	Aggressive	Maximum
-0.0003	-0.0049	-0.0048	-0.0127	-0.0117
*-10.5****	*-19.4****	*-13.7****	*-10.4****	*-10.5****

Table III (a)

The forecasting error of the original forecasting model by Jacquier, Kane, and Marcus and the simplified forecasting model by Bodie, Kane, and Marcus.

$$ERROR\ OF\ ORIGINAL\ MODEL = [\ G\ (F/E) + (\ G + 1/2\sigma^2\ )(\ 1 - (F/E)\ )\ ]\ - ACTUAL$$

$$ERROR\ OF\ SIMPLIFIED\ MODEL = [\ G\ (F/E) + \mu\ (\ 1 - (F/E)\ )\ ]\ - ACTUAL$$

Data Set One

For ten individual companies, the mean forecasting error based on monthly percent rate of return (t statistic in parenthesis)

Short-term forecast

Original model forecasting error

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
1.22	0.10	-0.24	0.02	3.16	0.30	1.09	1.15	2.48	-0.07
*5.04****	*0.32*	*-0.80*	*0.15*	*7.18****	*1.01*	*3.69****	*4.29****	*4.80****	*-0.36*

Simplified model forecasting error

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
1.22	0.09	-0.23	0.01	3.10	0.3	1.09	1.13	2.45	-0.07
*5.06****	*0.29*	*-0.76*	*0.13*	*7.10****	*1.01*	*3.67****	*4.21****	*4.76****	*-0.39*

Long-term forecast

Original model forecasting error

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
2.64	0.97	-0.12	-0.25	6.05	1.06	3.00	2.44	3.96	0.58
*24.6****	*15.3****	*-0.85*	*-2.45***	*13.8****	*9.10****	*39.4****	*19.4****	*13.0****	*12.6****

Simplified model forecasting error

AIG	T	BA	BAC	DELL	DIS	GE	IBM	TXN	XOM
2.64	0.97	-0.13	-0.26	6.09	1.07	3.00	2.45	4.00	0.58
*24.5****	*15.4****	*-0.85*	*-2.49***	*13.9****	*9.13****	*39.5****	*19.5****	*13.1****	*12.7****

Table III (b)

The forecasting error of the original forecasting model by Jacquier, Kane, and Marcus and the simplified forecasting model by Bodie, Kane, and Marcus.

$$ERROR\ OF\ ORIGINAL\ MODEL\ = [G\ (F/E) + (G + 1/2\sigma^2)(\ 1 - (F/E)\ )\ ]\ -\ ACTUAL$$

$$ERROR\ OF\ SIMPLIFIED\ MODEL = [G\ (F/E) + \mu\ \ (1 - (F/E))]\ -\ ACTUAL$$

Data Set Two

For five asset classes, the forecasting error of annual percent returns.

Short-term forecast

Original model forecasting error

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
-2.02 *-8.04****	-1.99 *-4.75****	-1.57 *-3.01***	-1.83 *-1.45*	3.17 *1.99**

Simplified model forecasting error

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
-2.02 *-8.05****	-2.00 *-4.76****	-1.58 *-3.02***	-1.91 *-1.51*	2.39 *1.49*

Long-term forecast

Original model forecasting error

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
-3.17 *-14.65****	-2.40 *-5.74****	-1.62 *-2.66***	-1.41 *-1.02*	-1.61 *-0.93*

Simplified model forecasting error

Treasury Bills	Intermediate-Term Treasury Bonds	Long-Term Treasury Bonds	Large Stock	Small Stock
-3.17 *-14.65****	-2.39 *-5.74****	-1.62 *-2.65***	-1.32 *-0.95*	-0.74 *-0.43*

Table III (c)

The forecasting error of the original forecasting model by Jacquier, Kane, and Marcus and the simplified forecasting model by Bodie, Kane, and Marcus.

$$ERROR\ OF\ ORIGINAL\ MODEL = [G\,(F/E) + (G + 1/2\sigma^2)(\,1 - (F/E)\,)\,] - ACTUAL$$

$$ERROR\ OF\ SIMPLIFIED\ MODEL = [G\,(F/E) + \mu\,(1 - (F/E))\,] - ACTUAL$$

Data Set Three

For five optimized portfolios, the forecasting error of annual percent return.

Short-term forecast

Original model forecasting error

Minimum	Conservative	Moderate	Aggressive	Maximum
-2.55 *-8.46****	-0.82 *-0.96*	-0.17 *-0.16*	2.08 *2.18***	3.14 *3.93****

Simplified model forecasting error

Minimum	Conservative	Moderate	Aggressive	Maximum
-2.55 *-8.46****	-0.82 *-0.96*	-0.17 *-0.16*	2.07 *2.17***	3.13 *3.92****

Long-term forecast

Original model forecasting error

Minimum	Conservative	Moderate	Aggressive	Maximum
-3.15 *-9.60****	1.05 *1.67*	2.44 *2.86***	5.06 *7.29****	5.37 *7.20****

Simplified model forecasting error

Minimum	Conservative	Moderate	Aggressive	Maximum
-3.15 *-9.59****	1.05 *1.68*	2.44 *2.87***	*5.07* *7.30****	*5.38* *7.18****

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Exchange Traded Funds: Impact on Diversification

Raj Aroskar

Abstract

The diversification potential of iShares is investigated by using sixteen iShares representing two different regions. VAR is used to detect both bidirectional relations between iShares and indexes and regional relations within iShares and indexes. Though iShares do capture information from their home markets, they also have an impact on their home market. Thus, it may be difficult for US investors to avoid systemic impact from the US market. Also, there are regional influences on individual European indexes and iShares and on Asian indexes leading to limitations for diversification. However, Asian iShares do not demonstrate any regional relationships and hence would lend themselves for diversification purposes.

Introduction

This study analyzes the diversification potential of exchange traded funds (ETFs) representing international markets. Relationships among assets are detrimental for diversification. If there are relationships in underlying markets, such relationships may get propagated in assets trading in the US. Furthermore, if assets trading in the US affect their underlying markets, investors may not realize the desired diversification. Hence, it is not only important to investigate just whether ETFs in the US mimic their underlying country markets; it is equally important to detect if ETFs impact their respective country markets and whether (present or absent) regional relationships among markets are demonstrated in the ETFs. This study contributes this important extension to the literature by using iShares trading in the U.S.

Morgan Stanley originally launched exchange traded funds, called World Equity Benchmark Shares (WEBS), that track the Morgan Stanley capital indexes representing world markets. WEBS were later renamed as iShares. iShares are distributed by SEI Investments distribution company and Barclays Global Fund Advisors serves as the investment advisor to the funds. MSCI country indices include every listed security in that country adjusted for free float (MSCI Barra Online).

Past studies have analyzed the effect the US market and home markets on iShares. This line of literature has argued that, as iShares representing a country's index trade in the US, both the US market and the home market will have an impact on the iShare. (Zhong and Yang 2005), (Cheng, Fung, and Tse 2008), and (Pennathur, Delcoure and Anderson 2002) all find that iShares are affected by the US market. They imply that such an effect is detrimental for US investors seeking diversification through the conduit of iShares. (Zhong and Yang 2005) also argue that diversification benefits are questionable as they find that the US market is the permanent driving factor rather than the home country market. (Tse and Martinez 2007) use the price discovery and informational efficiency approaches to argue against any diversification benefits of iShares. Studies have also investigated effects iShares have on their underlying indexes. One such study by (Simon and Sternberg 2005) demonstrates the forecasting power of German, UK, and French iShares on NAVs. (Lin and Chiang 2005) show that establishment of the Taiwan Top 50 Tracker Fund, a Taiwanese ETF, increases the volatility of component stocks of the Taiwan 50 Index.

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[1]Currently MSCI Barra

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Thus, both the above studies find an impact of ETFs trading in the US on the underlying index or its components.

A different set of literature incorporates relationships among iShares. They have mostly used developed markets. For example: Datar, So, and Tse (2008) find commonality and spillover among US and Japanese ETFs trading in the US. In their study, (Barari, Lucey and Voronkova 2008) find lower long-term and short-term relationships among indexes and thus higher diversification potential. On the other hand, they show evidence that iShares representing G7 markets show increasing conditional correlations and significant time-varying long-run relationships with the US. They argue such evidence would limit the case for diversification via iShares.

The above studies use a limited number of iShares to study effects on country indexes. This study incorporates many more iShares from two different regions. In addition to looking at the impact of indexes on ETFs, this study investigates the impact ETFs have on their underlying indexes. Thus, it expands the literature by looking at bidirectional relationships between iShares and indexes. This provides an insight for investors intending to diversify away from their home markets. As iShares trade in investors' home markets, an impact of iShares on respective underlying markets may not be desirable.

The study further investigates regional relationships among indexes in Asia and Europe, and it identifies if such relationships are demonstrated in iShares. To the extent that regional relationships are absent in iShares, it is beneficial for investors to hold multiple iShares from the same region.

This study finds bidirectional relationships among iShares and their underlying indexes. It also finds regional relationships among European indexes being evident in iShares. However, even when Asian indexes show regional relationships, there are no such relationships between Asian iShares. Thus, investors seeking exposure to the foreign markets may not be able to avoid systemic impact from their home market. However, this does not preclude them from seeking diversification using multiple Asian iShares.

Data

Data for this study includes sixteen iShares and their respective indexes representing Austria, Belgium, France, Germany, Hong Kong, Italy, Japan, Korea, Malaysia, the Netherlands, Singapore, Spain, Sweden, Switzerland, Taiwan, and the UK. This allows investigation of two regions: Asia and Europe. For this study, the data included closing prices of iShares spanning March 8, 2004 through February 29, 2008. iShare price information has been obtained from Yahoo! Finance. The index information represents Morgan Stanley Capital Index (MSCI) indexes for the countries under investigation as obtained from MSCI Barra.

Methodology and Results

This study investigates bidirectional relationships amongst the ETFs and their respective indices. Vector Auto Regression (VAR), as indicated in the model below, is used to investigate such relationships.

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{i=1}^{i=r} b_i X_{t-i} + e_t \qquad (1)$$

Where,
Y_t = Log returns of dependent variable (index/iShares)
X_t = Log returns of independent variable (iShares/index)
i = number of lags.

Box- Ljung Q-statistic for serial correlation in the residuals is used to indentify optimal number of lags.

To investigate the effect of an index on a country's iShare trading is the US, the coefficient of all the lags of the index (independent variable) are equated to zero, while treating the iShare as a dependent variable. Rejection of this hypothesis indicates an effect of the index on the iShare. The above procedure is repeated individually for all the countries (included in this study) in Europe and Asia that have iShares trading in the US. The reverse relationship from iShare to index is investigated by switching the dependent and independent variables to index and iShare respectively.

Panels A and B of Table I display results for the impact of the indexes on the iShares for Europe and Asia respectively. As is evident from the results for each of the European iShares, there is an impact from their respective indices. For Europe, the null hypothesis of no impact from index to iShare is rejected for all countries at 1% level of significance and for Japan and Korea at 5% level of significance. However, the hypothesis cannot be rejected for Singapore and Taiwan. Thus, Asian indices affect their iShares in the case of Hong Kong, Malaysia, Japan, and Korea but not in the case of Singapore and Taiwan.

Panels A and B in Table II indicate the effect of the iShares on the indexes. In the case of Europe, the null hypothesis of no effect from an iShare to an index is rejected at 1% level of significance for all countries. Similar results are also found for all Asian countries. Thus, for both regions, individual iShares trading here in the US affect their respective country indices.
Regional relationships amongst iShares are investigated using the following VAR model

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{n=1,i=1}^{n=k,i=r} b_{n,i} X_{n,t-i} + \varepsilon_t \qquad (2)$$

Where,
Y_t = log returns of dependent variables (iShares/index)
$X_{n, t-i}$ = log returns of independent variables (iShares/index)
i= number of lags
n= number of countries within a region

The effect of regional iShares as a group affecting a single iShare within a region is identified by equating the coefficients of all lags of all independent variables (iShares) to zero. The rejection of this null hypothesis indicates that regional iShares as a group affect that (dependent) country's iShare. This test is repeated by alternatively treating each country's iShare as a dependent variable for both regions (Asia and Europe). Similar tests are performed for all indexes.

Tables III and IV display the results of the above tests for iShares and indexes, respectively. It is evident from the results in Panel A of Table III that in the European case, the null hypothesis of regional iShares as a group affecting a single iShare in that region cannot be rejected where Austria, Belgium, Germany, the Netherlands, and Switzerland are the dependent variables. However, such hypothesis can be rejected at 5% level of significance in the case of the UK, France, Sweden, and Spain and at 10% level of significance in the case of Germany and Italy.

Thus, the group of European iShares affects the iShares of France, Germany, Italy, Spain, Sweden and the UK but not those of Austria, Belgium, the Netherlands, and Switzerland.

Table IV, Panel A indicates that the null hypothesis of regional European indexes as a group not affecting individual country indexes of Europe is rejected at 1% level of significance in the case of Austria, Belgium France, Germany, Italy, the Netherlands, Spain, and Sweden, but not in the case of Switzerland and the UK. Thus, regional European indices as a group affect individual country indexes in all cases, except in the case of Switzerland and the UK.

Table III, Panel B shows that for Asia, the null hypothesis of Asian iShares having no group effect on individual country iShares cannot be rejected at 1% level of significance. Thus, Asian iShares as a group do not affect individual country iShares in the region.

According to Table IV, Panel B, for Asian indexes, the null hypothesis of them as a group not affecting individual regional indexes is rejected for all countries at 1% level of significance. Thus, the group of Asian indexes affects individual country indexes.

Discussion of Results

Results show that all European iShares are affected by their respective indexes. This is beneficial to investors seeking exposure to these foreign markets of Europe. Such exposure to foreign indexes can also be obtained in the case of Japan, Hong Kong, Malaysia, and Korea by investing in their respective iShares in the US. However, investors do not get exposure to the Singaporean and Taiwanese markets by investing in their iShares here in the US.

Investing in foreign markets is desirable for diversification benefits. To the extent that iShares trading in the US affect their respective country indexes, US market factors affect them. Hence, diversifying away from the US market is limited. It is evident from the results that iShare prices do affect their respective indexes in both regions. Hence, the extent of the diversification benefit obtainable to investors is unclear.

Regional indexes in both Europe and Asia affect individual indexes within the respective region (in all the case of Asia and all except Switzerland and the UK in Europe). Hence, indexes within the same region do not offer themselves for diversification. However, the iShares have interesting relationships for the two regions. In the case of Spain, France, Germany, the UK, Italy, and Sweden their iShares are affected by regional iShares in Europe. Hence, holding more than one of these iShares may not provide appropriate diversification for investors. On the other hand, investors may still get diversification by holding one of the aforementioned European iShares and the iShares of Austria, Belgium, the Netherlands, and Switzerland.

Like Europe, in the case of Asia, regional indexes as a group affect individual indexes. Hence, exposure to all indexes in Asia at the same time may not be in the best interest for investors. However, in contrast to Europe where there are some regional affects, for Asia there are no regional effects on any one iShare. This creates diversification opportunities for investors who want to hold multiple Asian iShares.

These results are interesting because iShares trading in the US do affect their respective indexes. But, that does not reduce the potential for diversification to investors. Nevertheless, they have to be aware of the region that they are investing in, as Asia offers all of its iShares for

diversification, but in Europe only select iShares can be used.

Conclusion

This study demonstrates that if investors are cognizant about the region, they can obtain diversification benefits by investing in iShares. It focuses on the bidirectional impact that iShares and respective indexes have on each other. Additionally it compares the regional impact for the two regions. It compares this potential in two regions (Asia and Europe) whose iShares trade here in the US.

Results show that iShares in both Europe and Asia (except Singapore and Taiwan) are exposed to their respective indexes. This exposure is beneficial to investors seeking diversification from the U.S. market. In comparison, iShares in both regions do affect their respective indexes. This implies an impact of U.S. systemic risk on foreign markets. Hence, the notion of reducing the impact of US market risk by investing in foreign markets is severely hampered. On the other hand, a closer look at regional iShares builds a case for holding multiple iShares within a region. Even if there are regional influences in the indexes, no such influences are carried over in the case of any Asian iShare. Similarly, in the case of European iShares (Austria, Belgium, the Netherlands, and Switzerland), there are no regional effects. Thus, investors can hold multiple iShares in Asia and select European countries and enjoy the benefits of diversification. It shows that iShares can still be used as vehicles for diversification.

Table I: Effect of Individual Country Indexes on Corresponding Country iShares

PANEL A: EUROPE

	Dependent Variable (iShare)									
Independent variable index	Austria	Belgium	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland	UK
Austria	12.49***									
Belgium		17.48***								
France			13.27***							
Germany				18.49***						
Italy					21.82***					
Netherlands						18.6***				
Spain							20.24***			
Sweden								4.43**		
Switzerland									1671***	
UK										6.29***

PANEL B: ASIA

	Hong Kong	Japan	Korea	Malaysia	Singapore	Taiwan
Hong Kong	4.35***					
Japan		3.95**				
Korea			3.56**			
Malaysia				13.76***		
Singapore					1.62	
Taiwan						1.8

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{i=1}^{i=r} b_i X_{t-i} + \varepsilon_t$$

Where,
Y_t = Log returns of dependent variable (index)
X_t = Log returns of independent variable (iShares)
i = number of lags.

*** 1% level of significance
** 5% level of significance

Table II: Effect of Individual iShares on Corresponding Country Indexes

PANEL A: EUROPE

	Dependent Variable (index)									
Independent Variable (iShare)	Austria	Belgium	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland	UK
Austria	51.57***									
Belgium		50.3***								
France			47.13***							
Germany				47.44***						
Italy					35.48***					
Netherlands						48.00***				
Spain							36.46***			
Sweden								51.28***		
Switzerland									33.96***	
UK										48.47***

PANEL B: ASIA

	Hong Kong	Japan	Korea	Malaysia	Singapore	Taiwan
Hong Kong	76.75***					
Japan		89.98***				
Korea			89***			
Malaysia				104***		
Singapore					84.38***	
Taiwan						70.47***

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{i=1}^{i=r} b_i X_{t-i} + e_t$$

Where,

Y_t = Log returns of dependent variable (iShares)

X_t = Log returns of independent variable (index)

i = number of lags.

*** 1% level of significance

Table III: Effect of Regional iShares as a Group on Individual iShares within the Region

PANEL A: EUROPE

	Dependent Variable (Country iShare)									
Independent Variable	Austria	Belgium	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland	UK
European iShares	0.95	0.97	1.87**	1.15*	1.53*	0.98	1.67**	1.65**	1.23	1.78**

PANEL B: ASIA

	Hong Kong	Japan	Korea	Malaysia	Singapore	Taiwan
Asian iShares	0.19	1.07	1.16	0379	0.22	0.52

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{n=1,i=1}^{n=k,i=r} b_{n,i} X_{n,t-i} + e_t$$

Where,

Y_t = log returns of dependent variables (iShares)

$X_{n,\,t-i}$ = log returns of independent variables (iShares)

i= number of lags

n= number of countries within a region

** 5% level of significance

* 10% level of significance

Table IV: Effect of Regional Indexes as a Group on Individual Indexes within the Region

PANEL A: EUROPE

Dependent Variable(Country index)

Independent Variable	Austria	Belgium	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland	UK
European index	1.72***	1.88***	2.16***	1.91***	2.02***	2.24***	2.31***	2.37***	1.66	2.25

PANEL B: ASIA

	Hong Kong	Japan	Korea	Malaysia	Singapore	Taiwan
Asian index	5.32***	5.92***	2.68***	3.25***	1.85***	2.40***

$$Y_t = \sum_{i=1}^{i=r} a_i Y_{t-i} + \sum_{n=1,i=1}^{n=k,i=r} b_{n,i} X_{n,t-i} + \varepsilon_t$$

Where,

*** 1% level of significance

Y_t = log returns of dependent variables (index)

$X_{n,\,t-i}$ = log returns of independent variables (index)

i= number of lags

n= number of countries within a region

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Yen Carry Trade and Interest Rate Parity

Jin-Gil Jeong

Abstract

The "yen carry trade," borrowing in yen and investing in high yield currency prompted by the low Japanese interest rate, has been prevalent for the last ten years or so. We find that the outcome of the 3-month uncovered "yen carry trade", beginning March 1st of each year, tends to be positive for the last ten years. However, the results show that the source of returns on the "yen carry trade" in recent years is not interest rate differentials, but rather, the depreciation in the value of the yen. Interestingly, we find that the Korean won is the most attractive investing currency because returns are consistently positive except for one year, and large enough to exceed typical transaction cost.

I. Introduction

It has been known that the recent global economic crisis was triggered by the burst in the housing price bubble. The burst caused a liquidity crunch by (i) a sudden loss in property value and mortgage backed securities and (ii) increased counterparty risk suspecting integrity of any transaction resulting from failures of Bear Sterns and Lehman Brothers. Interestingly, we found that the first casualty country in liquidity crunch was Iceland during the worldwide financial crisis. The International Monetary Fund provided a $10 billion financial aid package in 2008.

The root of the economic catastrophe experienced by Iceland is 'carry trade' or 'currency carry trade,' a popular tool for investment professionals such as hedge funds or private equities. The idea of carry trade is simple: borrow money in a country at a lower interest rate and invest the money in another country generating higher yields. As long as the exchange rate between the two currencies is stable or the value of the borrowing currency is depreciating, carry traders are able to make profits.

Historically, the interest rates in Iceland tended to be much higher than those in European countries. Also, the exchange rate of the Icelandic krona against the euro, especially against the British pound, has been stable until the global financial crisis started in the second half of 2008. Many European depositors, especially British, deposited their money in Iceland's commercial banks to earn higher yields than their home countries. As a result, Iceland experienced a surge in capital inflows and foreign currency reserves and thus, a stable value of the Icelandic krona.

As the global financial crisis progressed, all depositors from European countries wanted to withdraw their deposits from Icelandic banks and convert to their home currencies such as the euro or the pound. Thus, Iceland caught up with the liquidity crunch and the value of Icelandic krona plunged facing a Wile E. Coyote moment: a sudden drop from a cliff in the value of a currency. Krugman (2007a, 2007b) publicized that the recent value of the U.S. dollar might experience the Wile E. Coyote moment due to huge a cumulative trade deficit of the U.S. But Iceland experienced the moment due to the liquidity crunch resulting from a huge exodus of

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capital in reserve currency such as the euro, British pound and U.S. dollars.

On the other hand, the Bank of Japan, the central bank, maintained a low interest rate policy- close to zero or zero percent in order to revive the economy during the last ten years or so. It is well known that Japan experienced a chronic recession as the bubble in its stock market and real estate market burst in the 1990's. Furthermore, the value of yen against the US dollar has been very stable, if not depreciating, for the last ten years or so as seen in Table 1. Thus, the direction of the yen carry trade by investment professionals is the opposite of carry trade in Iceland: Borrow money in Japanese yen at a very low cost or no cost at all and invest the money mostly in the U.S. markets earning higher yields. It has been known that investment professionals borrowed money heavily in Japanese yen. According to the Economist (2007), the Bank of Japan and the Japanese Treasury officials, in fact, estimated the yen borrowings by foreign banks and investment firms to be $64 billion to $160 billion, much larger than an IMF rescue package of $10 billion for Iceland.

Interestingly, before the current global financial crisis, academic research and many financial press warned about the implications of unwinding of the 'yen carry trade' in global financial markets e.g., Adrian and Shin (2007), Hattori and Shin (2007), Plantin and Shin (2008), Rosenbush (2007) Davies (2008), Dennis (2008), and Economist (2007, 2008). Specifically, Adrian and Shin (2007) and Hattori and Shin (2007) argued that huge borrowings in yen and its multiplier effects of the "yen carry trade" by financial institutions in the U.S. might cause a liquidity crisis when the traders start to unwind the carry trade. In addition to the problems embedded in mortgage backed securities and credit default swaps, it is clear that recent unwinding of the carry trade - converting US dollar to yen to repay the debt in yen as the value of yen starts to appreciate - contributed to the recent liquidity crunch as the value of US dollar faced a Wile E. Coyote moment.

In the context of an equilibrium in money and exchange markets, however, the profits (or losses) from the carry trade represent a deviation from the uncovered interest rate parity (UIRP) condition, implying that there exists an opportunity for uncovered interest arbitrage (UIA). In this paper, instead of testing whether the interest rate parity holds, covered or uncovered, we calculate the realized return of the of "yen carry trade" investing in 5 currencies: US dollar, Korean won, New Zealand dollar, Australian dollar and Icelandic krona. We also calculate standard deviations of the returns and coefficient of variation for the carry trade strategies.

Considering the significant implications of the "yen carry trade" in global financial markets, it is worthwhile to calculate the realized returns of the carry trade. Thus, the purpose of this paper is to confirm the magnitude of the realized returns on the yen carry trade for the last ten years using the Interest Rate Parity (IRP) concept. Specifically, we obtain real world data from public domain websites and the Bloomberg service. Then, we demonstrate the process of the yen carry trade by calculating realized returns for the last ten years.

II. Interest Rate Parity (IRP)

The return from the covered yen carry trade (r) can be measured as follows,

$$r = (i_{\$} - i_{¥}) - (\frac{F - S_0}{S_0} + \frac{F - S_0}{S_0} i_{¥}) \approx (i_{\$} - i_{¥}) - (\frac{F - S_0}{S_0}) \quad (1)$$

Where F is forward exchange rate and S_0 is spot exchange rate. Exchange rates are in American terms. $i_{\$}$ is US interest rate and $i_{¥}$ is Japanese interest rate. Although $\frac{F - S_0}{S_0} i_{¥}$ can be interpreted as risk premium on holding yen assets (Goyal and McKinnon 2002), it tends to be negligible. We delete the product term since we find it to be negligible with our data.

By replacing F with $\tilde{S}_1$, future spot exchange rate unknown at time 0, the expected return from the uncovered yen carry trade ($E(\tilde{r})$) can be measured as follows,

$$E(\tilde{r}) = (i_{\$} - i_{¥}) - (\frac{E(\tilde{S}_1) - S_0}{S_0} + \frac{E(\tilde{S}_1) - S_0}{S_0} i_{¥}) \approx (i_{\$} - i_{¥}) - (\frac{E(\tilde{S}_1) - S_0}{S_0}) \quad (2)$$

Furthermore, we delete the product term, $\frac{E(\tilde{S}_1) - S_0}{S_0} i_{¥}$, since it is negligible. For simplicity, we use a non-continuous compounding IRP instead of a continuous compounding.

III. Yen Carry Trade

A. Data

We collected the data from 3 sources; www.economagic.com, www.ny.frb.org and the Bloomberg service. In Table 1, we show the LIBOR data retrieved from www.economagic.com and the ¥/$ exchange rate data obtained from www.ny.frb.org. We also collected return on currency carry trade data from the Bloomberg service, which used daily compounding, to verify our results obtained in Table 2 and to calculate the performance of other investing currencies. The Bloomberg service has a section for currency carry trades (FXCT) that calculates historical returns of carry trades with a diverse combination of currencies and positions. We chose the March 1st of each year arbitrarily as the beginning date of the 3-month yen carry trade.

B. Covered Interest Arbitrage (CIA)

The process of the yen carry trade is straightforward. As shown in Table 1, a trader borrows money in the yen at lower LIBOR rate (3rd column) and the trader converts the yen to the U.S. dollar at the current spot exchange rates (5th column), then the trader invests the money in the U.S. money market yielding much higher return (the 2nd column). The trader decides to hedge in terms of the changing value of the yen against the US dollar.

In Table 2, interest rate differentials for the 3-month LIBOR are shown in the 2nd column.

In addition, consistent with the IRP condition, a low interest rate in Japan results in a forward premium on the yen in the forward exchange market as shown in the 3rd column. We calculate the returns on the covered yen carry trade using the forward market hedging by subtracting forward premium from interest rate differentials as in Equation (1).

The results are shown in the CIA column. Since the benefit of a lower interest rate in Japan tends to be less than or equal to the cost of hedging, measured by the forward premium, the returns on the 3-month covered yen carry trade are negative or zero except for one year (2003). Conversely, the size of return on reverse positions (dollar carry trade), borrowing in the US dollar and investing in Japanese yen, appears to be too small to cover the transaction cost. Thus, the result implies that covered IRP tends to hold for a 3-month period because an arbitrage profit is not possible using the forward contract. In Figure 1, we observe graphically that there exists no distinction between the interest rate differential and forward premium, implying no arbitrage opportunity with CIA. In Figure 2, we also observe that the return on a 3 month CIA with U.S. dollar (USD-F) is negligible or negative compared with the return on the UIA with other investing currencies.

In Table 2, we also provide summary statistics for the interest rates, exchange rates and returns. While the mean interest rate differential is 0.850% for a 3-month period, the mean forward premium is 0.994% on average for the same period. Although not reported here, we also calculated returns on the 3- , 6- and 9-month covered interest arbitrages. The returns are mostly negative and are very similar in magnitude, implying that there exists no covered interest arbitrage opportunity.

C. Uncovered Interest Arbitrage (UIA)

1. *Short in Yen and Long in US dollar*

Our results indicate that covered IRP tends to hold for a 3-month period because an arbitrage profit is not possible using the forward contract. Thus, the traders tend to resort to currency speculation rather than currency hedging. We calculate the returns on the 3-month uncovered yen carry trades (or uncovered interest arbitrages) in Table 2. Interestingly, the value of yen tended to depreciate for the period between March 1st and June 1st each year for eight out of the last ten years as shown in Table 2 (4th column).

As specified in Equation (2), the return on 3-month uncovered yen carry trade is calculated by subtracting the change in 3 month spot (4th column) from the interest rate differential (2nd column). If the trader speculated between March 1 and June 1 each year, the yen carry trade was mostly profitable because the trader earned a positive return in the money market and another positive return in the exchange market due to depreciation in the value of yen in the spot market. Interestingly, the outcome of the uncovered yen carry trade (6th column) shows positive returns for eight out of the last ten years. In Figure 1, we observe the depreciation in the value of yen for 8 out of 10 years in addition to the positive return (or interest rate differential) in

the money market.

The size of returns on the uncovered yen carry trade is surprisingly large considering that these are returns for a three month period. Thus, the arbitrage opportunity, triggered by low interest rate in Japan, is far too attractive to pass up for the traders even with the transaction costs represented by the typical bid-ask spread. This implies that uncovered interest rate parity (IRP) is not holding as long as a trader is able to make a profit on the yen carry trade by doing currency speculation.

We retrieved the returns of the carry trade from the Bloomberg service (7^{th} column) to compare with our results. On the FXCT page of the Bloomberg service, as we specify positions and weights of each currency and time period, we can easily obtain the returns from the cumulative indexes. Specifically, we obtain the cumulative index by specifying 100% short position for the yen and 100% long position for the U.S. dollar. As we compare the two returns, they are very close, but not exactly the same due to the difference in the method of compounding: The Bloomberg service uses daily compounding for calculation of the indexes while we use quarterly compounding.

In addition to the mean interest rate differential of 0.850%, the mean depreciation of the value of yen is 0.389% on average during the same period. This implies that the traders might have arbitrage opportunities by making profits from exchange market as well as from the money market. The coefficient of variation (2.869) is quite large, implying the high risk to obtain the returns. Although not reported here, the size of annualized returns on the 6-month UIA trade tends to be smaller than the 3-month yen carry trade. It may indicate that the time horizon of speculation in currency trading is a critical factor in determining the magnitude of returns on the yen carry trade. Generally speaking, the traders with a longer time horizon are exposed to higher currency risk than the traders with a shorter time horizon because it is more difficult to predict the change in future spot exchange rates.

2. *Short in Yen and Long in Other Currencies*

Using the Bloomberg service, we report the results of the yen carry trade taking a long position in currencies other than the US dollar in Table 3 and Figure 2. We also provide summary statistics for the returns. Although the Australian dollar has the highest mean return (2.314%) out of the five investing currencies, its coefficient of variation (2.469) is much higher than that of the Korean won (1.917). A long position in the Korean won (KRW) produced positive realized returns consistently except once in 2008. The coefficient of variation is also smallest for KRW, implying the low risk per normalized return. As seen in Figure 2, the volatility of Australian dollar is more pronounced than that of the Korean won. All in all, the results of Korean won (KRW) are far better than taking a long position in the U.S. dollar (USD), New Zealand dollar (NZD), Australian dollar (AUD) or Iceland Kroner (ISK). This is likely due to the exchange rate between the Korean won and Japanese yen is generally stable. Also, the predictability of the exchange rate is relatively higher compared to other exchange rates.

D. Interest Rate Differentials or Yen/Dollar Exchange Rate

It is obvious that although the primary trigger of the yen carry trade was the low interest rate in Japan, return on the carry trade is not dependent upon interest rate differential, but rather, it is dependent upon the value of the yen against the US dollar in the spot market. As shown in Tables 1 and 2, for 8 out of the last 10 years, the future spot exchange rates realized in 3 months show depreciation rather than appreciation in contrast to the forward premium on yen observed at the beginning of the trade on March 1st each year. Thus, our results suggest that the forward rate might not be a predictor of the future spot exchange rate for the Japanese yen. However, the results seem to be consistent with the skewness of FX returns and stochastic bifurcations suggested in Plantin and Shin (2008). Although not reported here, our results are also consistent with the intuition: the longer the time horizon for currency speculation in yen, the less for the returns on the yen carry trade since it is more difficult to predict the future spot exchange rate.

IV. Conclusion

The "yen carry trade," borrowing in yen and investing in high yield currency prompted by the low Japanese interest rate has been prevalent for the last ten years or so. Recently, as the value of yen starts to appreciate, the traders are in hurry to unwind the carry trade averting losses. Thus, it has been alleged that activities of carry traders, who repay the yen borrowings as soon as possible, contributed to the liquidity crunch during the global financial crisis in 2008 and 2009.

We show the process of the "yen carry trade" by calculating realized returns for the last ten years. We find that the outcome of the 3-month uncovered yen carry trade, beginning March 1st of each year, tends to be positive for the last ten years. However, the results show that the source of returns on the yen carry trade in recent years is not interest rate differentials, but depreciation in the value of the yen. Thus, the carry trade is an arbitrage opportunity not accompanied by currency hedging (or covered IRP), but accompanied by speculation (or uncovered IRP). Interestingly, we find that the Korean won is the most attractive investing currency in that returns are consistently positive except for a year (2008) and large enough to exceed typical transaction cost.

Table I
Interest Rates (LIBOR) and Exchange Rates (Spot and Forward)

Year	Interest Rates			Exchange Rates		
	3/1/yyyy [a]			3/1/yyyy [b]		6/1/yyyy [b]
	3 month LIBOR (annualized)[a]		Interest rate differential	¥/$ spot	¥/$ 3-month forward	¥/$ Spot
	$i_{\$}$	$i_{¥}$	$(i_{\$}-i_{¥})/4$	S_0	F	S_1
1999	5.028	0.276	1.188	119.66	120.97	118.21
2000	6.110	0.129	1.495	108.01	108.82	106.36
2001	5.089	0.270	1.205	117.14	118.97	115.72
2002	1.901	0.114	0.447	133.28	123.69	132.66
2003[a]	1.339	0.058	0.320	117.93	119.27	117.59
2004	1.120	0.051	0.267	108.93	110.45	108.64
2005	2.930	0.051	0.720	104.37	108.42	103.53
2006	4.830	0.093	1.184	116.18	112.43	114.51
2007	5.348	0.721	1.157	117.53	122.10	115.84
2008[a]	3.014	0.968	0.512	103.57	105.29	102.36

a) yyyy represents the year specified in each row. For 2003 and 2008, LIBOR rates are collected for 3/3, due to observed holidays. Data source: www.economagic.com.
b) yyyy represents the year specified in each row. For 2003 and 2008, exchange rates are collected for 3/3 and 6/3 to be consistent with the money market. Data source: www.ny.frb.org.

Table II
Return on 3-month Yen Carry Trade (%)

Date	Money market	Exchange market		Return on 3-month Yen Carry Trade		
	Interest rate differential $(i_{\$}-i_{¥})/4$	3 month forward premium[a] $(F-S_0)/S_0$	Change in 3 month spot[a] $(S_1-S_0)/S_0$	Using 3 month forward (CIA)	Using 3 month spot (UIA)	Bloomberg[b]
(1)	(2)	(3)	(4)	(5) [=(2)-(3)]	(6) [=(2)-(4)]	(7)
3/1/1999	1.188	1.227	-1.083	-0.039	2.271	1.715
3/1/2000	1.495	1.551	-0.744	-0.056	2.239	2.399
3/1/2001	1.205	1.227	-1.538	-0.022	2.743	2.302
3/1/2002	0.447	0.467	7.753	-0.020	-7.306	-6.755
3/3/2003	0.320	0.289	-1.124	0.031	1.444	1.456
3/1/2004	0.267	0.267	-1.376	0.000	1.643	1.405
3/1/2005	0.720	0.811	-3.735	-0.091	4.455	4.855
3/1/2006	1.184	1.458	3.335	-0.274	-2.151	-1.889
3/1/2007	1.157	1.459	-3.743	-0.302	4.900	4.912
3/3/2008	0.512	1.182	-1.634	-0.670	2.146	1.549
Summary Statistics						
Mean	0.850	0.994	-0.389	-0.144	1.238	1.195
Std Dev	0.444	0.497	3.458	0.216	3.553	3.385
CV [c]	0.522	0.500		n/a	2.869	2.833

a) Forward premium and changes in spot exchange rates are calculated using the exchange rate data in Table 1.
b) Return on the 3-month yen carry trade calculated from the FX Carry-Trade Index (FXCT). Data source: The Bloomberg service.
c) CV: Coefficient of Variation, n/a for zero or negative CV

Table III
Return on 3-month Yen Carry Trade Using High-Yield Currencies (%)

	Borrow in yen					Borrow in euro
	Invest in high-yield currencies					Invest in krona
Start date	USD	KRW	NZD	AUD	ISK	Euro/ISK
3/1/1999	1.715	4.934	1.835	5.558	0.163	3.053
3/1/2000	2.399	2.038	-3.929	-3.357	0.064	2.431
3/1/2001	2.302	0.509	-2.962	-1.286	-14.592	-7.500
3/1/2002	-6.755	1.580	6.779	2.654	4.056	3.008
3/3/2003	1.456	1.234	5.458	10.316	9.540	-0.330
3/1/2004	1.405	3.663	-6.200	-5.809	-0.541	-0.750
3/1/2005	4.855	4.304	1.641	0.589	-0.339	3.022
3/1/2006	-1.889	0.366	-6.573	-1.433	-9.727	-14.012
3/1/2007	4.912	5.629	13.416	11.651	16.357	9.141
3/3/2008	1.549	-6.394	0.440	4.258	-9.636	-12.776
Summary Statistics						
Mean	1.195	1.786	0.991	2.314	-0.466	-1.471
Std Dev	3.385	3.424	6.307	5.713	9.272	7.541
CV	2.833	1.917	6.368	2.469	n/a	n/a

a) For 2003 and 2008, returns are collected for 3/3, due to observed holidays.
b) Return on the 3-month yen carry trade based on the FX Carry-Trade Index (FXCT) obtained from Bloomberg.
c) USD: US dollar; KRW: Korean won; NZD: New Zealand dollar; AUD: Australian dollar ; ISK: Icelandic krona
d) CV: Coefficient of Variation, n/a for zero or negative CV

Figure 1

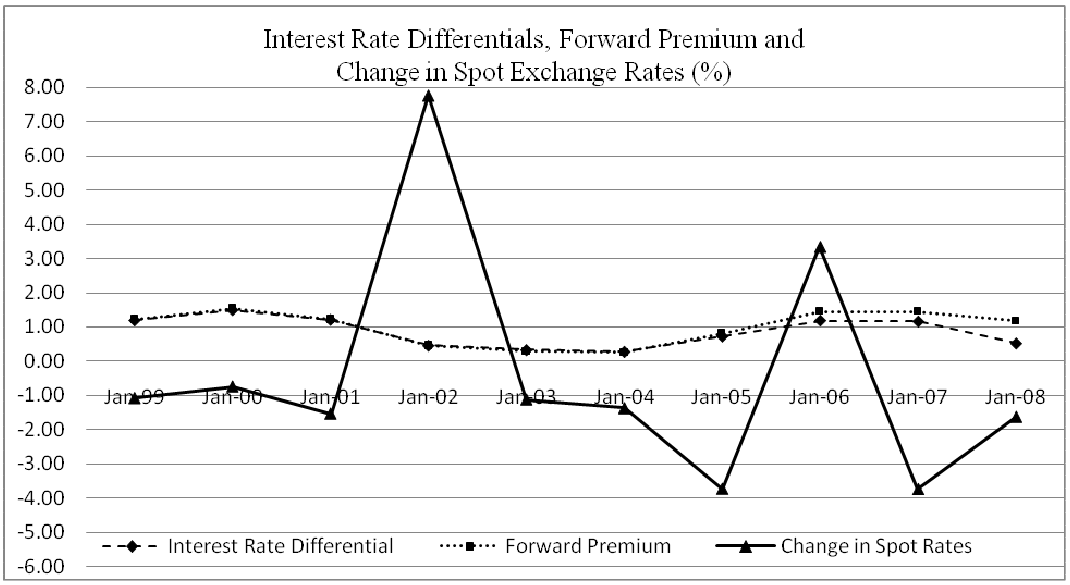
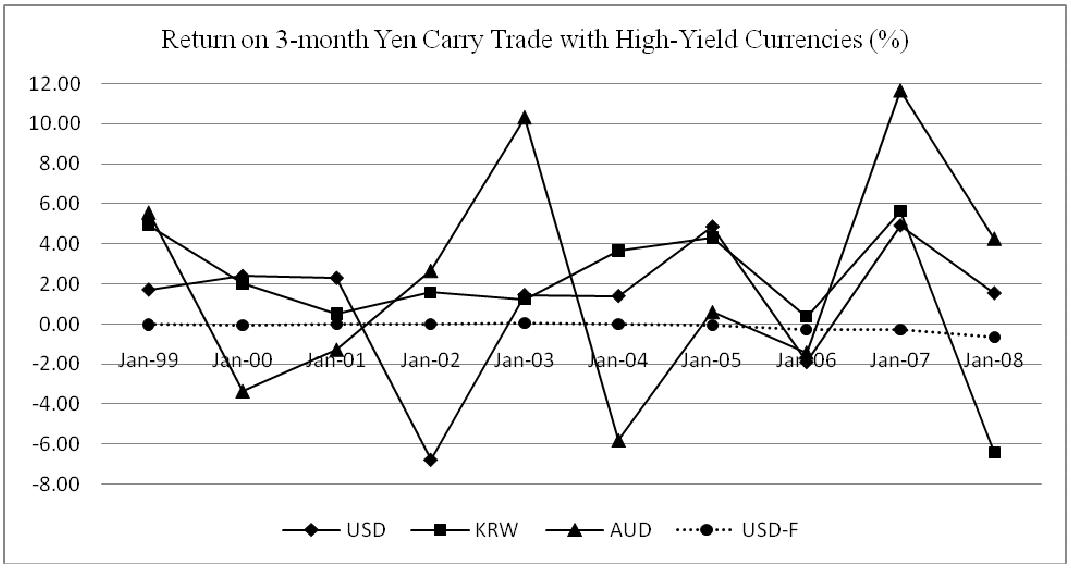


Figure 2



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A Study of Framing Effects in a New Risk Aversion Experiment

Larry L. Lawson and Catherine L. Lawson

Abstract

Risk aversion experiments such as those by Holt and Laury (2002 and 2005) measure risk aversion by examining responses of experimental subjects who are confronted with single-sheet paper displays of probability-ordered arrays of choices in which "real" money is at risk. As an alternative to this approach, the findings reported in this paper were obtained using a modified adventure-type video game to offer the choices presented by the HL experiment embedded in a more realistic scenario. The decisions are confronted first by our experimental subjects in a sequential and unordered manner. Then, later in the experiment, subjects are instructed to examine the results of their decisions in an array that shares the simultaneous and probability-ordered characteristics of the standard laboratory protocol. Subjects then had the option of altering their decisions before their payment was determined. The results indicate that decisions made in a sequential and unordered manner exhibit less risk aversion and higher degrees of decision inconsistency.

I. Introduction

Management of the risk-return tradeoff is a--or perhaps, *the*--central issue in the study of finance. Von Neumann and Morgenstern (1944) initiated formalization of this area with expected utility theory. Within this framework the degree of curvature of the utility function expresses the individual's degree of risk aversion. Over the succeeding 60 odd years, expected utility theory has been extended in many directions in an effort to refine and generalize its outcomes. In recent years, risk aversion has been the subject of numerous field and laboratory experiments that, among other things, serve as tests of the oft-used risk-neutrality assumption (e.g. Binswanger 1980; Kachelmeier and Shehata 1992; Beetsma et al 2001; Harrison et al 2007). These studies predominantly have found participants to be moderately risk averse rather than risk neutral as assumed in some theoretical models. The validity of early risk aversion studies was questioned, as they involved hypothetical or quite small payoffs. To address some of these concerns, studies by Holt and Laury (2002 and 2005) [hereafter HL] compared hypothetical and real, increasingly higher, payoff levels within a single study. They found that real, higher payoffs led to greater degrees of risk aversion and that most subjects exhibited decision consistency.

Our study was conducted using a novel methodology. We first trained, then had participants play, a non-violent, adventure-style video game. We obtained permission to modify a game that was originally designed to study NATO peacekeeping teams' behavior by BBN Technologies under contract to the U. S. military (BBN Technologies 2006). The system includes a data logging function that records all game behavior in a Sequel database and also provides a utility for statistical analysis of the data. We modified the NATO game as a first illustration (in a civilian rather than military context) of the use of this system for academic research. In this study, we use the game to replicate the HL experiment for measuring risk

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aversion. This allowed us to gather new evidence regarding one of the fundamental questions that has been asked about this body of research, namely, the impact of framing effects on the measurement of risk aversion (Anderson, et al 2007). It also allows us to illustrate the potential of this promising new methodological tool. In the pages that follow, the HL experiments are explained in more detail, followed by a description of the experiments we conducted to validate our methodology and examine the HL results. Some of the most notable outcomes of these experiments are then reviewed, with an emphasis on the impact of certain framing effects on risk aversion measurement.

II. The Holt Laury Experimental Methods and Outcomes

In the first HL experiment, 212 subjects were provided with 10 pairs of choices (hereafter referred to as "Decision Pairs") on a single sheet of paper, as shown in Table 1. The first 9 of these Decision Pairs present choices between a safer "Choice Set A" and a riskier "Choice Set B." Moving from the top of the page downward, the Decision Pairs offer increasingly higher probabilities of obtaining the higher prize. Most subjects' decisions exhibit safer choices (Choice Set A) at the top of the page and riskier choices (Choice Set B) on the lower part of the page. For the first 4 Decision Pairs, Choice Sets A have the higher expected value. For Decision Pairs 5 through 9, Choice Sets B have higher expected values. Decision Pair 10 does not involve risk but served as a test to see if subjects understood the game. Within this framework, switching from side A to side B between the 4^{th} and 5^{th} pair of choices indicates risk neutrality; switching beyond this point (lower on the page) indicates risk aversion and switching before this point (higher on the page) indicates risk prone behavior. Switching from side to side more than once indicates decision inconsistency.

HL counted the number of safe "A" choices as the variable of interest for their study. They also found 13.2% of the 208 subjects in their first study to be inconsistent. They disregarded the inconsistency, however, believing it to have little influence on their outcomes (Holt and Laury 2002 p. 1648f). Subjects' rewards were hypothetical in some cases and real in others. The real rewards were in multiples of 1x, 20x, 50x, and 90x base amounts for Set A ($2.00 or $1.60) and Set B ($3.85 or $0.10). In the experiments most comparable to ours the payments were Set A ($40.00 or $32.00) and Set B ($77.00 or $2.00). Players were actually paid using a "random round" payment method. In this method, players roll a 10-sided die first to see which of the 10 Decision Pairs will be used to determine their payoff and roll again to determine the size of the payoff. For example, if their first roll produced a 4, then Decision Pair 4 would be used as the basis of the payoff. Decision Pair 4 has a 40% chance of the higher value and a 60% chance of the lower value. Suppose the subject had selected Choice Set A for Pair 4. When they rolled the die the second time, a roll of 1-4 yielded the higher payoff ($40.00), whereas a roll of 5-10 yielded the lower payoff ($32.00). Had the subject selected Choice Set B, a roll of 1-4 would have yielded the higher payoff of $77.00 and a roll of 5-10 the lower payoff of $2.00.

In the first set of experiments conducted by HL, subjects completed the exercise more than once with different payoff scales. After a critique indicating the presence of order-of-play effects (Harrison et al., 2004), HL repeated their study so as to eliminate these order effects. The

risk aversion measures from the second round of HL outcomes with real 20x payoffs are most comparable to those in our research. HL found that the mean number of safe choices in two rounds of 48 subjects each were 6.7 and 7.1. Very similar results from one part of our study are reported below.

TABLE I: The Paper-Based Decision Table

Circle the appropriate letter to indicate your choice from each of the ten pairs below.

Decision Pair #	Choice Set A	Choose A or B	Choice Set B
1	10% chance of $40.00 and 90% chance of $32.00	← A B →	10% chance of $77.00 and 90% chance of $2.00
2	20% chance of $40.00 and 80% chance of $32.00	← A B →	20% chance of $77.00 and 80% chance of $2.00
3	30% chance of $40.00 and 70% chance of $32.00	← A B →	30% chance of $77.00 and 70% chance of $2.00
4	40% chance of $40.00 and 60% chance of $32.00	← A B →	40% chance of $77.00 and 60% chance of $2.00
5	50% chance of $40.00 and 50% chance of $32.00	← A B →	50% chance of $77.00 and 50% chance of $2.00
6	60% chance of $40.00 and 40% chance of $32.00	← A B →	60% chance of $77.00 and 40% chance of $2.00
7	70% chance of $40.00 and 30% chance of $32.00	← A B →	70% chance of $77.00 and 30% chance of $2.00
8	80% chance of $40.00 and 20% chance of $32.00	← A B →	80% chance of $77.00 and 20% chance of $2.00
9	90% chance of $40.00 and 10% chance of $32.00	← A B →	90% chance of $77.00 and 10% chance of $2.00
10	100% chance of $40.00 and 0% chance of $32.00	← A B →	100% chance of $77.00 and 0% chance of $2.00

III. Our Experimental Method

The method by which the decision problem was posed to the experimental subjects in our experiment was distinctly different from that of HL. We modified an adventure-style video game to provide a scenario wherein the HL Decision Pairs and Choice Sets would be encountered as a part of the game play. Inside the game scenario, experimental subjects (solicited by email from the general student population of our university) were assigned the role of assisting the "Drug Strike Force" in the town of Santa Catarina. Their task was one of recovering illegal drugs from crates hidden by a notorious drug cartel in various locations around the town. Subjects searched their assigned areas of the town to find pairs of crates (hereafter,

"Crate Pairs.") Each Crate Pair contained amounts of illegal drugs that corresponded to the Decision Pairs of the HL experiment. The player then made a decision about which ONE crate in the pair to open in order to recover the most drugs. Subjects were paid the HL 20x amounts at the end of the game for the drugs they found using the same random round protocol as the HL experiments. Subjects' payments ranged from $2.00 to $77.00 and averaged about $40.00 each.

Our Crate Pairs, Choice Sets, and payment method were identical to those of the first nine HL Decision Pairs. Because our method differed substantially from theirs, providing a richly textured context within which subjects' decisions were made, we were concerned in our first round of experiments to validate our method. As indicated above, the HL mean numbers of safe choices from the experiments that were most similar to ours were 6.7 and 7.1. Our mean number of safe choices was 6.9 – thus there was no difference between our mean number safe and the average of their mean number safe. Gender differences discovered by HL were consistent with those found by prior researchers in this area, with female mean number of safe choices being 0.5 greater (safer) than those of male subjects. Our results concurred, showing a +0.5 female difference. The percentages of inconsistent choices for the prior HL 20x studies were 7% and 10% (mean 8.5%). Our inconsistency rate was 8.3%. Thus, in view of this variety of findings (Table 2), we conclude that our experimental procedures do not induce departures from the fundamental results of other researchers in this area.

Table II
Validation Relative to Prior HL Studies

	HL 20x	*Final* LL 20x
Mean # of safe choices	6.7 & 7.1	6.9
Female difference in # of safe choices	+0.5	+0.5
Subjects with inconsistent choices	8.5%	8.3%

Aside from the contextual difference from HL, there were some additional differences in our presentation of the decision problem that were designed to examine the issue of framing. Our subjects encountered their decisions one at a time rather than simultaneously as was the case with HL's single-sheet paper presentation. Thus, they made each choice in a Decision Pair (i. e., the Crate Pairs) without reference to other decisions they had already made or would make. Further, our subjects encountered their decisions in an order determined by the search path they adopted rather than being presented with an ordered set of choices. A test of the Crate Pair "find order" indicated that no crate pairs were consistently found before or after others ($p = 0.999$). Thus, our subjects confronted their choices sequentially and randomly rather than simultaneously and in probability order.

Our video game had the additional advantage of being linked to a Sequel data base so that player actions could be recorded and studied. To take advantage of this and to examine the impacts of having sequential random choices, the in-game Drug Strike Force "Team Leader" asked subjects to search their assigned area of the town and collect drug packets in their backpacks, then meet at a rendezvous point after collecting all nine packets. At the rendezvous point, the Team Leader instructed subjects to place their drug packets in probability order. Upon

completing this task, subjects noticed that the safe packets (corresponding to safer Choice Set A decisions) were purple while riskier packets (Choice Set B) were gold colored. This ordering and color coding provided a "prompt" similar to the right-side of the page, left-side of the page prompt of the HL ordered Decision Pairs. At this point the Team Leader offered the subjects the opportunity to change any decisions with which they were dissatisfied. Thus, we were able to compare subjects' *first* risk aversion decisions when choices were encountered in a sequential, unordered manner, with their *final* decisions in which probability ordering and simultaneity were present. Of course, we could also then examine what types of changes were made and what types were not. We used this research procedure for 60 subjects. The next section of the paper reviews the results for our subjects.

V. Experimental Outcome

Subjects' decisions differed between their *first* and *final* choices in terms of their level of risk aversion. Using the HL criteria of number of safe choices as the indicator of risk aversion, we found that the mean number of safe choices was 6.72 when decisions were *first* made sequentially and in random order. This differed from the 6.92 *final* safe choice mean when outcomes were displayed simultaneously and in probability order (Table 3, $p = 0.05$). Using another measure, there were 30 of the 60 subjects who changed their number of safe choices between the *first* and *final* stages. Of these, 21 opted to reduce their level of risk while only 9 increased their level of risk taking (Table 4, $p = 0.03$). This finding, of a tendency to change toward more safe choices, and therefore toward more risk aversion, implies that subjects making risky decisions that are confronted "one by one" may exhibit less risk aversion than when the same decisions are made in the face of an ordered array of alternatives. It also suggests that prior studies of risk may overstate the level of risk aversion evidenced by people when they confront choices in what is arguably a more common circumstance – sequentially and unordered.

Table III
Differences Between *First* and *Final* Choices

	LL *First*	LL *Final*	p-value
Mean # of safe choices	6.72	6.92	.05
Subjects with inconsistent choices	41.7%	8.3%	.00

Subjects' decisions differed between their *first* and *final* choices in terms of consistency as well as in degree of risk aversion. The changes made from the *first* to *final* choices reduced the number of inconsistent responses. The inconsistency rate for the *final* choices was relatively small (8.3%) and similar to the mean for the HL studies (8.5%). The inconsistency rate for the *first* choices, however, was 41.7%, significantly higher than the *final* inconsistency rate (Table 3, $p = 0.00$). No subject made a *first* selection that was consistent but then, when given the opportunity, changed it to an inconsistent selection in his/her *final* choice (Table 4). As in the earlier finding, regarding the level of risk aversion, the *first* to *final* consistency reduction data indicates that risky decisions made sequentially exhibit less consistency in risk aversion than those same decisions made when confronting an ordered array of alternatives. Thus, this part of our study suggests that policies relying on consistency in people's assessments of risk should be approached more cautiously than previously thought.

TABLE IV
Subjects' Changes Between *First* and *Final* Choices

# of Subjects who changed:	Increased	Decreased	p-value
Level of Risk	912	2113	.03
Consistency	2014	0	.00

In considering both types of changes, i. e., those undertaken to alter the number of safe choices and those undertaken to improve consistency, 32 of the 60 subjects (53%) changed their minds in some way between their *first* and *final* decisions. Twelve of the 32 were consistent in their *first* choices and altered their decisions solely for the purpose of changing their number of safe choices. Two of the 32 left their number of safe choices alone but altered their patterns from inconsistent to become consistent. The other 18 of the 32 altered both their number of safe choices and their decision consistency (Table 4). Taken together, these findings suggest that decision makers confronting risky decisions that are posed sequentially and in random probability order exhibit behavior that is considerably different than when they confront probability ordered arrays of choices. In our study over half of the experimental subjects changed their minds when the choice format was altered. Information from studies using probability ordered arrays may be valuable for making inferences about "real world" behaviors when decision makers confront such arrays. But these studies may well mislead when making inferences about decision makers confronting individual, unordered decisions. It may be appropriate to entertain *multiple* conceptions and measurements of the risk aversion that people generally experience, depending upon not only the specific content of the decision problem, but also relatively subtle aspects of the problem presentation format.

A simple example may add clarity. Suppose a potential car buyer was to choose between nine brands of cars, each with a different and known repair cost history. Further suppose that all brands offer a warranty, but for a fee. The rational buyer confronted with all nine brands at once would prefer the warranty on the less reliable brands but decline on the most reliable brands. Existing research suggests that for most buyers their decisions would be consistent and reflect moderate risk aversion. Our research agrees, but *only* if all brands and warranties are considered side by side. However, if the buyer does his/her analysis sequentially rather than simultaneously, the result would be higher levels of risk taking and more inconsistent decisions. The additional inconsistency and risk taking would hold for financial decisions as well such as mortgage selection, decisions about investments, and decisions about alternative financing arrangements.

VI. Conclusion

We report above on an experimental study that reprised the well known Holt-Laury risk aversion experiments of 2002 and 2005. Our experiments were conducted by having participants play a modified version of an adventure-type video game. The participants' in-game decisions were made while confronting choice sets and payments that were the same as those in the HL

12 3 subjects changed only their risk level; 6 changed both their risk level and their consistency.

13 9 subjects changed only their risk level; 12 changed both their risk level and their consistency.

14 2 changed only their consistency, 18 changed both their risk level and their consistency.

20x experiments. Our participants were paid $2.00 to $77.00 in accordance with the random round method used in HL and several other prior risk aversion studies. Our experiment produced some outcomes very similar to or identical to the HL results, thus validating our novel experimental technique. Other results evidenced distinct differences from the HL study and allowed us to examine important aspects of framing in more detail than has previously been accomplished.

Our game software included a Sequel data base that recorded participants' individual decisions as they occurred in the game, both when the decisions were encountered one-by-one in the early part of the game, and later, when participants arranged their choices in a probability-ordered array reminiscent of the HL paper-based experiment. It was discovered that subjects made riskier decisions and less consistent decisions initially, then altered them so that less risky and more consistent choices were evident in their *final* probability-ordered array format. This suggests that studies such as those of HL that rely upon probability-ordered arrays may provide relatively reliable information about probability-ordered and arrayed "real world" decisions, but less reliable information about decisions that are not probability-ordered and that are made sequentially or individually.

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Neighborhood Spillovers: The Demand for Cubs Game Parking in Wrigleyville

Donald Salyards and Michael Wenz

Abstract

We examine the market for parking spaces during Cubs games, focusing on primary data from parking at two residential locations near Wrigley Field in 2008. We describe the price setting process in a theoretical and applied context. Renting six spaces to Cubs game patrons yielded nearly $14,000 during the 2008 baseball season. Parking revenues were higher when attendance was higher, during night games, during weekday games, and especially when the White Sox were the opponent. We suggest opportunities for increased efficiency in price setting for the building owners. We estimate the real estate value of each parking space at about $8,250.

I. Introduction

Wrigley Field, home of Major League Baseball's Chicago Cubs, is unique in many ways. Part of the charm of Wrigley Field is its symbiotic relationship with the local neighborhood known as Wrigleyville. Fans come from far and wide to pack not only the ballpark, but the dozens of taverns and restaurants surrounding it. They even fill the rooftops of the apartment buildings across the street to watch the games.

While the taverns, restaurants, rooftop spectators and resident Cub fans clearly receive some benefit from sharing their neighborhood with the Chicago Cubs, the relationship between the ballpark and the neighborhood residents and landlords has sometimes been contentious. Local activist group Citizens United for Baseball in the Sunshine was successful in keeping lights and night games out of Wrigley for years. In 2002 in Chicago National League Ball Club, Inc. v. Skybox on Waveland, L.L.C., the Cubs sued eleven rooftop owners for selling the view to their baseball games. Most recently, the neighborhood unsuccessfully resisted an expansion of the bleachers. The residents' concerns extend to crime, noise, congestion, traffic, and of course parking.

In this paper, we examine the market for parking near Wrigley Field during Cubs games. Parking spaces represent a perishable, non-renewable resource with stochastic demand, and prices fluctuate each day as information about current market conditions is updated. We obtained data on daily parking space rentals during the 2008 baseball season for two residences located approximately two blocks from the ballpark. We apply a revenue management model to discuss the factors that influenced daily demand for parking and discuss how Wrigley Field and the on-field performance of the Cubs might influence revenues and property values. Our results suggest that the parking entrepreneurs in our study could improve profitability by pricing less aggressively during weekend games. We also estimate the value of a parking space to the building owner of about $8,250.

II. Market Dynamics

This study focuses on the efforts of two local entrepreneurs, Mary and Paul, who reside in two neighboring buildings with three parking spaces each approximately two blocks from

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Wrigley Field. They parked cars and collected data on 80 of 81[15] home dates during the 2008 season, with Paul on the street holding a sign to attract potential parkers and Mary collecting money and guiding cars into the parking spaces in the alley behind their two buildings. Occasionally a third parker helps out in the alley.

Surrounding these six parking spaces is a densely populated residential neighborhood made up primarily of three story buildings inhabited by renters. There are a number of bars and restaurants in the area that are busy through the year, and even more so during baseball season. Parking is at a premium on all days, but especially on game days. The Cubs and Wrigley Field, unlike nearly all other baseball teams, do not provide parking facilities for fans. Many areas around the ballpark have street parking restrictions, and this particular street requires a local residential parking permit after 6 p.m. or two hours before night games, whichever occurs earliest. Also in the vicinity are some small commercially owned parking lots (between 10 and 50 parking spots) that rent spaces on game days. These locations typically announce a price each day, post it on a sign, and attempt to rent all the spaces in their lot at that price. In contrast, Paul and Mary continuously update their price based on changing market conditions.

A typical parking day has three distinct stages. About one hour before game time, Mary and Paul choose a starting price. Then they adjust this price as volume builds in the period immediately before the first pitch, and finally, the game begins and the market dynamics change in somewhat unpredictable fashion. The starting offer price is an educated guess at what the market will bear. Potential customers driving by roll down their windows and are individually quoted a price. As conditions change and spaces are filled, Paul adjusts the offer price accordingly. Because customers negotiate separately, it is not uncommon for cars parking right next to each other to pay different prices. Prices may rise as much as $15 in a ten-minute span. The trickiest time of day is immediately before game time. Sometimes, the first pitch results in traffic drying up almost instantaneously, but on other days, it results in a customer panic. In the former case, Paul and Mary may fail to sell all six spaces. In the latter case, however, panicked customers stop asking “How much?” and start asking “Where?” These customers end up paying a high price.

The economic problem reduces to maximizing revenues in the face of uncertain demand; once Mary and Paul show up to park cars, they face essentially zero marginal cost. There has been little work on the pricing mechanism for parking at non-stadium controlled facilities during sporting events, though some work has been done on the importance of parking accessibility as part of the fan experience (Hill & Green, 2000, Wakefield & Sloan, 1995). A significant amount of work has been done on this type of pricing problem in general. Bitran and Caldentey (2003) survey the literature and present a review of revenue management models and derive the basic optimization conditions for dynamic pricing of a perish able resource. Following their model, let V(Ct) represent the value of a parking space as a function of the remaining capacity C at time t. Let F(r,t) be the distribution function for a random variable representing the reservation price of the potential customer arriving at time t and pt represent the price offered for the space at time t. The customer purchases the space only if r>pt. Customers are assumed to arrive independently of each other. This results in a Poisson demand process with optimality condition given by the Bellman equation

15 No attempt was made to park cars on one date (6/26/08, vs. Baltimore).

$$\frac{dV(C_t)}{dt} = \max_{p \geq 0}\{\lambda(1 - F(p,t))[p - (V(C_t) - V(C_t - 1))]\} \quad (1)$$

where λ is a level parameter representing the intensity of demand[16]. Note that $V(C_t) - V(C_t - 1)$ represents the change in the value function that results from reducing capacity by one space, or the opportunity cost of selling the parking space at time t. Bitran and Caldentey use this equation to show that under some reasonable assumptions the optimal price is decreasing in t and increasing in Ct. In other words, the asking price should fall as it gets closer to game time, but rise as more spaces are sold.

Much of the literature is concerned with the implications of different functional forms for F, but in practice, F is understood in real time as Paul gathers information about drivers each day. Paul describes the process by which he chooses his offer price:

> [T]he information regarding pricing change prior to game time is based primarily on the interplay between Capacity Utilization Analysis, Potential Customer Feedback Analysis and Cubs Event Analysis which is basically further refinement of supply/demand analysis. Capacity Utilization Analysis relates to how much supply the immediate competition (one or two block radius) has left. More supply equals flexibility and give-up on pricing. Customer feedback analysis is somewhat related to supply but basically analyzes the traffic flow. More cars and roll-downs equal more demand opportunity. A couple key clues are if a potential customer initially rejects the offer but then comes back later and accepts; this is a bullish market structure. Also bullish is seeing previous turn-downs circling the neighborhood. Another bullish clue is if increasing numbers of individuals are inclined to attempt and negotiate a parking price; this typically indicates that supply is tight. Cubs Event Analysis basically incorporates statistics like tickets sold, the competition and the event day and time of the week. Cubs Event Analysis basically provides a feel for an estimate of what the underlying demand should be. If the underlying demand should be strong, then holding the line and moving up pricing is more likely.

In the notation of Bitran and Caldentey, Capacity Utilization Analysis and Cubs Event Analysis refers to the factors that influence λ, while Customer Feedback Analysis refers to the factors that influence F in equation (1).

III. Data and Empirical Analysis

For each game, Paul and Mary provided data on total revenue, number of cars, per car price, and average price. We did not obtain data on the time or order in which the cars were parked. In addition, we matched this with data on game attendance, weather conditions, game time, day of week, opponent, and the Cubs' position in the standings.[17] The average price for a parking space was $31.15 and the average number of cars parked was 5.56, resulting in $13,788 in revenue over the season. All six spaces were filled on 61 of 80 days, and five cars were parked on 9 days. Seven of the remaining ten days were weekends. The three games against the cross-town Chicago White Sox averaged $50.55 per space.

16 Bitran and Caldentey (2003) examine the case and present first order conditions for the optimal price in the case where λ is constant over time. Other research (Zhao & Zheng, 2000) derive similar results in a model with time-varying demand intensity as might be expected in the case of Cubs game parking.

17 Source: Chicago Cubs website. (Chicago Cubs, 2009)

We examine two empirical models. First, we estimate daily revenue as a function of demand conditions using ordinary least squares. Equation (1) is a reduced form expressing the value of parking spaces in terms of both price and capacity, so both can be treated as exogenous in the revenue management equation. In the second model, we note that price and quantity (or capacity utilization) are determined jointly. We create a structural model and use two stage least squares to decompose the effects of the various regressors on revenues into their price and quantity components.

We begin by estimating the following equation using ordinary least squares:

$$\text{DailyRevenue} = b_0 + b_1(\text{Attendance}) + b_2(\text{Weekend}) + b_3(\text{DayGame}) + b_4(\text{Rain}) + b_5(\text{WhiteSox}) + b_6(\text{GA}) + b_7(\text{ExtraHelp}) + \varepsilon \quad (2)$$

Attendance measures the announced number of tickets sold to that day's Cubs game; Weekend is a dummy variable indicating the game was played on a weekend; DayGame indicates that the game started at 3:05 or earlier (no games started between 3:05 and 6:05); Rain indicates whether it was raining at game time; WhiteSox is a dummy variable representing whether the opponent was the Chicago White Sox; and GA represents how many games the Cubs currently were ahead in their division standings. ExtraHelp indicates that a third parker was present on that day. The results of this regression are presented in Table I.

The Cubs sold between 37,812 and 41,730 tickets per game. Our model estimates suggest that an additional 100 tickets sold translates into an extra $2.64 in total revenue. Weekday starts generated an extra $41.19 in revenues compared to weekends. Weekend days were especially likely to be the days where demand dried up suddenly after the first pitch, and this information will be useful for Paul and Mary next year. Day games reduce revenues by $25.37 versus night games. This is probably due in large part to parking regulations. Street parking on nights of game days without a residential permit is prohibited in Wrigleyville, making demand for private spaces higher. Revenues fall by $10.62 on rainy days, though the effect was statistically insignificant.

When the White Sox come to Wrigley, daily revenues rise by $129.76. One possible explanation is that White Sox fans displace some Cubs fans, and that they are more likely to drive to the game than walk or use public transportation. Another explanation is that the Cubs-Sox games draw non-spectators to the neighborhood to participate in the revelry. It is also possible that the higher prices for Cubs tickets on these days attract wealthier people who are more inclined to pay for private, relatively close parking spaces.

Our estimated coefficient on the Cubs' position in the standings indicates an increase in revenues by $0.74 for each game they lead their division, though the result was not statistically significant. The Cubs averaged 2.7 games ahead over the course of the season. Playing .500 baseball would have meant an average of 8 games behind. Without placing an undue level of confidence on this result, these estimates suggest that a fall from the Cubs' actual .602 winning percentage to .500 would cost approximately $800 in revenue over the course of the season.

Next, we estimate the following system of equations using two stage least squares.

$$\text{AvgPrice} = b_0 + b_1(\text{Attendance}) + b_2(\text{Weekend}) + b_3(\text{DayGame}) + b_4(\text{Rain}) + b_5(\text{WhiteSox}) + b_6(\text{GA}) + b_7(\text{CarsParked}) + \varepsilon \quad (3)$$

$$\text{AvgPrice} = d_0 + d_1(\text{CarsParked}) + d_2(\text{ExtraHelp}) + \gamma \quad (4)$$

The need for two stage least squares arises because the number of cars parked and the price charged are jointly determined as seen from Equation (1) above. Equation (3) captures the factors that influence demand intensity—λ in equation 1, or Capacity Utilization Analysis and Cubs Event Analysis in Paul's terminology. Equation (4) measures the ability to accurately read market conditions—F in equation (1), or Potential Customer Feedback Analysis. Intuitively, equation (3) can be thought of as the demand equation, while equation (4) can be thought of as the supply or production equation. Demand depends on the characteristics of the particular game's crowd. Supply depends at least in part at how efficiently Mary, Paul, and sometimes a third parker, are able to park cars. The presence of a third parker is random and does not depend on the things that influence demand intensity, so the presence of the extra parker provides a useful instrument in identifying this system of equations. The third parker assisted on 23 days. On days without help, a queue of two or three cars may build as some other potential parkers would simply drive by rather than block traffic on the street. Additionally, without the third person, Paul has to walk a short distance each time he sells a parking space to point them to Mary, taking time that could be spent negotiating with potential customers or observing market conditions. In the mad rush around the time of the first pitch, the extra parker may make the difference between parking six cars or parking four.

Two stage least squares results are presented in Table II. The endogenous explanatory variable is the number of cars parked. The dependent variable is the average price per car. These results allow us to examine whether the revenue effects identified above are due to changes in price per car or in the number of cars parked. The first thing to note is that the number of cars parked does not significantly influence the average price of a car through the demand equation, but increases the price charged through the supply equation. This suggests that the demand curve facing Paul and Mary is highly elastic, as would be expected in this competitive market, but that there are gains to be made by parking cars more efficiently. In the language of equation (1), λ is determined exogenously, while the extra parker does in fact aid in the ability to understand the day's distribution of reservation prices, F.

These results allow us to break down the influences of the covariates on revenues into their price and quantity components. Above, we showed that an increase in attendance of 100 fans leads to a $2.64 increase in revenues. From Table II, we see that an increase of 100 fans leads to a $0.33 increase in the average price paid. If the average (5.56) number of cars is parked, the $2.64 increase can be decomposed into $1.81 in higher pricing and $0.83 in increased quantity. Weekend games lowered prices by an estimated $2.03 per car, which explains $11.17 of the $41.19 revenue decline. The vast majority of the lower revenues from weekend games come from an inability to fill all six spaces. There does not seem to be a post-first-pitch panic on weekends. This will be of great practical interest to Paul and Mary in future seasons. Nearly all of the $129.76 increase in revenues on White Sox game days comes from higher prices. The White Sox push up prices by $18.60 on average, and six cars were parked at each White Sox game. For day games, prices fell by $2.84 per car , which explains about $15.64 of the $25.37 decline in revenues. The position in the standings drove up the price by a statistically significant $0.35 per game ahead, though this did not translate into a statistically significant increase in revenues. Rain also had a statistically significant impact on prices, lowering them by $2.75 per car, but this did not translate into a statistically significant decline in

revenues. The presence of the third parker added $4.09 to the average price, but this led to a statistically insignificant increase in revenues of $9.36.

During 2008, the Cubs drew a record 3,299,840 fans. Our estimates above suggest a point elasticity of price with respect to attendance of 4.2. In other words, a 10% drop in attendance would lead to a 42% drop in price, or a fall from $31.15 to about $18 per space. As an admittedly imperfect check on our results and lacking concrete data, we asked Paul to provide his recollections about prices and capacity utilization over this period. Table III presents pricing estimates based on the model-estimated elasticity and Paul's estimate, scaled for capacity utilization. Paul overestimated 2008, but only slightly. He estimated 95% capacity utilization and about $35/space, versus actual results of 93% and $31.15. His recollections track reasonably well with our model. Note that Paul's 2002 estimate of $20.25 exceeds the model-predicted price of $11.76. This is consistent with the notion that if prices fall below the opportunity cost of the parker's time, parking entrepreneurs will exit the market. The model predicts a lower price in 2003 than Paul recollects, and a higher price in 2004. The Cubs in 2003 began with low expectations and went on to win a division title, while the 2004 squad started well but collapsed as the year went on. There was likely high variation in demand over the course of those two seasons. From 2005-2008, the Cubs' on-field performance was reasonably consistent from the beginning of the season to the end, and the two sets of pricing estimates are close.

IV. Conclusions

Competition for parking spaces near Wrigley Field during Chicago Cubs baseball games is fierce. This provides an opportunity for enterprising building owners to earn a substantial amount of revenue by meeting this demand. One important practical finding for Mary and Paul that comes out of this study is the relatively high frequency with which unsold parking spaces occurred on weekends. Rather than seeing the post-first-pitch panic, weekends were more likely to dry up quickly. Increasing the average number of cars parked from 5.0 per weekend day to 5.83 cars, the weekday average, on the 26 weekend game days would have added about $650 to the yearly total. This information should prove useful in future seasons.

We can construct some back of the envelope estimates of the impact of variation of Cubs attendance on parking prices and extend this to consider the value of a parking space. Shutdown costs for entrepreneurial building owners are essentially zero, and the marginal cost of parking is only the value of the entrepreneur's time, so parkers will leave the market when prices fall below this level. Paul's ten years of parking experience and the authors' own anecdotal evidence gathered from attending many games over the years suggests a lower bound on parking prices of about $15. Any premium over this lower bound represents economic profit and adds value to the property. The last column of Table III translates the model-predicted price of a parking space into a measure of annualized economic profit per space. Average economic profits over the period based on the results of our model are estimated to be $3,964 per year. Area capitalization rates for properties in the area are between 5% and 8% (Real Estate Capital Institute, 2008). At 8% cap rates, the returns to parking translate into about $49,500 in property values, or about $8,250 per space.

Further study is needed to extend one year's results to past and future seasons, but the analysis of the parking market in 2008 supports the conclusion that there are positive economic returns accruing to owners of parking spaces near Wrigley Field. The evidence presented here also suggests that the performance of the Cubs, through its effects on game attendance, affects the size of these profits. At least in this way, good baseball is good for the neighborhood.

Table I. Regression Estimates on Total Revenue

Dependent Variable	Total Revenue
	Parameter Estimate (Standard Error)
Intercept	-877.67**
	(227.41)
Attendance	0.0265**
	(0.01)
Weekend	-41.19**
	(9.53)
DayGame	-25.38**
	(8.82)
Rain	-10.62
	(8.52)
WhiteSox	129.76**
	(21.20)
Div_Position	0.74
	(1.48)
ExtraHelp	9.36
	(9.22)
N	80
R-Squared	.5848

*Statistically significant at a 95% confidence level.
**Statistically significant at a 99% confidence level.

Table II. Two Stage Least Squares Estimates on Average Price

Dependent Variable	Average Price	Average Price
	Parameter Estimate (Standard Error)	Parameter Estimate (Standard Error)
Intercept	-105.37**	21.90**
	(23.91)	(3.99)
Attendance	.0033**	
	(.0006)	
CarsParked	.331	1.45*
	(.48)	(.70)
Weekend	-2.03*	
	(1.09)	
Rain	-2.75**	
	(.89)	
White Sox	18.60**	
	(2.19)	
Div_Position	.358*	
	(.16)	
Day Game	-2.85**	
	(.94)	
Extra Help		4.09**
		(1.46)
N	80	80
R-Squared	.6960	.1280

*Statistically significant at a 95% confidence level.
**Statistically significant at a 99% confidence level.

Table III. Estimated Impacts of Cubs Attendance on Parking Returns

Year	Per Game Attendance	Model-Predicted Price	Paul-Estimated Price	Economic Profit
2002	34,627	$11.52	$20.25	$ 0.00
2003	36,575	17.78	24.30	1,252.24
2004	39,138	26.01	21.25	4,959.18
2005	38,276	23.24	22.95	3,712.45
2006	38,559	24.15	24.65	4,121.76
2007	40,153	29.27	30.40	6,427.21
2008	40,738	31.15	33.25	7,273.31

Source: Ballparks of Baseball (2008).
Model-Predicted Price$_t$ = P_{2008} *(1-(A_t-A_{2008})/A_{2008})*4.2; A=Attendance, 4.2=Elasticity of Price With Respect to Cubs Attendance from Table II Coefficient
Paul-Estimated Price is the per-space average price times capacity utilization rate based on Paul's recollection of market conditions at those times.
Economic Profit is based on the model predicted price; Economic Profit = 0 if P_t<$15; Economic Profit=($P_t$-15)*81 games*5.56 cars parked per game

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Role of Energy Futures Markets: Hedging Effectiveness against Speculative Forces

Jeong W. Lee

I. Introduction

When crude oil price was skyrocketing toward 150 dollars per barrel in 2008, commodity-market regulators began to investigate whether energy-market players were injecting false data into the marketplace to influence perceptions about energy market supply and demand. Of course, this investigation was mainly prodded by public outcry and Congress searching for villains of the day. One aspect of the concerns of the regulators was that companies might be reporting inventory levels that were inaccurate to benefit their own trading positions. For example, a company could theoretically underreport barrels in their tanks at a key hub to suggest oil was scarcer than it really was, and then sold its physical oil at a premium when oil prices jump on misleading news. Another concern was whether companies conduct some physical oil sales and purchases solely to influence short-term pricing on energy markets.

In addition, the recent financial turmoil dubbed as "the worst financial crisis since the Great Depression" was a direct result of the changes in FASB accounting principles into the "marked to market" values, many argued. However, reviewing financial statements that incorporate unfamiliar assets and leverage, whose characteristics include high volatility, may be too complex for routine audits where suggestions are made based primarily on the grounds of *book* values. In volatile markets, top decision makers should steer the course of companies based on "real time" or "marked to market" information rather than on historical values.

Energy companies, countries dependent on foreign oils, or even investors or traders in the energy markets, may pay high prices if they can not establish reliable hedges against vicious energy price swings. Unfortunately, it can be shown that establishing a reliable hedge is extremely difficult. In addition, energy markets are very sensitive to international politics as well as global uncertainties. Since energy is indispensable to our daily lives, understanding the mechanism of energy hedging becomes more than a financial matter.

As one way to study the role of energy futures markets against speculator manipulations, this study investigates the optimal timing for hedging in natural gas spot market utilizing both
natural gas futures and heating oil futures. Many of the previous studies took a slightly different approach to hedging problems. Some studies have shown that the optimal number of futures contracts to be sold is the number that minimizes the variance of net profit of the hedged positions (Johnson 1960; Stein 1961). Others have tried optimal hedging techniques to minimize the variance of earnings (McKinnon 1967; Overdahl 1987; Newberry 1988). More recent studies on the stock market include those on the dynamic efficiency between spot and futures markets in the case where short-selling restrictions were lifted. (Jiang,Gung, and Cheng 2001)
Since the effectiveness of minimum-risk hedge ratios may differ under various market conditions, the optimum size of futures positions can be analyzed for periods of rising and falling natural gas prices. Given the extreme nature of the price volatility of natural gas, it is

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worthwhile studying the possibility of hedging natural gas market with both natural gas and other alternatives such as heating oil futures, since both natural gas and heating oil is used for heating, sometimes for the same premises. Recall, during the latter part of 2000 and the early part of 2001, natural gas prices had run up from $2 per unit (1 mil btu) to around $10 per unit. In California, natural gas prices peaked at $59 per unit during January of 2001.
A futures hedge is usually initiated by buying (selling) futures contracts and terminated by closing out the position when the spot market transaction occurs. The position is typically closed by selling (buying) the same contract in the futures market rather than taking delivery of the underlying asset. An investor can reduce part of their natural gas market exposure between the time of natural gas purchases and sales by selling futures contracts. This statement is especially true for energy companies who produce and hold large volumes of natural gas. These companies can offset short-term losses in their natural gas holdings by selling natural gas or heating oil futures contracts. Price risk is reduced to the extent that the gain in the futures position offsets the losses in the value of the spot holdings and vice versa.

The paper first provides a review of prior studies and defines an appropriate measure of hedging effectiveness. The next section is the data analysis where hedging effectiveness and minimum-risk hedge ratios for the natural gas and heating oil futures are determined using the daily natural gas spot prices. Additionally, the risk-reduction measures are examined across futures contracts with different numbers of day remaining. The final section is the conclusion of the paper.

II. Hedging Effectiveness for Natural Gas

The effectiveness of a hedged spot position is dependent on the size of the futures position and the degree of correlation between changes in the value of the spot position and changes in futures prices over the hedging period. During any particular hedging period, the co-movement between the natural gas futures market and the natural gas spot market may not be perfect since they are basically two different markets. Their co-movements are not the same for the following reasons:

1. The differences between investors perceived present value of cash versus futures may fluctuate as economic and other conditions change.
2. The futures price is influenced by factors that do not necessarily affect the spot price.
3. Since spot and futures are different markets, their price changes can be random and independent over time.

Note: Futures prices reflect levels of, and changes in, financing costs of the underlying instrument, because futures are in effect an alternative to purchasing the instrument today and carrying it until the delivery date, thereby incurring the financing charges. Hence, it is safe to say that the supply-and-demand conditions in the spot and futures markets may not be exactly the same.

Several earlier studies (Ederington 1979; Johnson 1960) concluded that significant portions of the risk of price changes accompanying cash positions could be eliminated using futures contracts in various financial products over specific time periods. Based on these

studies, it can be shown that the minimum-risk hedge ratio and hedging effectiveness are related to the covariance, or correlation, between spot and futures price changes, and the variance of futures price changes over the period of the hedge. This hedge ratio can be interpreted as the weight of the futures position in a portfolio consisting of both spot and futures positions, or the proportion of the predetermined spot position that is hedged.

In order to find the size of the futures position that minimizes the exposure to price risk, we minimize the variance of the hedged portfolio with respect to the proportion of the portfolio held in futures contracts.

$$\min \text{Var}(C_{ht}) = \text{Var}(C_{st}) + X_f^2 \text{Var}(C_{ft}) + 2X_f \text{Cov}(C_{st} C_{ft}) \qquad (1)$$

where C_{ht} is the change in the value during period t of the hedged spot position, C_{st} , C_{ft} are the changes in value during period t of the spot position and futures contracts, respectively, X_f is the proportion of the portfolio held in future contracts: X_f*would equal the optimal hedge ratio (HR*) with $X_f < 0$ representing a short position and $X_f > 0$ a long position in futures.

$$\frac{\delta \text{Var}(C_{Ht},)}{\delta X_f} = 2X_f \text{Var}(C_f) + 2 \text{Cov}(C_s C_f) = 0 \qquad (2)$$

$$-\frac{\text{Cov}(C_S, C_f)}{\text{Var}(C_f)} = X_f^* = HR^* \qquad (3)$$

Therefore, the optimum hedge ratio is the equivalent of the negative of the slope coefficient of a regression of spot price changes on futures price changes.

The use of absolute price changes instead of the percentage changes in value is warranted because of the unique circumstances associated with the hedging decision in the portfolio model. One of these circumstances is a result of the objective of a futures hedging strategy. The objective is to minimize potential losses from a fixed, predetermined, position of the portfolio. The futures position should not be viewed as a substitute for the cash position. Futures are combined with the cash position to minimize losses in value of the cash position. Accordingly, effective hedging depends on the amount of covariance between value changes of the spot and futures.

> Another basis for the reliance on price changes versus returns is that the futures positions have no initial investment value and thus do not provide returns on investment in the normal sense. The only costs associated with futures hedges are transaction costs, the opportunity cost of funds provided as margin before gains on the spot position are realized, and the costs associated with basis risk. The basis risk cost comes from the fact that with imperfect foresight, gains and losses on spot and futures positions may not exactly offset each other in every period.

The measure of hedging effectiveness (E_f*) for the minimum-risk hedge is defined as the proportional reduction in the variance of changes in the value of the spot position that comes from maintaining the hedge ratios determined above rather than holding an unhedged

position (X_f =0). E_f* is the coefficient of determination for the regression of spot price changes on futures' price changes used to estimate HR*.

$$E_f^* = \frac{\text{Var } (C_s) - \text{Var } (C_H)}{\text{Var } (C_s)} = 1 - \frac{\text{Var}(C_H)}{\text{Var}(C_s)} \quad (4)$$

$$E_f^* = \frac{\text{Cov } (C_s, C_f)^2}{[SD(C_s)SD(C_f)]^2} = R^2 \quad (5)$$

To the extent that the variances and covariance are stable, historical data can be used appropriately to help solve for the minimum-risk hedge ratios and to estimate its potential effectiveness in reducing the variability in spot price changes. Hedge ratios and hedging effectiveness may change over time due to changes in market conditions and in market participants. Hedge ratios and effectiveness may also vary for contracts with different times to delivery.

The correlation structure of price changes can change over time as a function of the direction of natural gas price movements and their impact on various participants in the futures market. Investors with long positions in natural gas may increase their hedging activity when they expect price drops larger than anticipated by the market. The opposite behavior would be expected of investors with short positions. The relative amount of hedging participation, and the extent of spot futures arbitrage in rising and falling markets may impact hedge ratios. Also, the cheapest deliverable instrument may change and thereby alter hedging effectiveness.

If hedging effectiveness and ratios differ significantly in rising and falling markets, both passive and selective hedgers may want to incorporate these differences in their hedging strategies. A passive hedger is one who maintains a continuous futures hedge to eliminate all exposures caused by the fluctuations of natural gas prices. If hedging effectiveness and ratios change over time, proper adjustments may be needed in the size of their futures position over time. Selective hedging may be done by using the futures market as an alternative to liquidating or investing in a spot position based on natural gas market forecast. These hedgers may be interested in the hedge ratio that is most relevant to their forecasts. Note that the different optimal hedge strategies in rising and declining markets will not guarantee selective or passive hedgers that they will be able to capitalize on these differences. To capitalize on these differences would require the differences to be stable, and for hedgers to be able to identify the general direction of the market over the hedging period.

Minimum risk hedge ratios and hedging effectiveness may also change over time due to structural changes in natural gas markets that affect the volatility of spot price changes. Increased volatility of daily natural gas prices is transmitted to futures prices through the implied expected future values. An increase in natural gas market volatility, whatever the source, should increase the incentive to use futures hedges and, accordingly, should increase participation in the relevant futures market. On top of a changing energy environment, the term to delivery of the futures contract may be related with different levels of hedge ratios and hedging performance. Unlike other financial futures contracts, like stock index or

T-bond futures which have heavy trading volumes only for "front" month contracts, energy futures contracts (both natural gas and heating oil) have decent trading volumes throughout different expiration months. Generally, as the contract gets very close to delivery, investors who do not wish to execute delivery may liquidate their positions.

III. Data and Methodology

1) Data Set and Methodology

Daily data was acquired from January 3, 2003 to March 21, 2008 (1301 observations). All the price sets (natural gas spot and futures, heating oil futures) were drawn from a Bloomberg subscription terminal. Price changes for each contract are grouped according to the number of days remaining. For this study, we utilized 4 delivery futures (March, June, September, and December) both for natural gas, and heating oil futures. Both natural gas and heating oil futures price changes are matched with spot natural gas price changes. Ordinary least-square (OLS) regressions of spot price changes on contemporaneous futures price changes provide estimates of hedging effectiveness (R^2) and minimum-risk hedge ratios (regression coefficient on the spot price).

To determine if the estimated hedge parameters differ with respect to time to delivery, separate regressions are run for price changes on contracts with various days remaining to delivery. Days remaining to delivery are subdivided by 1-30 days, 30-60 days, and 60-102 days. Two types of statistical analysis are used to compare estimated levels of hedge ratios and effectiveness across subsets of the sample. First, separate OLS regressions are estimated for each subset of the sample to determine minimum-risk hedge ratios and effectiveness measures. Neter and Wasserman (1972) provide a procedure for estimating a confidence region for coefficients of determination (R^2). This procedure is used to analyze the significance and the stability of the hedging effectiveness measures. The second test gives statistical comparisons of hedge ratios over different market conditions. Two sets of slope and intercept terms, along with an interaction term, are added to the regression model to compare the several subsets of data under analysis. This procedure was first suggested by Gujarati (1970) and facilitates the testing of the hypothesis that hedge ratios are equal under rising vs. declining prices. The full model becomes

$$C_s = \alpha_o + \alpha_1 D(S) + \beta_1 C_f + \beta_2 D(S) C_f \qquad (6)$$

where

C_s, C_f = change in spot and futures prices
D(S) =1 if $C_s < 0$ (natural as spot prices rose)
= 0 if $C_s > 0$ (natural gas spot prices declined)

2) Empirical Results and Analysis

Table I presents a comparison between the hedge ratio and hedging effectiveness estimates based on the full data set and selected subsets of the data. Results are reported for observations segmented by days remaining to delivery as well as for the full data set. Table II shows the summary of hedge ratio estimation for the full model with dummy variables. The numbers in parenthesis are t-statistics.

Examination of these results leads to several points that are worthy of further discussion. In the case where we utilize natural gas futures to hedge natural gas spot positions, hedges of the spot using the minimum-risk hedge ratio can provide an average proportional reduction in variability from 1.8% to 44.9%, i.e. an increase in effectiveness. Hedging with 1-30 days-to-delivery futures contracts provides a better hedge than any other subset of time-to-delivery for natural gas futures contract. In addition, the estimate of the hedge ratios and levels of effectiveness for the nearest days-to-delivery seem to occur because futures and spot price behave similarly as futures contracts near delivery. 61-91 days-to-delivery futures contracts have the second highest hedging effectiveness. 31-60 days-to-delivery futures contracts perform the poorest. Simply put, a futures contract with one to two months-to-delivery is not a good hedging vehicle compared with other delivery month futures. Similar results can be seen in the heating oil futures case. However, in this case, the estimate of the hedge ratio is highest with 61-91 days-to-delivery futures. The next best futures contract for hedging is 1-30 days-to-delivery futures. Generally speaking, as is expected, the natural gas contract is a better hedging tool than the heating oil futures to hedge the spot natural gas position.

IV. Conclusion

The extreme volatility of energy prices, which often occurs when we are not so well prepared for it, and the collapse of financial markets in general have compelled us to delve into the possibility of using energy futures contracts as means of reducing the variability of energy markets. One of the essential energy sources is natural gas. Natural gas is notorious for its volatility and cheap substitutes are not easily found. In this paper, we studied the optimal timing for hedging in natural gas spot with heating oil futures as well as natural gas futures.

When natural gas futures are used to hedge natural gas spot positions, a proper choice of timing and contract can achieve an average proportional reduction in variability from 1.8 % to 44.9%. Hedging with the front month futures provides a better hedge than any other subset of time-to-delivery for natural gas futures contracts. Also, the estimate of the hedge ratio is highest with 1-30 days-to-delivery futures. The large hedge ratios and levels of effectiveness for the nearest days-to-delivery contracts seem to occur because futures and spot prices behave similarly as futures contracts near delivery. 61-91 days-to-delivery futures contracts have the second highest level of hedging effectiveness. 31-60 days-to-delivery futures contracts perform the poorest. These results roughly state that a futures contract with one to two months to delivery is not a good hedging vehicle compared with other delivery month futures.

Similar results can be seen when the heating oil futures contracts are used for hedging. The 31-60 days-to-delivery futures contracts show the lowest hedge ratio and hedging effectiveness. But in this case, the estimate of the hedge ratio is highest with 61-91 days-to-delivery futures. The next best futures contracts for hedging is the 1-30 days-to-delivery futures. Overall, as is expected, the natural gas futures contract is a better hedging tool than the heating oil futures contract to hedge the spot natural gas position. Given a different data set, different outcomes might have resulted. Further analysis of different sets of data is needed to reach conclusions regarding optimal energy futures strategies for hedgers.

Table I
Hedge Ratios and Effectiveness Estimates
(Jan 3, 2003 – Mar 21, 2008)
(Daily Natural Gas Cash and Natural Gas or Heating Oil Futures Prices Changes)

	Days to Delivery	Hedge Ratio (HR)	Hedging Effectiveness (R^2)	N
Natural Gas Futures	1-30	0.8492	0.458	444
	31-60	- 0.2180	0.018	445
	61-91	0.3882	0.3492	412
	All	0.5342	0.0232	1301
Heating Oil Futures	1-30	0.0121	0.2768	444
	31-60	0.0328	0.0210	445
	61-91	0.0061	0.3488	412
	All	0.2134	0.0322	1301

Table II
Results of Hedge Ratios Estimation with Dummy Variables

	Natural Gas Futures				Heating Oil Futures			
Variables	1-30 Days	31-60 Days	61-91 Days	All Data	1-30 Days	31-60 Days	61-91 Days	All Data
D(S)	-1.258	-0.435	-0.175	-0.258	-0.194	-0.389	-0.189	-0.263
	(-12.01)	(-2.83)	(-13.01)	(-4.8)	(-11.96)	(-2.64)	(-14.26)	(-5.52)
C_f	0.937	-0.268	0.392	0.427	0.007	0.0838	0.004	0.012
	(12.31)	(-0.26)	(3.65)	(1.30)	(0.94)	(1.05)	(1.71)	(0.85)
$D(S)C_f$	-0.339	-0.558	-0.283	-0.404	0.015	-0.079	-0.001	-0.008
	(-2.79)	(-0.37)	(0.12)	(-0.95)	(-1.22)	(-0.73)	(-0.35)	(-0.38)
Multiple R^2	0.449	0.018	0.359	0.022	0.266	0.019	0.338	0.021
No. of Observations	444	445	412	1301	444	445	412	1301

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Real Estate Index Funds: Characteristics and Performance Evaluation

C. Edward Chang and Walt A. Nelson

Abstract

This paper examines operating characteristics, risk and performance measures of all available vehicles for index investing in U.S. real estate funds during the ten-year period from April, 1999, to March, 2009. The authors of this study find real estate index mutual funds and exchange-traded funds exhibit lower Expense Ratios, lower Turnover Rates, and mostly lower Tax Cost Ratios than category averages. As newcomers, real estate exchange-traded funds have had a good start, with the lowest Expense Ratios, lowest Turnover Rates, and lowest Tax Cost Ratios. Vanguard's four index mutual funds over the past ten years have outperformed their counterpart category averages with higher Returns, higher Risks, and higher Risk-Adjusted Returns. On the contrary, Wells' four index mutual funds over the past ten years have underperformed their counterpart category averages with lower Returns, higher Risks, and mostly lower Risk-Adjusted Returns. Four ETFs with at least three-year track record, however, have collectively underperformed index mutual funds over the past five with lower Returns, mostly higher Risks, and mostly lower Risk-Adjusted Returns. Nonetheless, Vanguard's ETF has been able to mostly outperform Vanguard's index mutual funds with higher Returns, lower (or same) Risks, and higher (or same) Risk-Adjusted Returns since its inception.

I. 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 & Gensler, 2002; Ferri, 2007; Haslem, 2003; Swedroe, 2004). The first index mutual fund (the Vanguard 500 Index Fund, initially operating under the name First Index Investment Trust) 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 more than three decades, the market share of index funds constitutes 17% of equity fund assets (10% market share by index mutual funds and 7% market share by the exchange-traded funds) (Bogle, 2007).

This paper examines operating characteristics, risk and performance measures of all available vehicles for index investing in U.S. real estate funds during the ten-year period from April, 1999, to March, 2009. In this study, real estate index funds include not only index mutual funds (hereafter "IMFs"), but also their recently emerging close substitutes --- exchange-traded funds (hereafter "ETFs"). Operating characteristics include Expense Ratios, Annual Turnover Rates, and Tax Cost Ratios. Performance measures include Average Annual Returns and Return Percentile Rank in Category, Risks (measured by Standard Deviations and Betas) and Risk-Adjusted Returns (measured by the Sharpe Ratios and Alphas). Our results would help shed light on two issues: First, how do real estate index funds (IMFs and ETFs) perform compared with average of all real estate mutual funds (hereafter AMFs), and thus actively-managed real estate mutual funds? Second, do real estate ETFs perform as well as real estate IMFs?

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II. Equity Index Investing and Literature Review

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 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 do not perform as well as 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).

This paper investigates how well index investing works on a narrower scale – real estate 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.

III. Data and Methodology

Real estate mutual funds and ETFs are defined by Morningstar as domestic equity funds that specialize in real estate. Real estate IMFs and ETFs with at least three-year data available on March 31, 2009, were collected from Morningstar's Principia. Table 1 shows of 229 real estate mutual funds, 8 IMFs from two fund families (Vanguard and Wells) were found. These 8 IMFs were supplemented by 4 ETFs from three fund families (iShares, SPDR, and Vanguard) for this study.

Most tables contain two panels. The first panel is to compare real estate IMFs vs. real estate AMFs. The second panel is to compare real estate ETFs vs. real estate AMFs. In order to make meaningful comparisons, we choose to compare all measures with matching category and duration (time period). Operating characteristics collected, averaged, and reported include: Expense Ratios, Annual Turnover Rates, and Tax Cost Ratios.

Expense Ratio is the annual fee all mutual funds charge investors. Expense Ratio is expressed as the percentage of assets deducted each fiscal year for fund expenses, including 12b-1 fees, management fees, administrative fees, operating costs, and all other asset-based costs incurred by the fund.

Turnover Rate or Ratio is a measure of the fund's trading activity. Turnover Ratio is computed taking the lesser of purchases or sales (excluding all securities with maturities of less than one year) and dividing by average monthly net assets. A Turnover Ratio of 100% does not

necessarily suggest all securities in the portfolio have been traded. The fund might have held 50% of all positions for the past five years and turned over the other 50% of all positions twice throughout the year. A low Turnover Rate would loosely indicate a buy-and-hold strategy. High Turnover would indicate an investment strategy involving considerable buying and selling of securities. The Turnover figure is culled directly from the financial highlights of the fund's Annual Report and is not calculated by Morningstar.

The Morningstar Tax Cost Ratio measures how much a fund's annualized return is reduced by the taxes investors pay on distributions. Funds regularly distribute dividends and capital gains to their investors. Investors then must pay taxes on those distributions during the year they are received. Like an Expense Ratio, the Tax Cost Ratio is usually concentrated in the range between 0% and 5%. A 0% Tax Cost Ratio indicates the fund had no taxable distributions. A higher Tax Cost Ratio indicates the fund was less tax efficient.

Performance measures include conventional Return, Risk, and Risk-Adjusted Return measures as suggested by Bodie, Kane and Marcus (2007). Annual Average Returns are measured by mutual funds' net asset value (NAV) returns and ETFs' market returns. Return Percentile Rank in Category represents the percentile rank the fund's return had in its Morningstar category over the designated time frame. Returns are ranked from highest to lowest, with the best return having a 1% ranking and the worst a 100% ranking. These relative figures are a good way to locate funds that out- or underperformed their peers during a certain time period.

Standard Deviation (a statistical measurement of dispersion about an average) depicts how widely a fund's returns varied over a certain period of time. Investors use the Standard Deviation of historical performance to predict the range of returns most likely for a given fund. When a fund has a high Standard Deviation, the predicted range of performance is wide, implying greater volatility. Morningstar computes the Standard Deviation by using the trailing monthly total returns for the appropriate time period. All monthly Standard Deviations are then annualized. Standard Deviation is also a component in the Sharpe Ratio, a risk-adjusted return measure developed by Nobel Laureate William Sharpe. The Sharpe Ratio is calculated by using both the Standard Deviation and excess return to determine reward per unit of risk. The higher the Sharpe Ratio, the better the fund's historical risk-adjusted return performance. The Sharpe Ratio over a three-year period is calculated for the past 36-month period dividing a fund's annualized excess returns over the risk-free rate by its annualized Standard Deviation. It is recalculated by Morningstar on a monthly basis.

Two statistics from modern portfolio theory are also used to shed some light on funds' market risks and market-risk-adjusted returns. While Standard Deviation is a measure of a fund's absolute volatility, Beta is a measure of a fund's sensitivity to market movements. Morningstar calculates beta by comparing a fund's excess return over Treasury bills to the market's excess return over Treasury bills, so a beta of 1.10 shows that the fund has performed 10% better than its benchmark index in up markets and 10% worse in down markets, assuming all other factors remain constant. A low beta signifies only that the fund's market-related risk is low. Beta is particularly appropriate when used to measure the risk of a combined portfolio of mutual funds. Alpha is a measure of the difference between a fund's actual returns and its

expected performance, given its level of risk as measured by Beta. A positive Alpha figure indicates the fund has performed better than its Beta would predict. In contrast, a negative Alpha indicates the fund's underperformance, given the expectations established by the fund's Beta. For example, the Alpha of 0.86 indicates that the fund produced a return 0.86% higher than its Beta would predict.

IV. Results

Results of Expense Ratios, Annual Turnover Rates and Three-Year Tax Cost Ratios are tabulated in Table 2. Both IMFs and ETFs, compared with AMFs, appear to have lower Expense Ratios, lower Turnover Rates, and inconclusive Tax Cost Ratios. Vanguard's 3 IMFs exhibit lower Tax Cost Ratios (1.85% vs. 2.58%) while Wells' 4 IMFs exhibit higher exhibit lower Tax Cost Ratios than those of AMFs. ETFs, compared with IMFs, appear to have lower Expense Ratios (0.30% vs. 0.89%), lower Turnover Rates (15.50% vs. 21.50%), and lower Tax Cost Ratios (1.66% vs. 2.79%). Vanguard's ETF, compared with average of Vanguard's IMFs, exhibits lower Expense Ratios (0.10% vs. 0.12%), same Turnover Rates (32.00%), and lower Tax Cost Ratios (1.77% vs. 1.85%).

Average Annual Returns are shown in Table 3. During the ten-year period from April 1999 to March 2009, IMFs appear to display lower Returns (2.76% vs. 3.38%) than AMFs. Nevertheless, Vanguard's 4 IMFs exhibit higher Returns (3.58% vs. 3.38%) while Wells' 4 IMFs exhibit lower Returns than category average. During the five-year period from April 2004 to March 2009, ETFs appear to display inconclusive Returns when compared with category average. ETFs, compared with IMFs, appear to have lower Returns over the past five years. Vanguard's ETF, compared with average of Vanguard's IMFs, exhibits slightly higher Returns (-25.01% vs. -25.04%) during the past three years.

Results of Return Percentile Rank in Category are similar, as shown in Table 4. During the ten-year period from April 1999 to March 2009, IMFs appear to display worse Return Percentile Rank in Category (63.63%) than category average (50.00%). Nonetheless, Vanguard's 4 IMFs, throughout the ten-year period, consistently exhibit better Return Percentile Rank in Category than category averages, while Wells' 4 IMFs exhibit worse Return Percentile Rank in Category than category averages.

Standard Deviations are tabulated in Table 5. Throughout the ten-year period from April 1999 to March 2009, IMFs appear to show higher Standard Deviations (22.41% vs. 21.90%) than category average. During the five-year period from April 2004 to March 2009, ETFs appear to display inconclusive Standard Deviations compared with category averages. ETFs, compared with IMFs, exhibit lower Standard Deviations (33.21% vs. 33.65%) over the three years, but higher Standard Deviations (29.08% vs. 29.05%) over the three five years. Vanguard's ETF, compared with average of Vanguard's IMFs, exhibits slightly lower Standard Deviations (33.14% vs. 33.16%) during the past three years.

Results of Sharpe Ratios are shown in Table 6. Throughout the five-year period from April 2004 to March 2009, IMFs appear to show higher Sharpe Ratios (-0.30% vs. -0.32%) than category average. Furthermore, Vanguard's 4 IMFs exhibit higher Sharpe Ratios (0.14% vs. 0.12%) while Wells' 4 IMFs exhibit lower Sharpe Ratios than category average. During the five-year period from April 2004 to March 2009, ETFs appear to display inconclusive Sharpe

Ratios compared with category averages. ETFs, compared with IMFs, exhibit lower Sharpe Ratios (-0.84% vs. -0.80%) over the three years, and the same Sharpe Ratios (-0.30%) over the three five years. Vanguard's ETF, compared with average of Vanguard's IMFs, exhibits the same Sharpe Ratios (-0.78%) over the past three years.

Results of Betas and Alphas are tabulated in Table 7. During the past three years, IMFs appear to show higher Betas (1.50 vs. 1.47) and higher Alphas (-3.44% vs. -4.26%) than category averages. During the same three-year period, EIFs exhibit higher Betas (1.52 vs. 1.47) and inconclusive Alphas than category averages. ETFs, compared with IMFs, exhibit higher Betas (1.52 vs. 1.50) and lower Alphas (-3.71% vs. -3.44%). Vanguard's ETF, compared with average of Vanguard's IMFs, exhibits the same Betas (1.48) and higher Alphas (-2.53% vs. -2.62%) over the past three years.

V. Conclusion

The authors of this study find real estate index mutual funds and exchange-traded funds exhibit lower Expense Ratios, lower Turnover Rates, and mostly lower Tax Cost Ratios than category averages. Vanguard's four index mutual funds over the past ten years and its exchange-traded fund over the past three years have outperformed their counterpart category averages with higher Returns, higher Risks, and higher Risk-Adjusted Returns. On the contrary, Wells' four index mutual funds over the past ten years have underperformed their counterpart category averages with lower Returns, higher Risks, and mostly lower Risk-Adjusted Returns.

As newcomers, real estate exchange-traded funds have had a good start, with the lowest Expense Ratios, lowest Turnover Rates, and lowest Tax Cost Ratios. Four ETFs with at least three-year track record, however, have collectively underperformed index mutual funds over the past five with lower Returns, mostly higher Risks, and mostly lower Risk-Adjusted Returns. Nonetheless, Vanguard's ETF has been able to mostly outperform Vanguard's index mutual funds with higher Returns, lower (or same) Risks, and higher (or same) Risk-Adjusted Returns since its inception.

Table I. Numbers and Names of Available Real Estate Index Funds as of March 31, 2009

Fund Type	Fund Name	With 3-Year Data	With 5-Year Data	With 10-Year Data
Real Estate Mutual Funds		229	200	87
Index Mutual Funds	Vanguard REIT Index	Yes	Yes	Yes
Index Mutual Funds	Vanguard REIT Index Adm	Yes	Yes	Yes
Index Mutual Funds	Vanguard REIT Index Inst	Yes	Yes	Yes
Index Mutual Funds	Vanguard REIT Index Signl	Yes	Yes	Yes
Index Mutual Funds	Wells DJ Wil U.S. REIT In A	Yes	Yes	Yes
Index Mutual Funds	Wells DJ Wil U.S. REIT In B	Yes	Yes	Yes
Index Mutual Funds	Wells DJ Wil U.S. REIT In C	Yes	Yes	Yes
Index Mutual Funds	Wells DJ Wil U.S. REIT In I	Yes	Yes	Yes
Exchange-Traded Funds	iShares C&S Realty	Yes	Yes	
Exchange-Traded Funds	iShares DJ RE Index	Yes	Yes	
Exchange-Traded Funds	SPDR DJ Wilshire REIT	Yes	Yes	
Exchange-Traded Funds	Vanguard REIT Index ETF	Yes		

Table II. Expense Ratio (%), Annual Turnover (%) and Three-Year Tax Cost Ratio (%)

A. Index Mutual Funds vs. Category Average

Fund Name	Expense Ratio		Annual Turnover		Tax Cost Ratio	
	IMF	AMFs	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	0.20	1.48	32.00	110.00	1.83	2.58
Vanguard REIT Index Adm	0.10	1.48	32.00	110.00	1.85	2.58
Vanguard REIT Index Inst	0.09	1.48	32.00	110.00	1.87	2.58
Vanguard REIT Index Signl	0.10	1.48	32.00	110.00		
Wells DJ Wil U.S. REIT In A	1.14	1.48	11.00	110.00	3.63	2.58
Wells DJ Wil U.S. REIT In B	1.89	1.48	11.00	110.00	3.35	2.58
Wells DJ Wil U.S. REIT In C	1.90	1.48	11.00	110.00	3.30	2.58
Wells DJ Wil U.S. REIT In I	1.69	1.48	11.00	110.00	3.71	2.58
Average of Vanguard Funds	0.12	1.48	32.00	110.00	1.85	2.58
T-test (probability)	0.00001***		0.00000***		0.00013***	
Average of All Funds	0.89	1.48	21.50	110.00	2.79	2.58
T-test (probability)	0.04529**		0.00000***		0.27691	

B. Exchange-Traded Funds vs. Category Average

Fund Name	Expense Ratio		Annual Turnover		Tax Cost Ratio	
	ETF	AMFs	ETF	AMFs	ETF	AMFs
iShares C&S Realty	0.35	1.48	9.00	110.00	1.54	2.58
iShares DJ RE Index	0.48	1.48	7.00	110.00	1.75	2.58
SPDR DJ Wilshire REIT	0.25	1.48	14.00	110.00	1.57	2.58
Vanguard REIT Index ETF	0.10	1.48	32.00	110.00	1.77	2.58
Average	0.30	1.48	15.50	110.00	1.66	2.58
T-test (probability)	0.00034***		0.00024***		0.00029***	

IMF: Index Mutual Fund ETF: Exchange-Traded Fund AMFs: Average of All Mutual Funds

***, **, *: Significant at the 0.01, 0.05, 0.10 level

Table III. Average Annual Return (%)

A. Index Mutual Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	IMF	AMFs	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	-25.09	-26.12	-8.78	-9.73	3.54	3.38
Vanguard REIT Index Adm	-25.02	-26.12	-8.70	-9.73	3.60	3.38
Vanguard REIT Index Inst	-25.00	-26.12	-8.68	-9.73	3.61	3.38
Vanguard REIT Index Signl	-25.04	-26.12	-8.74	-9.73	3.56	3.38
Wells DJ Wil U.S. REIT In A	-26.77	-26.12	-10.39	-9.73	2.29	3.38
Wells DJ Wil U.S. REIT In B	-27.35	-26.12	-11.09	-9.73	1.51	3.38
Wells DJ Wil U.S. REIT In C	-27.32	-26.12	-11.07	-9.73	1.53	3.38
Wells DJ Wil U.S. REIT In I	-26.59	-26.12	-10.17	-9.73	2.42	3.38
Average of Vanguard Funds	-25.04	-26.12	-8.73	-9.73	3.58	3.38
T-test (probability)	0.00001***		0.00001***		0.00063***	
Average of All Funds	-26.02	-26.12	-9.70	-9.73	2.76	3.38
T-test (probability)	0.40317		0.47255		0.05049*	
B. Exchange-Traded Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	ETF	AMFs	ETF	AMFs	ETF	AMFs
iShares C&S Realty	-28.15	-26.12	-10.13	-9.73		
iShares DJ RE Index	-26.13	-26.12	-10.02	-9.73		
SPDR DJ Wilshire REIT	-26.90	-26.12	-9.39	-9.73		
Vanguard REIT Index ETF	-25.01	-26.12				
Average	-26.55	-26.12	-9.85	-9.73		
T-test (probability)	0.28171		0.33154			

IMF: Index Mutual Fund ETF: Exchange-Traded Fund AMFs: Average of All Mutual Funds
***, **, *: Significant at the 0.01, 0.05, 0.10 level

Table IV. Return Percentile Rank in Category

	3-Year		5-Year		10-Year	
Fund Name	IMF	AMFs	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	43.00	50.00	48.00	50.00	45.00	50.00
Vanguard REIT Index Adm	41.00	50.00	46.00	50.00	44.00	50.00
Vanguard REIT Index Inst	40.00	50.00	45.00	50.00	42.00	50.00
Vanguard REIT Index Signl	41.00	50.00	47.00	50.00	44.00	50.00
Wells DJ Wil U.S. REIT In A	67.00	50.00	72.00	50.00	79.00	50.00
Wells DJ Wil U.S. REIT In B	74.00	50.00	78.00	50.00	88.00	50.00
Wells DJ Wil U.S. REIT In C	74.00	50.00	78.00	50.00	88.00	50.00
Wells DJ Wil U.S. REIT In I	65.00	50.00	69.00	50.00	79.00	50.00
Average of Vanguard Funds	41.25	50.00	46.50	50.00	43.75	50.00
T-test (probability)	0.00040***		0.00615***		0.00109***	
Average of All Funds	55.63	50.00	60.38	50.00	63.63	50.00
T-test (probability)	0.17221		0.04694**		0.05832*	

IMF: Index Mutual Fund AMFs: Average of All Mutual Funds
***, **, *: Significant at the 0.01, 0.05, 0.10 level

Table V. Standard Deviation (%)

A. Index Mutual Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	IMF	AMFs	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	33.19	32.50	28.71	28.13	22.16	21.90
Vanguard REIT Index Adm	33.16	32.50	28.68	28.13	22.14	21.90
Vanguard REIT Index Inst	33.15	32.50	28.69	28.13	22.14	21.90
Vanguard REIT Index Signl	33.15	32.50	28.68	28.13	22.14	21.90
Wells DJ Wil U.S. REIT In A	34.21	32.50	29.46	28.13	22.70	21.90
Wells DJ Wil U.S. REIT In B	34.14	32.50	29.42	28.13	22.66	21.90
Wells DJ Wil U.S. REIT In C	34.12	32.50	29.40	28.13	22.66	21.90
Wells DJ Wil U.S. REIT In I	34.10	32.50	29.39	28.13	22.65	21.90
Average of Vanguard Funds	33.16	32.50	28.69	28.13	22.15	21.90
T-test (probability)	0.00000***		0.00000***		0.00001***	
Average of All Funds	33.65	32.50	29.05	28.13	22.41	21.90
T-test (probability)	0.00022***		0.00014***		0.00069***	

B. Exchange-Traded Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	ETF	AMFs	ETF	AMFs	ETF	AMFs
iShares C&S Realty	34.66	32.50	30.14	28.13		
iShares DJ RE Index	31.72	32.50	27.89	28.13		
SPDR DJ Wilshire REIT	33.31	32.50	29.20	28.13		
Vanguard REIT Index ETF	33.14	32.50				
Average	33.21	32.50	29.08	28.13		
T-test (probability)	0.16208		0.14194			

IMF: Index Mutual Fund ETF: Exchange-Traded Fund AMFs: Average of All Mutual Funds
***, **, *: Significant at the 0.01, 0.05, 0.10 level

Table VI. Sharpe Ratio

A. Index Mutual Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	IMF	AMFs	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	-0.78	-0.84	-0.27	-0.32	0.13	0.12
Vanguard REIT Index Adm	-0.78	-0.84	-0.27	-0.32	0.14	0.12
Vanguard REIT Index Inst	-0.78	-0.84	-0.27	-0.32	0.14	0.12
Vanguard REIT Index Signl	-0.78	-0.84	-0.27	-0.32	0.14	0.12
Wells DJ Wil U.S. REIT In A	-0.81	-0.84	-0.32	-0.32	0.08	0.12
Wells DJ Wil U.S. REIT In B	-0.84	-0.84	-0.34	-0.32	0.05	0.12
Wells DJ Wil U.S. REIT In C	-0.84	-0.84	-0.34	-0.32	0.05	0.12
Wells DJ Wil U.S. REIT In I	-0.81	-0.84	-0.31	-0.32	0.09	0.12
Average of Vanguard Funds	-0.78	-0.84	-0.27	-0.32	0.14	0.12
T-test (probability)	0.00000***		0.00000***		0.00299***	
Average of All Funds	-0.80	-0.84	-0.30	-0.32	0.10	0.12
T-test (probability)	0.00263***		0.05239*		0.12743	
B. Exchange-Traded Funds vs. Category Average						
	3-Year		5-Year		10-Year	
Fund Name	ETF	AMFs	ETF	AMFs	ETF	AMFs
iShares C&S Realty	-0.85	-0.84	-0.29	-0.32		
iShares DJ RE Index	-0.88	-0.84	-0.34	-0.32		
SPDR DJ Wilshire REIT	-0.85	-0.84	-0.28	-0.32		
Vanguard REIT Index ETF	-0.78	-0.84				
Average	-0.84	-0.84	-0.30	-0.32		
T-test (probability)	0.50000		0.23197			

IMF: Index Mutual Fund ETF: Exchange-Traded Fund AMFs: Average of All Mutual Funds

***, **, *: Significant at the 0.01, 0.05, 0.10 level

Table VII. Three-Year Betas and Alphas (%)

A. Index Mutual Funds vs. Category Average				
	Beta		Alpha	
Fund Name	IMF	AMFs	IMF	AMFs
Vanguard REIT Index	1.48	1.47	-2.67	-4.26
Vanguard REIT Index Adm	1.48	1.47	-2.59	-4.26
Vanguard REIT Index Inst	1.48	1.47	-2.59	-4.26
Vanguard REIT Index Signl	1.48	1.47	-2.63	-4.26
Wells DJ Wil U.S. REIT In A	1.52	1.47	-3.84	-4.26
Wells DJ Wil U.S. REIT In B	1.52	1.47	-4.71	-4.26
Wells DJ Wil U.S. REIT In C	1.52	1.47	-4.74	-4.26
Wells DJ Wil U.S. REIT In I	1.52	1.47	-3.73	-4.26
Average of Vanguard Funds	1.48	1.47	-2.62	-4.26
T-test (probability)	0.00000***		0.00000***	
Average of All Funds	1.50	1.47	-3.44	-4.26
T-test (probability)	0.00270***		0.02161**	
B. Exchange-Traded Funds vs. Category Ave				
	Beta		Alpha	
Fund Name	ETF	AMFs	ETF	AMFs
iShares C&S Realty	1.59	1.47	-3.89	-4.26
iShares DJ RE Index	1.48	1.47	-4.32	-4.26
SPDR DJ Wilshire REIT	1.52	1.47	-4.08	-4.26
Vanguard REIT Index ETF	1.48	1.47	-2.53	-4.26
Average	1.52	1.47	-3.71	-4.26
T-test (probability)	0.08224*		0.13037	

IMF: Index Mutual Fund ETF: Exchange-Traded Fund AMFs: Average of All Mutual Funds
***, **, *: Significant at the 0.01, 0.05, 0.10 level

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Fundamental Stock Investment Strategies for Bull and Bear Markets

Charles W. Johnston

Abstract

This research paper provides a stock investment model using both value and growth strategies for bull and bear markets. The model is based on fundamental principles of finance and can be efficiently used by individual investors and professional stock portfolio managers, in markets with high or low volatility, in the U.S. and internationally. The author initially developed the model primarily as a teaching tool, to demonstrate a profitable use of financial ratio analysis. The model and other findings of this research paper could also be useful to finance teachers of stock investing and their students.

I. Introduction

As the author was writing this paper in early March, 2009, we were experiencing a long and severe bear market in stocks, which started in October, 2007, and has seen the S&P 500 stock market index in the U.S. decline by almost 60%, to a level not seen since October, 1996 (Associated Press, 2009). Many investors appear to be ignoring fundamentals. Many appear to be focused on short-term trading rather than long-term investing. Many have substantially reduced their stock investments or cashed out of the stock market, to obtain the safety of low-risk money market accounts paying low returns.

It seems like a particularly good time to provide investors with my stock investment model, based on fundamental principles of finance, to encourage people to invest in undervalued growth stocks to earn high returns, as long-term investors. The model provides lower risk to help investors stay invested in stocks during both bull and bear markets.

Some of the fundamental principles used include:

* the weak form of the efficient markets hypothesis
* international portfolio diversification
* optimal asset allocation
* dollar-cost averaging
* rebalancing
* minimize transactions costs
* minimize taxes
* value investing strategies
* growth investing strategies
* portfolio risk management
* long-term investment planning and forecasting
* time in the market outperforming market timing.

Currently, there is no widely-accepted, standard model for stock investing. The author first developed this model about ten years ago, and has modified it several times, based on both ongoing academic research and investment results. Some of the stock selection criteria were chosen from those recommended by legendary stock investors Peter Lynch and Warren Buffett, well-known stock analysts James O'Shaughnessy and David

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Dreman, and succcssful stockbroker Brett Machtig (Machtig & Behrends, 1997; O'Shaughnessy, 1998; Dreman, 1998; Lynch & Rothchild, 1989; Hagstrom, 2001). In recent years, several previous research papers written on this stock model by the author for the Academy of Finance have convinced the author to exclude technical analysis and exclude macroeconomic variables from the model, while adding qualitative screening variables and changing some of the parameter values for some quantitative criteria. While only including the most important variables, this model is more of a full-information model than most individual and professional investors use to make buy and sell recommendations for common stocks.

This internationally diversified stock portfolio model includes strategies for both value investing and growth investing, while managing risk, transactions costs, and taxes. The stock selection criteria include quantitative financial ratio analysis, and qualitative screening considerations. Buying and selling is used to maximize returns, with a minimum recommended investment period of five years.

The author cannot document the long-term stock market performance of this model, because important changes in the model have been made in recent years. Some recent empirical evidence is provided showing that a sample stock portfolio that fits the model did outperform the market over a 10-month period in 2009. Other empirical evidence is provided to highlight how the model usually outperforms the market, by screening out the biggest losers, while including some of the biggest winners.

The model makes sense financially and is strategically designed to outperform the market, while taking less risk than that incurred by the average stock investor. Previous versions of the model have successfully identified many valuable stock investments, including takeover targets just prior to profitable mergers and acquisitions announcements. Investors using this model will likely earn more than they could earn by investing in index funds and/or exchange-traded funds, and will learn more about how to profitably invest and manage an internationally diversified stock portfolio than they would learn by investing passively in professionally-managed equity mutual funds (Goetzmann and Massa, 2003). Investing using this model is also substantially less risky and less time consuming than buying and managing your own business, but you still earn the profits created by many successful businesses. Investing in an individual stock portfolio, using this model, could also be used to complement an individual's other investments in equity investments, including equity mutual funds, exchange-traded funds, and/or index funds (Schwab, 2001; Weldon, 1997).

In addition to helping stock investors, this research paper could also be used by finance professors to teach their students how to use the model to profitably invest in stocks and manage a stock portfolio. The author has taught these stock investment strategies to many students in his MBA core finance classes for many years. Most students have particularly valued and enjoyed this useful learning.

II. Quantitative Stock Selection Criteria

In searching for stock picks, the current values of the following financial ratios can be found on financial websites, usually in the order presented in my model (Key Statistics, n.d.;

Ratios, n.d.; Analysts Estimates, n.d.; Estimates, n.d.). The common stock investor doesn't have to calculate these values himself or herself. Some financial websites also provide stock screening, where the investor can specify the values of some financial ratios, and screen through all the stocks in a given database, to identify stocks with selected ratio values (Stock Screener, n.d.).

There are no widely-accepted standard criteria for selecting common stocks for a profitable stock portfolio. A combination of research and investment experience have led me to select the following financial ratio criteria and their respective limit values (Keown, Martin, Petty, and Scott, 2005).

* quick ratio or acid test ratio = (current assets - inventory)/(current liabilities) > or = 0.8

The quick ratio is a measure of liquidity. The 2008 liquidity crisis highlights the financial risk to companies that do not have sufficient liquidity to pay their expenses, including their accounts payable and debt service payments on short-term debt, particularly during periods of negative net cash flows. Ideally, a company would have a quick ratio that's high enough to provide it the funds needed to meet its liquidity needs, without having much excess liquidity, since current assets pay a lower rate of return than longer-term assets.

* accounts receivable turnover = (credit sales)/(accounts receivable) > or = 6

Accounts receivable turnover is a measure of operating efficiency. Offering credit to finance sales helps to increase sales and profits, so long as the buyers are creditworthy. The lower the turnover, the less-restrictive the credit policy, but that increases the credit risk to the company and the problems of bad debts on uncollected accounts receivable. If accounts receivable turnover is at least six times per year, credit risk is well-managed, without credit being too restrictive.

* return on total assets (ROA) = (net income)/(total assets) > or = 5%
* return on equity (ROE) = (net income)/(stockholders' equity) > or = 10%

ROA and ROE are measures of profitability. The model screens out companies that have been unprofitable in the recent past, but does not screen out companies that were successfully turned around from being unprofitable in previous years. The model favors companies that efficiently use debt financing to increase ROE relative to ROA. So long as the level of debt is manageable, for a profitable company, debt financing also helps to lower the after-tax cost of financing. A separate debt/equity ratio criterion was recently deleted from the model, partly because good data was unavailable.

* EPS growth (EPSG) = (projected long-term average annual growth in earnings per share) > or = 10%

EPS growth is the compound rate of return that the investor expects to earn in purchasing or holding a given stock. This criterion restricts investments to growth

companies and aggressive growth companies. It also makes the model forward-looking, since this is a forecast of future earnings growth. Projected average annual EPSG for the next five years is an intermediate term forecast, but it is the most forward-looking estimate provided by expert institutional analysts in the set of financial ratios on financial websites. Once you've requested a stock quote, this data is available under the link to "analysts estimates" or "estimates" (n.d.). It's best to use the mean forecast of all professional analysts covering the stock. Some successful value investors advise against investing in growth stocks, and advise against relying on analysts' forecasts of future earnings (Dreman, 1998; Tier, 2005).

The remaining financial ratios are price-to-value ratios, for measuring shareholder value to new equity investors.

* price-earnings ratio (P/E) = (common stock price per share)/(earnings per share)
  < or = 20

This is the stock price per share divided by the earnings per share. A lower ratio value is better (Greenwald, Kahn, Sonkin, & Van Biema, 2001). A common stock with a P/E > 20, is likely to be overvalued. When available, it's better to use a forward P/E than a trailing P/E. A trailing P/E uses the earnings per share for the last twelve months; a forward P/E uses the projected earnings for the next twelve months. These two P/E ratios can differ significantly for the same company in some time periods. However a new investor in the stock cannot receive last year's earnings. For the 1881-2000 period, 16 was the average historical value of this financial ratio for stocks in the S&P Composite Index (Shiller, 2000, p. 8).

* price-sales ratio (P/S) = (common stock price per share)/(sales revenue per share)
  < or = 2.0

This selection criterion prevents the investor from paying too much for a stock relative to its sales revenue. Once you've bought stock in the company, you can earn income from both current sales and all future sales. In his research of 45 years of market data, O'Shaughnessy found the P/S ratio to be the best criterion for identifying undervalued stocks (O'Shaughnessy, 1998, p. 36).

* price-book ratio (P/B) = (common stock price per share)/(net worth per share)
  < or = 4.0

The market price per share of stock is measure of its economic value; book value per share is a measure of its accounting value. In a bull market, the average stock trades for a multiple in excess of four times book value. Dreman's research found that stocks in the Compustat database with the lowest P/B ratios significantly outperformed stocks with higher P/B ratios, in the 1973-1996 period (Dreman, 1998, p. 122).

* dividend yield = (annual dividend per share)/(market price per share)
  > or = 2%

When available, it's best to use a forward estimate of the dividend yield. In principle, a stock that pays a dividend isn't necessarily better than one that doesn't, everything else equal. Long-term investors who aren't living off dividend income, are primarily interested in capital gains, which are usually higher for companies that reinvest their profits to grow their earnings. However, having to pay dividends helps to discipline financial managers to focus on maximizing shareholder returns. Historically, dividends have accounted for about 40% of the total return to stockholders, on average (Fonda & Kapadia, 2009). Dividend-paying stocks are also less risky. The dividend helps to stabilize the stock price during bull and bear markets. However, dividends aren't guaranteed and could be unexpectedly cut to reduce cash outflows from a company (Lepro, 2009).

* price/cash flow (P/CF) = (price per share of common stock)/(net cash flows per share) < or = 15

One fundamental principle of finance is that "cash – not profits -- is king" (Keown, Martin, Petty, and Scott, 2005, p. 14). For a financially well-managed company, the P/CF ratio is highly-correlated to the P/E ratio. Consequently, including this selection criterion may seem redundant. However, including it can protect the investor from investing in a company that is burning through cash, while growing its managed earnings, to hit its earnings forecast. In that event, the company could periodically restate its earnings, causing the stock price to plummet.

III. Qualitative Stock Selection Criteria

After finding stocks that fit the parameter values of the quantitative financial ratios in the model, consider deleting any stocks of companies that have one or more of the following qualitative problems, if these problems are likely to significantly reduce the company's expected future profits. If a company has these problems, you can often discover and learn about them on a financial website, by asking for a stock quote, then clicking on "headlines" or other "news and information links" (n.d.). Recent news may not have been considered by analysts in their long-term EPS growth forecasts.

* Lawsuits (e.g., class action personal injury or patent infringement)
* Government regulatory investigations (e.g., SEC or IRS)
* Labor market problems (e.g., impending labor union strike)
* Principal–agent problems (e.g., excessive executive compensation)
* Company specific risk (e.g., poor quality management or high legacy costs)
* Industry problems (e.g., increasing competition or excess supply)
* Domestic or foreign economic problems (e.g., slowdown in economic growth)

IV. Other Fundamental Principles Required In The Model

The following fundamental principles of investing are also important selection criteria in my model.

- Choose an optimal asset allocation among stocks, bonds, money, and other assets that best fits your investment time horizon and risk tolerance. Some researchers have concluded that investors' asset allocation decision could determine over 90% of their average annual portfolio return (Schwab, 2001, p. 21; Machtig and Behrends, 1997, p. 129). Make investments consistent with your risk preferences – conservative, moderate, or aggressive (Siegel, 1998, p. 37). Per Warren Buffett, the risk of earning a lower return than your required return is a better measure of risk than a stock's beta or a portfolio's beta (Greenwald, Kahn, Sonkin, and Van Biema, 2001, p. 169). The model provided in this paper focuses on the common stocks, but it's important for most investors to also invest in other types of assets.

- Rebalance periodically (e.g., annually) or whenever your asset allocation differs significantly from your desired asset allocation. Rebalancing can help investors achieve their investment return goals, by maintaining their optimal asset allocation (O'Shaughnessy, 1998, p. 51). Rebalancing will also increase the cumulative return, by buying low and selling high.

- Diversify your stock investment portfolio, by industry, by market cap, and internationally, to reduce portfolio risk to a comfortable level, consistent with your risk tolerance (Dreman, 1998, p. 170). International portfolio diversification, globally, can substantially reduce investors' portfolio risk (Machtig and Behrends, 1997, p. 217). While O'Shaughnessy recommends stock portfolio diversification across 25-50 stocks; Buffett recommends holding a less diversified portfolio, concentrated in twelve stocks or less (Tier, 2005, p. 16-17; O'Shaughnessy, 1998, p. 51-53).

- Buy low and sell high, globally (Lynch, 1989, p. 293; Greenwald, Kahn, Sonkin, Van Biema, 2001, 171; Siegel, 1998, p. 90). The model provided in this paper recommends only buying stocks that are temporarily undervalued, and recommends selling them when they are temporarily overvalued.

- Use dollar-cost averaging to lower the average cost of your stock investments. By investing periodically a fixed amount of money or a fixed percentage of pay, throughout up and down markets, investors can usually lower their average cost per share of stock, especially in volatile markets (Johnson and Krueger, 2004).

- Have a minimum stock investment period of five years, so that you can give your stock portfolio time to recover in value, if the market goes through a long bear market. The longer your investment period, the lower your risk of earning less than you could have earned on alternative investments. Staying in the stock market also helps to lower your transactions expenses (Machtig and Behrends, 1997, p. 68-73). There is no requirement that you hold any individual stock for any period of time.

- Don't try to "time the market" through frequent short-term trading of your stocks. Frequent trading will likely reduce your returns, while increasing your trading expenses and taxes. Most investors who try to sell at the peak and buy at the trough, are unlikely to get the timing right. Mistakes in timing are likely to be costly. Being out of the stock market during just a small percentage of the market's best days could substantially lower investors' returns (Barber and Odeon, 2000; Bogle, 2001, p. 88-89; Machtig and Behrends, 1997, p. 71; O'Shaughnessy, 1998, p. 24-26).

- Don't chase investments that have earned unusually high returns in the recent past; they're more likely to underperform in the near future. Over time, the return on most stocks tends to regress to the mean (Hong and Stein, 1999; Machtig and Behrends, 1997, p. 68).

- Don't use technical analysis to analyze stocks, per the weak form of the efficient market hypothesis (Johnston, 2006). Fundamental analysis is useful, given that most empirical evidence fails to support the stronger forms of the efficient market hypothesis (Gu, 2004; Adrangi., Chatrath, and Shank, 2002). The principles developed by behavioral finance researchers interestingly highlight ways in which stock investors are not always rational and stock markets are not always efficient (Belsky and Gilovich, 1999; Shiller, 2000). Most active stock market professional investors also contend that stock markets are often inefficient enough to permit the profitable use of fundamental analysis (Dreman, 1998, p. 59-64; Bogle, 2001, p. 50; Lynch and Rothchild, 1989, p. 34-35; Hagstrom, 2001, p. 158-159).

- Don't buy and sell stocks in response to frequent headline news reporting of recent past changes in macroeconomic data values, such as economic growth, unemployment, inflation, interest rates, and foreign exchange values. Since the data is reported with a lag, and may be substantially revised, ignoring it will keep the investor forward-looking, with a long-term focus. Headline news articles and broadcasts inefficiently encourage investors to frequently and sometimes substantially reallocate their funds among their different types of assets (Johnston, 2006). Don't engage in day trading. Frequent trading in response to changing macroeconomic market conditions, at home and/or abroad, would inefficiently increase investors' tax liabilities and transactions expenses, for a given expected return (Bogle, 2001, p. xviii; Schwab, 2001, p. 31-32).

- Use an online discount broker to research stocks and reduce your transactions cost of buying and selling stocks. The author currently uses www.tdameritrade.com and has been happy with their services. Stock investors can compare and contrast the costs and benefits of competing discount brokers online to find the best one for them. With access to high-quality data, analysis, research tools, a profitable model for picking stocks, and low-cost transactions costs for trading, even small individual investors can invest and trade online.

- Minimize your taxes, for a given portfolio return, by investing in tax-sheltered retirement accounts and annuities (Alltizer and Hamill, 1999; Greenwald,

Kahn, Sonkin, and Van biema, 2001, p. 170). In taxable accounts, less frequent trading will reduce your tax liability. Most of the return from stock investments will be in the form of capital gains, which have a maximum marginal tax rate of 15% . Stock market gains are not taxable until realized by selling. Taxable gains can be netted against losses. If a net loss on stock investments occurs in some year, the net loss can be used to shelter other personal income, up to $3000 per year, with additional losses carried forward.

- Increase your savings rate to finance your investments by paying yourself first, by automatically transferring part of each paycheck to your savings account or brokerage account.

V. Sell Rules

The following sell rules are used in my model:

- Sell stocks that no longer fit the model.
- Sell stocks to raise cash to buy better stocks.
- Sell stocks, when needed to rebalance your stock portfolio.
- Sell stocks to manage your tax liabilities.
- Sell stocks during bull markets, when needed to raise cash for other purposes.

VI. A Sample Of Stocks That Fit The Model

Provided below is a sample of stocks of companies that met all the quantitative ratios of my model, as of March 6, 2009. In parentheses are the stock symbols. The author used two financial websites, http://finance.yahoo.com and http://www.reuters.com/finance to identify these stock picks, by searching through the financial ratios of the stocks of sixty large-cap U.S. multinational companies.

- United Technologies (UTX).
- Microsoft (MSFT)
- Texas Instruments (TXN)
- Intel (INTC)
- The Gap (GPS)
- Nike (NKE).

Stocks that fit the model are not limited to large-cap stocks and are not limited to U.S. stocks, but these six demonstrate that there are stocks that fit the model, even though most don't. The model is designed to be very selective, to protect the investor from downside risk, while providing the investor with growth stock investments that are temporarily undervalued by the market. Large-cap growth stocks of U.S. multinationals corporations are the most likely to be fairly valued, in the global market economy, since they are the most widely-held and most heavily analyzed and traded.

While professional equity mutual fund managers could add all of these stocks to their internationally diversified stock portfolios, an individual investor with little money to invest

in a given month could buy just one. Buying one stock per month would allow individual investors to accumulate an internationally diversified stock portfolio of 12 stocks in a year and 24 stocks in two years, if they continued to fit the model.

VII. Empirical Evidence

The following table provides empirical evidence demonstrating that the small portfolio of stocks recommended by the model on March 6 significantly outperformed the benchmark S&P 500 index for the short-term period through the end of the year. The March 6 price is the purchase price (Get Quotes, n.d.). The December 31 price is the closing price (Historical Prices, n.d.). This investment period provided unusually high capital gains for both the market index and the stock portfolio, following a long bear market (Twin, 2010). The stocks recommended by the model also earn a dividend yield that exceeds the market average.

Company Name and Stock Symbol	Stock Price on 3/6/09	Stock Price 12/31/09	Capital Gain 3/6/09 – 12/31/09
United Technologies (UTX)	$38.54	$69.41	80%
Microsoft (MSFT)	15.28	30.48	100%
Texas Instruments (TXN)	14.71	26.06	77%
Intel (INTC)	12.41	20.40	64%
The Gap (GPS)	9.85	20.95	113%
Nike (NKE)	38.94	66.07	70%
Average for All Stocks			84%
S&P 500 Index			65%

Any small sample of stock investments during a non-representative investment period could provide biased results, and is insufficient to prove that the model will usually outperform the market. No model will always outperform the market in every short-term period.

It's not unusual for the portfolio of stocks that fit the model to beat the market, in the long-run, through bull and bear markets. The model is strategically designed to achieve that goal. One way that the model helps investors to earn more than the average stock market return is by screening out the stocks of companies that will most likely be the biggest losers, including overvalued, unprofitable, and low-growth companies. For example, in the late 1990s, the model screened out the stocks of the Internet companies, including AOL and Amazon.com, that imploded in the 2000-2002 bear market. The model also screened out Enron, Worldcom, and the other overvalued companies whose stock prices plummeted in 2001-2002, after they announced they had substantially overstated their earnings for the last several years. Another way that the model helps investors to outperform the market is by recommending the stocks of undervalued companies that are most likely to be acquired at a substantial premium. For example, the model recommended buying Mobil, before it was merged with Exxon, and recommended buying Chrysler several months before it was acquired, at a substantial premium, by Daimler-Benz. Shortly after the acquisition, the model recommended selling DaimlerChrysler, before the stock price declined.

One suggestion for future research is that other researchers empirically test the model presented in this paper, over different time periods, with different data sets, and compare the results to other models and market indexes. Teachers of finance or investment courses could also have their students test the model, using the investment websites highlighted in this paper, helping them learn to profitably invest in and manage a stock portfolio. The author has done that in his MBA core finance course over many years and most students have highly valued and enjoyed this useful learning.

VIII. Conclusions

This paper provides a model developed by the author that both professional and individual investors could profitably use to develop and manage an internationally diversified portfolio of common stocks. The model is based on fundamental principles of finance and investing, and includes both quantitative and qualitative stock selection criteria used and recommended by some of the most successful professional stock investors. The model uses both value investing and growth investing strategies, while excluding the technical strategies of momentum investors.

The author initially developed this model more than ten years ago, primarily as a tool for teaching students a profitable use of financial ratio analysis. Since then, the author has revised the model on numerous occasions, changing some of the selection criteria and some of their value limits. These changes prevent the author from providing a substantial performance record for the model; although overall performance has encouraged the author and other investors to continue to use and improve the model. In his more than twenty years of researching and investing in stocks, the author has not found a comparable model. Investors who fail to use a well-constructed strategic model and those who use models that violate the principles of finance and investing are unlikely to achieve their goals.

This paper also provides a sample of large-cap stocks of U.S. multinational corporations that currently fit the model, and explains how the author researched these stocks online using popular financial websites. Empirical data for a recent short-term investment period found that the capital gains for most of these stocks and the overall stock portfolio significantly beat the S&P 500 Index benchmark. Other important examples of stocks screened out by the model and examples of stocks recommended by the model are provided to demonstrate how the model can help investors to usually outperform the market. The author suggests that additional empirical tests of this model's performance could be provided by other researchers and/or students in finance or investment courses.

In the global universe of tens of thousands of stocks, investors should have no problem finding stocks that fit the model, even though most stocks fail to fit the model. The model also provides sell rules. For example, stocks that no longer fit the model should be sold. Important changes in market conditions and important changes in the financial performance of companies create opportunities to buy stocks that previously didn't fit the model, and to sell stocks that no longer fit the model, while continuing to hold other stocks.

By using this model, investors are likely to beat the stock market averages, for comparable portfolios, by investing in profitable growth companies whose stocks are

temporarily undervalued, and avoiding the less desirable stocks of other companies included in index funds, exchange-traded funds, and equity mutual funds. Investors in those other equity-type investments could use this more selective model for a portion of their stock portfolio investments to improve their overall investment performance.

While the model is well-designed and its performance may be sensitive to even small changes, investors using the model could, at their own risk, customize it, in an attempt to improve the model, based on their own research and investing experience.

As the author is completing this paper in early 2009, the stock market indexes in the U.S. and abroad have declined dramatically in the second long and severe bear market in the last decade. Many stock investors have been scared out of the market and are hoping to buy back into the market at the bottom. Others have turned to speculative short-term trading using technical analysis and frequent trading based on short-term momentum trends. Others are buying and holding the whole market, and seeing substantial losses on some stocks more than offset their gains on other stocks. Many are ignoring the fundamentals that determine the financial performance of companies and determine the returns on individual stocks. It seems like a particularly good time to remind investors that to achieve their goals they need to invest long-term, through bull and bear markets, using a strategic model that is based on the fundamental principles of finance and investing.

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Financial Meltdown – Crisis and Challenges

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Abstract

This paper looks at the current financial crisis in the light of the preceding major bubbles in the United States. We observe that history of bubbles is history of asset bubbles with attendant easy money. We posit that solution to these bubble crashes do not have to lead to deflation or inflation. If we go back to the basic of credit creation through real savings, the solution will not likely to set the stage for another bubble. An example of back to basic credit creation is provided.

I. Introduction

A U.S. recession was inevitable by 2007, and it indeed began in December 2007, according to the National Bureau of Economic Research. Yet financial markets continued to function – until September 15, 2008 meltdown.

This crash was triggered when the Treasury took over Fannie Mae and Freddie Mac on September 8, 2008. Their combined assets were over $5 trillion. These firms help guarantee most of the mortgages in the United States. The Treasury was cleared by Congress to take this action in July 2008 when it insisted that no intervention would be needed. The Treasury replaced the management of both companies and took over their operations. This signaled the market that the mortgage market and its institutions in the U.S. are now clearly broken.

On Sunday, September 14, 2008, the largest bankruptcy filing in U.S. history was made by Lehman Brothers with over $600 billion in assets and 25,000 employees. The largest previous filing was by WorldCom, whose assets were just over $100 billion just prior to bankruptcy.

On Tuesday, the Federal Reserve made a bridge loan to AIG, the largest insurance company in the world which has assets of over $1 trillion and over 100,000 employees worldwide. The Fed never asserted its authority in a firm at this scale and so far removed from its own supervisory authority.

All three firms were unable to *retain* financing; however, the reasons differed in each case. AIG had to raise money because it had written $57 billion of insurance contracts whose payouts depended on the losses incurred on subprime real-estate related investments. While its core insurance businesses and other subsidiaries were doing well, these contracts, called credit default swaps (CDS), were making significant amount of losses. Were AIG to default on CDSs, some other contractual partners would insist on prepayment of their claims. In addition, other large financial firms including the largest bond-investment fund in the world, PIMCO had guaranteed AIG.'s bonds by writing CDS contracts. Given the huge size of the contracts and the number of parties interconnected, the Federal Reserve decided that AIG was too connected to fail. Hence, AIG had to be rescued. The Fed loaned $85 billion to AIG to honor its contracts which was subsequently raised to $144 billion.

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These events triggered widespread panics which led the Dow Jones Industrial Average to drop more than 500 the day after Lehman Brothers filed for bankruptcy. Stocks continued to plummet in the days to come, and it was realized that the nation was in the midst of a serious stock market crash. By Friday's close (10/10/08), the Dow's average had fallen 5,713 points (-40.3%) from its record finish of 14,165.43 just a year earlier (10/9/07). The Dow recorded its worst weekly percentage loss ever, a fall of 18.2%. Furthermore, the S&P 500 and the Nasdaq each lost 15.3% in the same week.

The Monday meltdown worsened a boom-and-bust cycle mainly present in the U.S. and U.K. into a global financial panic. The global system itself was highly vulnerable at that moment, so the meltdown did not come out as a shock. It was a culmination of a series of events and lack of engagement on the part of regulators that finally found a crash expression by September 15. The Treasury's desperate call for $700 billion in bailout funding four days after the Lehman collapse probably exacerbated the sense of panic, even though the funding request was appropriate. It arrived too late and without a relevant plan.

The panic kept on spreading and engulfed the biggest bank Washington Mutual in its wake in the following week. The whole financial system was adversely affected: the shrinkage and subsequent collapse of inter-bank lending; the migration of investors from equities, banks, commercial paper, hedge funds and money-markets to government securities and commodities; the effective shutdown of corporate and municipal bond markets; and the abrupt withdrawal of credits to emerging markets from Argentina to Dubai to Hungary and South Korea. Most importantly, the consumer spending, the biggest driver of the economy, dried up.

II. The Making of the Meltdown

Understanding the making of the financial shock that occurred is vital to finding a way out of our current mess. In the short span of five years, American investors moved from the collapsing tech bubble into the real estate bubble.

We observe historical regularities in the ongoing global financial crisis sparked by subprime mortgage defaults in the United States. The systemic financial crises are typically preceded by asset price bubbles with credit booms and large capital inflows. Major default episodes are typically apart by decades, however, lately these are happening with increasing frequency. The recent US sub-prime financial crisis shows remarkable similarities with other bubbles in the past, and is, therefore, hardly unique.

Serial Bubbles - From Tech Bubble to Real Estate Bubble

i. Beginning and end of Tech Bubble

For all bubbles, the base of the problem had been credit. Some of them exhibited asset side problem and some demonstrated liability side problem Tech bubble problem was on the asset side. Causes of this financial meltdown can be traced back to events that occurred several years ago. In the late 1990s, the price of stocks of Internet startup companies grew at an unsustainable rate leading to tech stock bubble. The Fed's easy money

policies helped the bubble to grow. Also, during the same time, there was a phenomenal rise in computer hardware and software spending for Y2K preparedness to avoid operational crisis in the financial system. Due to overly optimistic long-term forecasts and sales, the dot-com industry was flourishing. Internet IPO underwriter requirement for profitability was lowered from three years in eighties to a quarter in late nineties. In fact, by the bubble time, investors were not requiring profitability in the foreseeable future. Hence, the bubble grew to an unsustainable size as investors poured money into the startup companies, causing them to become extremely overvalued. It soon became obvious that the market for dot-com services couldn't produce the anticipated profitability. Once the companies used up all their capital, they began to fall one by one, especially, technology-related companies. There was a continuous fall in consumer prices due to the oversupply of computer and related equipment, which further contributed to the downfall of related companies, eventually bursting the Tech Bubble in March of 2000. Other factors contributing to the downfall was the Fed's monetary policy at the time of crash. During the technology bubble, credit was relatively easy to obtain. In early 2000, failing to see the onset of the crash, the Fed tightened the monetary policy to slow the economy – a déjà vu of 1929-32 scenario.

In 2003 as a reaction to the bursting of tech bubble Greenspan cut the prime rate to just 1% in order to stimulate the economy and avoid a long recession. This resulted in the growth of another bubble, this time the asset was the real estate.

ii. Beginning and end of Real Estate Bubble

After the tech bubble burst, the money available at the time had nowhere to go except into real estate. Interest rates were very low, and there was a tremendous amount of money available. This is when greed came into play. Mortgage institutions lowered their standards to subprime to attract more borrowers. This led to speculation in the housing industry. Prices of homes increased in double-digit rates, which made homeowners feel wealthy. Mortgages were sold to borrowers who could not really afford them. This is when hubris was evident on the part of mortgage lenders. Hubris is a term used to indicate excessive pride, self-confidence, or arrogance, which many a times result in tragic downfall. That was exactly where the housing market headed. In order to raise capital and to make more loans, the debts and loans were bundled together with subprime loans as Collateralized Debt Obligations (CDOs), leading investors to believe that all the mortgages including subprime ones were safe. Financial institutions took greater risks than they could sustain. Lack of regulation played a major role here. Regulatory changes like Commodity Futures Modernization Act of 2000 enabled the Wall Street to be out of reach of the government's regulatory constraints on derivatives. The players were now free to trade CDS in a manner which was identified as security fraud by some.

Once again world came to know about the asset bubble late. Because it was difficult to determine the number of subprime mortgages that were inside Wall Street portfolios, all mortgage securities were deemed as bad. Given this uncertainty, investors avoided mortgages altogether and created a freeze in the mortgage markets affecting many banks' solvency. They now have increased leverage due to bad mortgages listed as assets and suspended making more loans. Furthermore, banks quit lending to other banks for fear of exposure to

more subprime loans. These financial institutions did not have enough capital to protect themselves against bad debt, nor did they concentrate on risk management.
Bear Sterns faced a similar problem to Lehman Brothers. The Fed, the lender of last resort, agreed to bail out Bear Sterns. It provided lending to JPMorgan to assume Bear Sterns' assets and liabilities. When Lehman Brothers was in the same situation, however, the Fed refused to bail it out. This "A" rated company, which was one of Wall Street's strongholds for 154 years, was forced to file for bankruptcy. As the institutions are interconnected, the fall of Lehman Brothers put the insurance company AIG in serious trouble. This time the government took control and rescued AIG using $85 billion in taxpayer funds as an emergency loan. AIG failed partly because of its enormous exposure in the *unregulated* area of credit default swaps. Credit default swaps make up an unregulated market of $45 trillion, which is five times the size of the U.S. government bond market. Because of the overwhelming size of the assets that could go bad through contagion if AIG crumbled, the government decided it would be best to save the company even after it let Lehman Brothers to go bankrupt. These institutions were not the only ones to find themselves in serious trouble during the meltdown. Morgan Stanley and Goldman Sachs were converted overnight from independent to regulated banks. Washington Mutual was taken over by JP Morgan Chase, making it the biggest banking failure in U.S. history. Wachovia was taken over by Wells Fargo.

The chain reaction affected balance sheets of most financial entities. The homeowners were foreclosed upon. The mortgages became non-performing. This meant that the Collateralized Debt Obligations built on top of them had to be downgraded which in turn downgraded CDS. The banks holding the original instruments were left with unhedged instruments, and if they were going to write them off, they would become insolvent. On the other hand, if they held them at a fictional face value, they could not make new loans. Thus many of them proceeded to write new derivatives, piling up another layer of CDS on top of the old ones, hoping that a new credit event would allow them to recoup some fraction of what they held, or they made agreement with other CDS holders to not enforce each other's bad debts. The number of CDS's doubled even as the credit market was collapsing.

Thus most of the financial institutions decided not to make new loans. But this credit contraction meant that more people fell into default, ARMs were adjusted upwards even more, and another round of toxic waste was created. When banks were not lending to each other, then central banks stepped in. The US Federal Reserve offered dollar swaps, in essence buying currency without any fees, in order to make sure that banks around the world could loan. However, even with these steps panic began. The housing bubble continued to erode in Europe, but while important banks failed, there was no cascading collapse. Interbank lending shrunk and money got diverted into short term treasuries. One month Treasury dropped a full percentage point of yield, from 1.37% to..36%, on September 15. The flight to quality continued. By Wednesday the three month Treasury had a constant maturity yield, of just .03%. The next day interbank lending froze solid on 19-September-2008. By injecting liquidity the Fed created investment demand, without investment supply. Money fled for commodities, driving food and oil higher. This only put more downward pressure on the underlying housing stock, and therefore deepened the losses at Freddie Mac, Fannie Mae, the investment banks that held the CDOs, and AIG which reinsured these financial assets. Oil prices shattered 100 dollars a barrel on the spot market subsequently peaking at 130 dollars a

barrel. By October, it was broadly accepted in the financial world that the real estate bubble has crashed

III. Solution – Deleverage

When you are in fire, you do not ask for a fire code. The first in an emergency is to prevent the panic from causing a systemic collapse of liquidity and sudden insolvency of major financial institutions. It was leverage that created the problem, and hence, the answer is to deleverage. There are two ways to deleverage an economy.

First is the traditional and simple way where people actually try to pay their debts. However, direct deleveraging causes the problems of falling asset prices as people sell their assets to pay. Economy slows down resulting in bankruptcies and joblessness.

Most economic experts blame the tight liquidity conditions on bank actions to improve their solvency. In fact, it is believed that the collective attempt of banks to improve their solvency actually aggravates the risk of making them less solvent as their asset prices fall further, thereby deepening the liquidity crisis.

Let us see why. Assume an entity that finances $800 of assets with a debt of 600 and equity of 200. The leverage is Asset/Equity and for this case it is 4. When asset value falls by 10%, it is now valued at $720 which brings equity down to 120. These numbers now increase the leverage to 6. To deleverage, either asset needs to be decreased and/or equity need to be increased. When banks trim their assets by not lending, it will deleverage. As a result of the real-estate market crisis and the fall in the value of houses, banks and various financial institutions took the decision to reduce their leverage by trimming their assets. However, by cutting lending, banks are forcing various borrowers to sell off their assets to prevent insolvency. Consequently this deleveraging sets in motion of asset-price deflation. This in turn lowers borrower collateral and causes banks to reduce their lending further.

It follows that if all financial institutions are trying to fix their balance sheets, they could drive asset prices down, which for a given debt will shrink their net worth and actually increase their leverage, or make them less solvent. This is the paradox of deleveraging. If this process is not contained in time it could seriously damage the real economy, so it is held.

So what should be done here? According to popular thinking, the central bank or the government must step in and start buying the assets that banks are trying to get rid of. This, it is held, will prevent the asset-price deflation and can ruin the real economy. The Treasury has launched a $787 billion dollar bailout in that respect. Central banks around the world have become the lender of last resort to a wide range of financial institutions.

Originally, the Fed tried to buy up the toxic assets to affect the numerator of leverage multiplier. Later it shifted to direct re-capitalization, perhaps, because of fear of deflation. However, they create a new and worse problem of inflation, maybe hyperinflation. Inflation reduces the real value of debt in a perverse and unpredictable way. Debtors benefit from inflation, however, savers lose. Inflation like bailouts rewards the least responsible players – those who have gotten themselves heavily in debt and punishes those who have not. As

Germany saw in the '20s, it de-stabilizes the whole society leading to extremely dire outcomes. More fundamentally, this bailout shifts from restoring banking system to restoring banks that may be ethically indefensible.

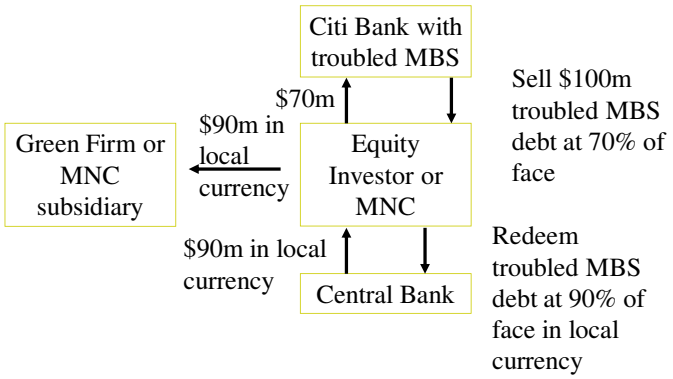
One year after a financial crisis federal government debt increased, on average, by about 86 percent. Thus the fiscal burden of banking crisis extends far beyond the commonly cited cost of the bailouts.

IV. Challenges: Avoiding More Harm

However, there is another way where deleverage can take place without creating deflation or inflation. This type of deleveraging is done by going back to basics of credit creation, i.e., credit is based on real savings. The debt for equity swap is such an example. It is capable of solving problem that happens on the asset side of the balance sheet and generates credit based on real savings.

Exhibit I – Going Back to Basics of Credit Creation

Debt-for-Equity Swap – Simultaneously Prevents Deflation and Provides Capital Infusion



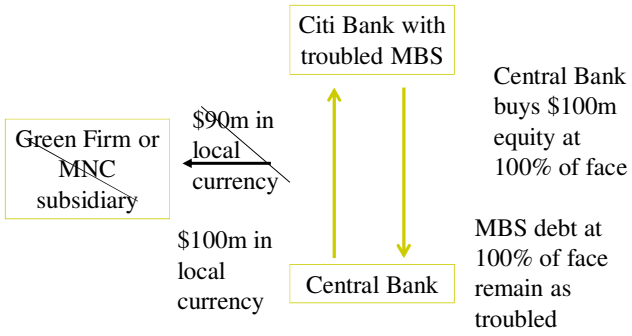
An illustration is provided above. The crucial point is the interjection of equity investor or MNC between the Fed and Citi bank. The Citi bank, a money center international bank, sells $100m of MBS debt to equity investor who in turn gets $90m from the Fed. The equity investor only pays $70m to Citi bank. This is a win-win situation for all parties. Deflation is reduced; credit is expanded based on real economy not out of "thin air." Given the focus on going green by current administration, these green equity investors immediately has $20m of built up equity. In fact, this can happen with concerted effort on a global scale. The Fed can be replaced by another Central Bank as a player in the debt to equity swap illustration above. At that point currency in question will be local currency from the Central Bank.

However, current Fed bailout focuses on direct re-capitalization of banks. They

shifted from asset side management to liability side management. This does not solve the liquidity problem as banks still have troubled assets in their balance sheet which, inter alia with recessionary economy, compel the banks to suspend further creation of loan. Liquidity problem continues to remain in an economy with double digit unemployment. Importantly, as the money is not going to production of real savings, the bailout is likely to be inflationary.

Exhibit II – Current Inflationary Bailout.

Current Direct Re-capitalization – Inflationary with Constrained Liquidity



Direct re-capitalization is required when the problem is on the liability side as was in 1930s. There were bank runs for redemption of deposits; and liability side was drawn down with cash withdrawal by the depositors. The crisis was further worsened as the shortage of liquidity motivated depositors to withdraw funds from banks that were not in distress, causing still more failures. However, current crisis is different in that lenders do not have shortage of liquidity. Lending is freezing up for two reasons. Lenders see that their balance sheets are adversely affected by the troubled assets and they now have high leverage. So, they deleverage by trimming their lending. Second, lenders do not have the confidence that their would-be-borrowers will have the ability to pay. Direct re-capitalization does not deal directly with these real issues and will be inflationary, and is likely to create another asset bubble. However, debt to equity swap addresses both of these issues and will bring liquidity flow back to the real side of the economy.

V. What is likely to happen – Any Danger Ahead?

If we compare 2008 with 1929, we see that we avoided Great Depression. It is quite apparent from the following graphs that we managed to avoid the danger of 1929. However, did you postpone it to the future? Did you already put in seeds for another bubble to get out of the ruins of the current one? Is history repeating itself? Can you not start relating credit to real savings and investments rather than creating it from thin air? These are the questions that beg our attention.

Exhibit 3

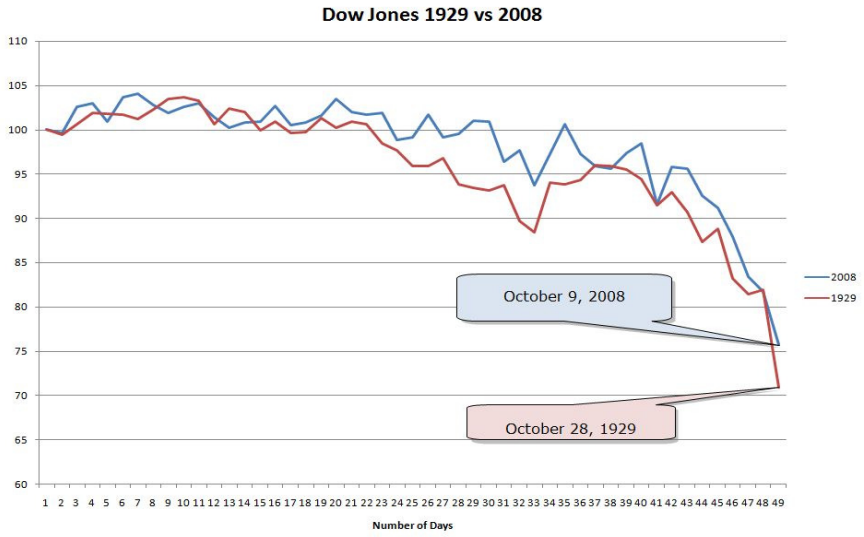


Exhibit 4

VI. Preventing Future Catastrophes

We see that financial catastrophes are happening with increasing frequency. After 1929, the major crash was in 1987 – 57 years apart. However, tech bubble crash in 2000 and real estate bubble crash in 2008 happened in quick succession. There are many reasons cited for this increased frequency. However, one thing stands out is that "too connected to fail"

syndrome got more pronounced in the technology driven global information economy. Now days the asset bubble goes to unsustainable height in a period doubling fashion. The particular asset varies from one bubble to another. Increasingly the bubble asset class is becoming more complex and connected. Easy monetary policy and low interest rates remain consistent underlying drivers that induce ordinary people to acquire that asset class. And then when it is realized, monetary policy tightens and the boom collapses.

Solution prescriptions from various schools of thought span the full spectrum to stem the future crises. Recommendations include breaking up of the big corporations so that none is too big to fail. Behavioral economists focus on human frailties of bounded rationality and limited self control and recommend full disclosures to eliminate the mania driven bubbles.

In this paper we emphasize the investigation of individual bubbles and observe that we create bubble to get out of the ruins of the other. That does not have to be. Even though all bubbles are asset bubbles, the nature of the solution differs according to which side of the balance sheet is affected. We can avoid setting the stage for another bubble if we do not apply the same solution to every bubble. However, all available evidence point to the fact that we are set to create another bubble, possibly Green bubble, to get out of the ruins of the current real estate bubble crash. We are applying liability side solution to the asset side problem, possibly for the fear of potential deflation. However, as we point out here that going back to the basics of credit creation, we do not have to fear deflation and apply wrong solution. The current re-capitalization solution will create too much money which will have nowhere to go but to green assets.

VII. Conclusions

The nature of free market economy will generate cycle. However, it is not in the nature of the free economy to generate major crashes. The major crashes are generated with too much money in the system. The lack of vigilance lets the asset bubble assume unsustainable height. We conclude that to solve one bubble crash we do not have to plant the seeds for the other. To avoid such error we need to go back to basics of credit generation from real savings. This will shape our future efforts to apply appropriate policy measures in times of need.

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Returns: An International Perspective

Jayen B. Patel

Abstract

This study examines risk and return characteristics of developed and emerging country stock markets. In recent years, U.S. individual investors have increasingly invested in foreign markets and are therefore interested in understanding stock market performance in other countries. Also, students find financial theory more relevant if concepts are explained using actual stock market data. Therefore, the results of this study will be helpful in explaining stock market return and risk concepts to individual investors and students alike.

I. Introduction

This study examines stock market returns in developed as well as emerging economies. The findings of this study will help individual investors understand how stock markets in various countries have performed in recent years. These results are useful as individual investors are able to compare U.S. equity market returns with those in developed and emerging economies around the world. Second, the results of this study may assist financial planners in explaining global stock market behavior to their clients. Financial professionals can explain the importance of long-term investing in stock market using these results. Finally, the results of this study may also help academicians to explain financial concepts such as risk and return using actual stock market index data. Students find financial theories more meaningful when explained in the context of actual financial market data.

This paper is organized as follows. The following section discusses the data utilized in this study. The literature review and empirical results are discussed in the following section. Finally, the paper summarizes the major findings of the study.

II. Data

This study examines national stock market indices of developed as well as emerging markets. This study has comprehensively collected index values of every available individual broad-based country stock index for the period 1998 to 2007. More specifically, Standard and Poor's broad based stock indices for the following countries are utilized:

A. Developed Stock Markets: (1) Australia (2) Hong Kong (3) Japan (4) New Zealand (5) Singapore (6) South Korea (7) Austria (8) Belgium (9) Denmark (10) Finland (11) France (12) Germany (13) Greece (14) Ireland (15) Italy (16) Netherlands (17) Norway (18) Portugal (19) Spain (20) Sweden (21) Switzerland (22) United Kingdom (23) Canada (24) United States.

B. Emerging Stock Markets: (1) China (2) India (3) Indonesia (4) Malaysia (5) Pakistan (6) Philippines (7) Taiwan (8) Thailand (9) Argentina (10) Brazil (11) Colombia (12) Chile (13) Mexico (14) Peru (15) Czech Republic (16) Hungary (17) Poland (18) Russia (19) Turkey (20) Egypt (21) Israel (22) Jordan (23) Morocco (24) South Africa.

Index values for each country stock index are collected for the period from December 1997 through December 2007. Additionally, index values of two broad stock indices,

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namely the emerging market index and the developed market index excluding the U.S. stock market index are utilized for comparison purposes. The index values for all stock market indices are in U.S. dollars and are obtained from the Standard and Poor's website. The returns are then calculated utilizing the standard formula. Therefore, each of the forty-eight country indices and two broad indices has annual stock returns available in U.S. dollars for the ten-year period 1998 to 2007. The next section briefly discusses selected literature relevant to this study.

III. Literature Review

Barry, Peavy III and Rodriguez (1998) state that emerging stock markets did not generate higher returns than the U.S. market for the time period December 1975 to June 1995. However, they found emerging market returns were relatively greater than U.S. stock returns for some shorter time periods. They caution that these conclusions are based on a broad emerging stock market index and the performance of individual emerging markets varies considerably.

Hanna, McCormack and Perdue (1999) state that investors invest in international equity markets to reduce risk while maintaining a certain level of return. They examined stock returns for the seven most industrialized nations (G7) over the ten year period January 1988 to December 1997. They found that the portfolio consisting only of U.S. stocks dominated every other portfolio consisting of U.S. stocks along with any other major stock market index of the remaining six G7 nations.

Bhargava, Konku and Malhotra (2004) examined returns for four stock indices, namely, Standard and Poor's Composite Index, Morgan Stanley Capital International World Index, Europe, Australia and Far East Index, and the Morgan Stanley Capital International Europe Index for the period 1978 to 2000. They conclude that, although the benefits of investing internationally have decreased, U.S. investors can still benefit from investing in international financial markets. Furthermore, they add that U.S. investors may particularly benefit by investing in European stock markets.

Tokat and Wicas (2005) state that historical risk and returns for U.S. and international securities are relatively similar over the long run. But, a combination of U.S. securities along with non-U.S. equities has resulted in higher risk-adjusted portfolio returns over the long run. They add that, despite the powerful argument for the long-term case, the benefits of investing internationally over short-term periods are somewhat unclear. The risk and return for non-U.S. equities can vary substantially over shorter time periods. The authors conclude that U.S. investors can benefit by investing in foreign stocks when the domestic stock market is not performing well.

Xavier-Gomez and Metghalchi (2006) indicate that there is still a significant home country bias in the investments of U.S. investors. They investigated whether U.S. investors should invest some proportion of their portfolio investments in emerging stock markets, and found that ex-post realized returns of emerging market stocks for the period 1988 to 2003 were small. They concluded that investments in emerging market stocks do not consistently help U.S. investors. Emerging markets outperform developed markets only over some time

periods. Furthermore, emerging market returns of some regions perform better than those of other regions.

Boudreaux, Rao, Ward and Ward (2007) indicate that U.S. investments in emerging markets will continue to grow as domestic stock returns decline. They state that stock markets around the world are not perfectly correlated so that a downturn in the stock market of one country may be offset by an upturn in another country. They found that nine out of ten international mutual funds outperformed the U.S. stock market fund for the period September 2000 to September 2006, and they also found that foreign funds had greater volatility than U.S. funds.

Michelson, Philipova and Strotova (2008) compared fund returns with returns for three stock indices namely, emerging markets, the MSCI and the S&P 500 for the period 1999 to 2005. They report that annualized returns for emerging market funds underperformed only the emerging market index and outperformed the other two non-emerging equity indices. They conclude that U.S. investors would have benefited by investing in emerging markets during the five year period of their study.

Patel (2008) examined monthly returns of the U.S. stock market with two broad based stock indices of Europe, namely, the developed Europe index and the emerging Europe index, for the period January 1995 through July 2007. Patel found that the broad based emerging market index of Europe outperformed the broad based developed market index of Europe and the U.S. stock index. He concluded that the emerging markets of Europe could have provided important return and diversification benefits to U.S. investors.

Published research indicates some mixed results. Some studies indicate foreign stock investments are not particularly beneficial to U.S. investors, while other studies state that U.S. investors can benefit substantially by investing in foreign stock markets. This study contributes to the existing literature by examining the performance of individual country equity markets. The results are discussed in the next section.

IV. Empirical Results

Table I presents summary statistics of returns for three major stock indices, namely, the U.S., the developed market excluding the U.S. stock index (DEVXUS) and the emerging equity index. The U.S. stock index generated the lowest annual returns (7.9%) compared to both the DEVXUS index (12.0%) and the emerging stock index (20.0%) for the period 1998-2007. As expected, the emerging stock market had the highest volatility in returns as measured by standard deviation (35.2%). In contrast, the U.S. stock index had the lowest standard deviation (16.5%) compared to the other two stock indices. The coefficient of variation was lowest for the DEVXUS stock index and, additionally, as expected, the range between the minimum and maximum annual return is highest for the emerging index (104.2%) and lowest for the U.S. index (53.3%). The difference in annual returns for the emerging stock markets is greater than 100 percent. But, more importantly, the range is also equally high for the developed equity indices. The difference between annual returns is greater than fifty percent for the U.S. stock index and greater than sixty percent for the DEVXUS stock index. It is clear that the range on a yearly basis is substantial for all three

indices so that investments in these markets should be long-term, particularly if investors seek to invest in individual country stock markets.

To illustrate this point further, Table II compares the difference between two five-year sub-periods, namely the 1998-2002 and 2003-2007 periods, for the individual emerging stock markets. The difference between the two five-year sub-periods is substantial for each country stock index. Among the individual countries, Egypt has the highest difference (99.3%) whereas Pakistan has the lowest difference (9.3%). The emerging stock market index has a difference of 38.3 percent between the two five-year sub-periods. It is clear that individual investors need to invest over a longer period than five years because of the volatility inherent in emerging stock markets. This table also displays the differences between the two five-year sub-periods for the individual developed country stock markets. Again, the difference is substantial between the two five-year sub-periods for each of the developed stock markets. Norway has the highest difference (45.9%) whereas Finland has the lowest difference (10.0%) in absolute values. The U.S. has a mean annual difference of 13.2 percent between the two five-year sub-periods. Again, the results indicate that investments in stock markets should be long-term in emerging as well as developed stock markets.

Table III ranks mean annual returns of all forty-eight country stock indices for the ten-year period 1998 through 2007. During this period, Egypt had the highest mean annual return (43.5%) whereas Taiwan had the lowest mean annual return (5.3%) among the stock markets of the forty-eight countries. The U.S. stock market ranked 47th out of the 48 stock markets, generating mean annual returns of 7.9 percent for the ten year period 1998 through 2007. These results indicate that U.S. investors could have benefited substantially by investing in international stock markets, emerging as well as developed stock markets.

Many individual emerging markets generated greater returns than those of the individual developed markets. The two developed stock markets, South Korea and Finland, also generated greater returns than those of the other equity markets. The summary rankings of annual returns are reported in Table IV. Ten of the top twelve returns were generated by emerging stock markets. Additionally, nineteen of the top twenty-four returns were generated by emerging stock markets, while nineteen of the twenty-four lowest returns were generated by developed stock markets.

Table V ranks the risk of the forty-eight country stock markets around the world, measured by standard deviations ranked from lowest to highest. The risks of the individual developed stock markets are generally substantially lower than the risks in the individual emerging markets. The U.S. stock market has the lowest volatility (16.5%) whereas Turkey has the highest volatility (88.6%) in annual returns. Table VI provides a summary of the rankings by standard deviation. Eleven of the twelve lowest standard deviations are from developed stock markets, and twenty of the twenty-four highest standard deviations are from emerging stock markets.

As expected, the results of the standard deviation rankings are consistent with the mean return rankings in that financial theory indicates a positive relationship between risk

and return. Therefore, investors expect the equity markets to reward risky investments with relatively higher returns, as revealed, to a great extent, in earlier tables. Emerging markets generally produced higher returns and risks, and developed stock markets generated lower returns and risks. The issue that becomes critical then is which markets generate better risk adjusted returns. The next table presents data for the coefficient of variation (CV), the standard deviation divided by mean return.

Table VII presents the CV rankings, which indicate risk per unit of return, so that it is desirable for investors to have a lower CV. The earlier tables reveal that emerging stock markets have generally produced higher returns whereas developed stock markets have lower standard deviations. Therefore, it is interesting to observe the rankings of country stock markets based on CV. The table indicates that Australia has the lowest (best) CV whereas Taiwan has the highest CV, and the U.S. was ranked thirty-nine out of the forty-eight country stock markets examined in the study. Again, these results indicate that U.S. investors could have benefited substantially by investing in foreign stock markets.

Table VIII presents a summary of the CV rankings. The top twelve stock markets are distributed among five emerging markets and seven developed stock markets. The bottom twelve CVs include eight emerging markets and four developed stock markets. These results indicate that investors should consider individual country stock markets characteristics while investing in global stock markets.

V. Conclusion

This study examined risks and returns of forty-eight country stock markets for the ten-year period 1998 to 2007. The result of this study will be helpful to individual investors as they can compare performance of national stock markets of countries around the world. Also, these results emphasize the importance of long-term investing in stock markets. Financial professionals and academicians may be able to use the results of this study to explain financial concepts to their clients and their students.

Table I

Summary Statistics of Broad Stock Market Indices

Annual Returns: 1998 to 2007

Index	Mean	SD	CV	Min	Max	Range	N
US	7.9	16.5	2.096	-21.4	31.9	53.3	10
DEVXUS	12.0	20.6	1.711	-20.1	42.1	62.2	10
EMGMKT	20.0	35.2	1.766	-32.9	71.4	104.2	10

Note: All Index Values are in U.S. Dollars
DEVXUS is developed stock excluding U.S. stock index. EMGMKT is emerging stock market

Table II

Stock Market Mean Annual Returns: Two Sub-Periods

Emerging Stock Markets				Developed Stock Markets			
Country	1998-02	2003-07	Diff	Country	1998-02	2003-07	Diff
Egypt	-6.2	93.1	99.3	Norway	-3.2	42.7	45.9
Brazil	-3.7	69.9	73.7	Austria	0.4	37.7	37.4
Colombia	-7.4	62.3	69.6	Germany	-3.9	33.3	37.2
Argentina	-15.1	47.8	62.9	Denmark	0.2	35.9	35.7
Peru	4.9	60.3	55.3	Portugal	-2.6	28.7	31.3
Philippines	-14.5	40.0	54.5	Sweden	2.1	32.8	30.7
Czech Republic	4.5	58.9	54.5	Singapore	-0.4	30.3	30.7
India	4.2	56.9	52.7	Spain	3.5	34.1	30.7
China	2.5	54.0	51.5	Canada	0.9	31.6	30.6
Indonesia	3.8	53.0	49.2	Greece	10.1	39.7	29.5
Morocco	-2.1	44.3	46.4	Hong Kong	1.9	30.5	28.6
Turkey	12.1	57.9	45.8	Australia	5.4	33.7	28.2
Jordan	2.9	48.0	45.1	Belgium	2.6	29.4	26.7
Chile	-3.5	38.3	41.8	Netherlands	-2.0	24.1	26.1
Hungary	0.2	39.2	38.9	New Zealand	2.1	27.0	24.9
Poland	2.3	37.7	35.3	Ireland	2.0	24.8	22.8
Thailand	6.6	39.3	32.7	Switzerland	-0.8	21.1	21.9
Mexico	6.2	37.5	31.3	UK	-0.9	20.9	21.8
South Africa	6.6	34.7	28.0	France	5.4	24.9	19.5
Taiwan	-7.6	18.2	25.8	Italy	5.9	23.9	18.0
Israel	3.7	27.5	23.8	Japan	1.6	16.0	14.5
Malaysia	14.3	27.9	13.6	US	1.3	14.5	13.2
Russia	36.8	48.4	11.7	Finland	35.5	25.5	-10.0
Pakistan	27.5	36.8	9.3	South Korea	44.5	33.1	-11.4
EMGMKT	0.8	39.1	38.3	DEVXUS	0.01	24.0	24.0

Note: All Index Values are in U.S. Dollars
Diff is difference in annual returns between two five-year sub-periods

Table III

Annual Mean Return Rankings of Country Stock Markets: 1998-2007

Rank	Country	Mkt	Mean	Rank	Country	Mkt	Mean
1	Egypt	E	43.5	25	Austria	D	19.1
2	Russia	E	42.6	26	Spain	D	18.8
3	S. Korea	D	38.8	27	Denmark	D	18.1
4	Turkey	E	35.0	28	Sweden	D	17.4
5	Brazil	E	33.1	29	Chile	E	17.4
6	Peru	E	32.6	30	Argentina	E	16.4
7	Pakistan	E	32.1	31	Canada	D	16.2
8	Czech	E	31.7	32	Hong Kong	D	16.2
9	India	E	30.5	33	Belgium	D	16.0
10	Finland	D	30.5	34	Israel	E	15.6
11	Indonesia	E	28.4	35	France	D	15.2
12	China	E	28.3	36	Singapore	D	14.9
13	Colombia	E	27.5	37	Italy	D	14.9
14	Jordan	E	25.4	38	Germany	D	14.7
15	Greece	D	24.9	39	New Zealand	D	14.6
16	Thailand	E	22.9	40	Ireland	D	13.4
17	Mexico	E	21.9	41	Portugal	D	13.1
18	Morocco	E	21.1	42	Philippines	E	12.8
19	Malaysia	E	21.1	43	Netherlands	D	11.0
20	South Africa	E	20.6	44	Switzerland	D	10.2
21	Poland	E	20.0	45	UK	D	10.0
22	Norway	D	19.8	46	Japan	D	8.8
23	Hungary	E	19.7	47	US	D	7.9
24	Australia	D	19.5	48	Taiwan	E	5.3

Note: All Index Values are in U.S. Dollars

Table IV

Summary of Mean Return Rankings of Country Stock Markets

Ranks	Emerging Markets	Developed Markets	Total
Ranks 1 to 12	10	2	12
Ranks 13 to 24	9	3	12
Ranks 25 to 36	3	9	12
Ranks 37 to 48	2	10	12
Total	24	24	48

Table V

Standard Deviation Rankings of Country Stock Markets: 1998-2007

Rank	Country	Mkt	SD	Rank	Country	Mkt	SD
1	US	D	16.5	25	Morocco	E	33.2
2	UK	D	18.1	26	Philippines	E	33.7
3	Switzerland	D	18.4	27	Hungary	E	34.0
4	Australia	D	18.7	28	Czech	E	34.8
5	Netherlands	D	19.8	29	Mexico	E	36.5
6	Denmark	D	23.3	30	Israel	E	36.5
7	France	D	23.3	31	Sweden	D	37.8
8	Canada	D	23.4	32	Malaysia	E	41.0
9	New Zealand	D	24.5	33	China	E	43.3
10	Italy	D	25.3	34	Peru	E	44.1
11	Portugal	D	25.4	35	Greece	D	46.9
12	Poland	E	25.4	36	Jordan	E	46.9
13	Austria	D	27.6	37	Indonesia	E	47.4
14	Singapore	D	28.4	38	India	E	47.8
15	Spain	D	28.4	39	Argentina	E	49.0
16	Taiwan	E	28.6	40	Thailand	E	49.6
17	Ireland	D	28.7	41	South Korea	D	50.7
18	Germany	D	28.9	42	Brazil	E	54.2
19	Hong Kong	D	29.0	43	Colombia	E	55.8
20	Japan	D	30.1	44	Finland	D	56.4
21	Norway	D	31.3	45	Pakistan	E	64.1
22	Belgium	D	31.7	46	Russia	E	69.6
23	Chile	E	32.4	47	Egypt	E	73.9
24	South Africa	E	32.8	48	Turkey	E	88.6

Table VI

Summary of Standard Deviation Rankings of Country Stock Markets

Ranks	Emerging Markets	Developed Markets	Total
Ranks 1 to 12	1	11	12
Ranks 13 to 24	3	9	12
Ranks 25 to 36	10	2	12
Ranks 37 to 48	10	2	12
Total	24	24	48

Table VII

Coefficient of Variation Rankings of Country Stock Markets: 1998-2007

Rank	Country	Mkt	CV	Rank	Country	Mkt	CV
1	Australia	D	0.956	25	Netherlands	D	1.794
2	Czech Republic	E	1.098	26	Switzerland	D	1.810
3	Poland	E	1.272	27	UK	D	1.811
4	Denmark	D	1.288	28	Jordan	E	1.844
5	South Korea	D	1.306	29	Finland	D	1.849
6	Peru	E	1.352	30	Chile	E	1.858
7	Canada	D	1.444	31	Greece	D	1.882
8	Austria	D	1.447	32	Singapore	D	1.903
9	Spain	D	1.509	33	Portugal	D	1.944
10	China	E	1.531	34	Malaysia	E	1.947
11	France	D	1.533	35	Germany	D	1.970
12	India	E	1.565	36	Belgium	D	1.981
13	Morocco	E	1.572	37	Pakistan	E	1.994
14	Norway	D	1.580	38	Colombia	E	2.031
15	South Africa	E	1.590	39	US	D	2.096
16	Russia	E	1.634	40	Ireland	D	2.142
17	Brazil	E	1.638	41	Thailand	E	2.163
18	Mexico	E	1.671	42	Sweden	D	2.171
19	Indonesia	E	1.673	43	Israel	E	2.340
20	New Zealand	D	1.681	44	Turkey	E	2.530
21	Egypt	E	1.700	45	Philippines	E	2.642
22	Italy	D	1.705	46	Argentina	E	2.993
23	Hungary	E	1.726	47	Japan	D	3.426
24	Hong Kong	D	1.794	48	Taiwan	E	5.404

Table VIII

Summary of Coefficient of Variation Rankings of Country Stock Markets

Ranks	Emerging Markets	Developed Markets	Total
Ranks 1 to 12	5	7	12
Ranks 13 to 24	8	4	12
Ranks 25 to 36	3	9	12
Ranks 37 to 48	8	4	12
Total	24	24	48

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Early Adopters of Fair Value Accounting for Stock-Based Compensation: A Case for Signaling

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Abstract

This paper explores signaling as a possible explanation as to why companies voluntarily used the fair value method to account for stock-based compensation prior to it becoming mandatory in 2004. Our sample was divided into two groups, early adopters and non-adopters, to determine whether early adopters were signaling through their adoption decision that they were higher quality firms. A univariate analysis was performed to test the differences between the means of quantifiable attributes of the adopting and non-adopting firms for 2002 and 2003. Our findings are consistent with a signaling explanation that, for some firms, the decision to voluntarily expense options long before there was a requirement to do so signaled that these firms were committed to earnings quality and reporting transparency, and thus were more desirable to investors than their non-adopting counterparts.

I. Introduction

Turn-of-the century accounting scandals, corporate bankruptcies, and the well-publicized Arthur Anderson debacle are stark reminders of the regulatory environment in which corporate misconduct and deceptive accounting practices frequently occurred, and often with dire consequences to investors. Public outcry for regulatory change ultimately led to the passage of the Sarbanes-Oxley Act in 2002. This legislation sent a strong message to the accounting profession that accounting rules and standards should promote more quality and transparent reporting. As Congress was enacting Sarbanes-Oxley, the accounting profession was grappling with another difficult and politically charged issue: how to account for stock-based compensation. The matter was complicated by the fact that, at the time, accounting standards allowed stock-based compensation to be accounted for using either of two vastly different methods: the Intrinsic Value Method (IV) or the Fair Value Method (FV). The Intrinsic Value Method is based on Accounting Principles Board Opinion No. 25: Accounting for Stock Issued to Employees - APB 25 (APB 1972), and the Fair Value Method is based on the Statement of Financial Accounting Standard No. 123, Accounting for Stock-based Compensation - SFAS 123
(FASB 1995).

Under IV, stock-based compensation cost was seldom reflected in earnings because the recognized expense was based on the excess, if any, of the market price of the stock at the grant date over the exercise price of options. Since the option price was routinely set to equal the market price on the grant date, companies systematically avoided recognizing compensation costs from such transactions. In fact, IV only required companies to provide pro forma disclosures of net income and earnings per share as if SFAS 123 had been adopted.

In contrast, stock-based compensation costs were reflected in earnings under the FV

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because the costs were measured at the grant date based on the expected fair value of the stock award and recognized over the service period. Intuitively, most would argue that FV promoted more quality and transparent reporting because it more accurately reflects the economic substance of the underlying transactions. Despite this compelling argument, few companies voluntarily used FV prior to the required adoption of Statement of Financial Accounting Standards 123 (Revised) (SFAS 123(R)) in 2004 (FASB 2004). Only 179 companies had adopted or announced their intention to adopt the FV approach by March, 2003. The number had risen to 276 by May, 2003, and to 483 by February, 2004 (McConnell, Pegg, Senyak, & Mott 2004).

The choice of methods in accounting for stock-based compensation can potentially have a significant impact on a company's reported earnings. Arthur Levitt, Jr., former chairman of the SEC, points out that Federal Reserve researchers concluded that between 1995 and 2000, the average earnings growth of the companies in the S&P 500 would have been 2.6% less had stock options been expensed (Levitt 2002). A similar study of companies in the S&P 500 concluded that average earnings may have been overstated by as much as 10 percent because of not recognizing stock-based compensation expense (Kieso, Weygandt, & Warfield 2005). The effect was even greater on companies with broad based stock option plans. For example, if Cisco Systems, which granted stock options to virtually all its employees, had been required to expense its options in 2001, the organization's reported loss would have been $1.7 billion greater than the figure actually reported.

In October 1995, the FASB issued SFAS 123 which encouraged (but did not require) companies to account for stock-based compensation at the estimated fair value of stock options on the grant date. This standard prompted few additional companies to use FV. Similar to the behavior before this standard was issued, most companies continued to account for stock-based compensation under IV.

Despite the obvious inadequacy and inconsistency in the applicable standards, the Financial Accounting Standards Board (FASB) did not require companies to use the FV until 2004. This failure to act by the FASB contributed to an environment where reported earnings and financial position were systematically distorted. Furthermore, the reluctance of companies to voluntarily use FV suggests a general willingness of companies to sacrifice earnings quality and reporting transparency for more short-term earnings objectives.

Of the more than 9000 public corporations, only a small number chose to use FV from 2002 and 2004. What factors, if any, distinguished the early adopters of the FV (FASB's Recommended approach) from companies that continued to use IV? One approach to answering this question might be found in signaling theory.

II. Background

A. APB 25: INTRINSIC VALUE METHOD

Issued in 1972 by the Accounting Principles Board (the predecessor to the Financial Accounting Standards Board), APB 25 provides guidance on generally accepted methods of accounting for most types of stock-based compensation awards. It requires companies to use the intrinsic value method where compensation expense is measured as the difference

between the market price of the stock and the exercise price of the stock option on the measurement date. The measurement date is the first date on which both the number of options and the exercise price are known. For the typical stock option plan, the measurement date is the date options are issued to the employees. This is also referred to as the grant date. Compensation expense is almost never recorded under APB 25 because most companies use a fixed plan, whereby the exercise price is routinely set to equal the market price on the grant date. Companies that apply APB 25 and related interpretations to account for stock options must adopt the disclosure provisions of SFAS 123. These provisions are explained in the next section.

B. SFAS 123: FAIR VALUE METHOD

In June, 1993, the FASB proposed that firms account for stock options at fair value on the grant date and expense it over the periods that employees provide service. This proposal was abruptly withdrawn in December, 1994, in response to opposition by a vast majority of comment letters to the exposure draft.

In October, 1995, the FASB issued SFAS 123, effective for fiscal years beginning after December 15, 1996. SFAS 123 recommended (but did not require) that compensation expense from stock options be measured at FV and recognized in the financial statements over the service period of the employees receiving the stock options. In a political response to companies' overwhelming opposition to the FV method, SFAS 123 was modified to allow the use of the intrinsic value method under rules of APB 25. Companies that elected to use APB 25 were required only to disclose in footnotes the pro forma effect on net income and earnings per share as if the preferable fair value method had been used to recognize the stock-based compensation expense. Thus, companies were allowed to continue using the Intrinsic Value Method despite the concerns expressed by users of the financial statements (primarily through their comment letters) that the intrinsic value method would result in financial statements that would not adequately account for the economic impact of underlying transactions when employees received stock-based compensation in exchange for their services.

C. PROPOSED AMENDMENT TO SFAS 123 AND 95

In April, 2003, the FASB unanimously voted in favor of expensing stock options at fair value over the service period based on an option pricing model. This was followed in March, 2004, by an exposure draft entitled "Share-Based Payment-an Amendment of Statements No. 123 and 95 (Proposed Statement of Financial Accounting Standards)". This proposed statement mandated the use of only the FV method and was designed to improve comparability and transparency by eliminating the use of the intrinsic value method. Interestingly, the FASB based its position on the reasoning that recognizing compensation cost in the financial statements, as opposed to footnote disclosures, improves the relevance, reliability, and transparency of the financial information.

The FASB noted three principal factors that influenced its actions. The first was the concern that financial statements under the intrinsic value method do not faithfully represent the economic transactions affecting the issuer, namely, receipt and consumption of employee services in exchange for equity. The second was the need to improve the comparability of reported financial information by eliminating alternative accounting methods. Finally, the

FASB wanted to simplify U.S. GAAP with respect to the accounting for stock-based compensation and provide greater convergence with international accounting standards. The proposal was adopted in 2004 as SFAS 123 (R).

I. Signaling Theory

Signaling was first proposed by Michael Spence to address the problem of information asymmetry in transactions where one party has more or better information than others (Spence 1973). He suggested that the problem could be resolved by having one party send a signal to reveal relevant information about itself to the other party. The party receiving the signal would interpret it and adjust its behavior accordingly, thus resolving the problem of information asymmetry. The concept was originally studied in the context of prospective employees signaling their skills to prospective employers, but has since been broadened to apply to many other economic decisions.

In general, signals are used to indicate a certain quality that would otherwise not be directly observable. Signaling occurs in competitive environments where it is beneficial to produce an honest signal, but prohibitively costly to produce a deceptive one. The costs include both the cost to produce the signal and the punitive cost for producing a deceptive signal. Thus, signals tend to be honest and reliable when the potential benefits of producing them truthfully exceed the costs.

Information not directly observable that FV companies would want to convey through signaling are earnings quality and more transparent reporting practices. Although some companies produce higher quality earnings and engage in more transparent accounting practices, such qualities can only be confirmed through costly and detailed analysis. Signaling is a cost effective alternative that allows such firms to distinguish themselves as higher quality companies because the cost of adopting FV is more than off-set by the perceived higher quality from signaling. In the current study, we assume that the voluntary adoption of the FV is a cost-effective way for a firm to signal its higher quality.

IV. Research Motivation and Purpose

We argue that stock options are costs of doing business that should be reflected in earnings like any other measurable cost of doing business. Furthermore, by including these costs in earnings, both the quality of earnings and financial position of a company are improved. Therefore, we hypothesize that the companies are signaling their commitment to earnings quality and reporting transparency by voluntarily adopting FV. Although we recognize that the adoption decision may have been motivated by other factors, signaling is one of the more theoretically compelling possibilities. Given all the recent accounting scandals in which numerous high profile companies were forced to restate their financial statements for various improprieties, signaling to the public that a firm is proactive in adopting accounting standards that promotes earnings quality, comparability, and transparency seems like a smart strategy. Such reporting would be highly desirable if these firms were indeed of a higher quality when compared to the IV firms.

What motivated those relatively few companies to adopt FV voluntarily? Were they,

in fact, signaling information about their philosophies concerning earnings quality and reporting transparency? This paper addresses these and other questions by analyzing selected variables for differences between early adopters (FV firms) and non-adopters (IV firms) for explanations consistent with signaling theory. It is our expectation that firms' willingness to voluntarily expense options is related to key financial variables associated with firm size, growth, operating profit margin, risk, quality of earnings, and stock market performance. We, therefore, hypothesize that FV firms are significantly different from IV firms with respect to the following key variables:

- EBIT margin
- Beta
- 3 year average total asset growth
- 3 year average sales growth
- Level of total assets
- Level of sales
- Dividend yield
- Dividend yield to dividend yield of the S&P 500
- 1 year total return
- 3 year total return
- 5 year total return
- Option expense to reported net income
- Interest expense to reported net income

V. Empirical Methodology

For each of the fiscal years ending in 2002 and 2003, we used the population of S&P 500 companies and divided it into two categories: 1) those that adopted the FV method (SFAS 123) of recognizing stock-based compensation expense in earnings and 2) those that chose the alternative intrinsic value method (APB 25) of providing such information in a footnote disclosure only. The appropriate category was determined by reviewing each company's annual report (or form SEC 10-K) for accounting procedures and related disclosures concerning stock-based compensation. During this review we collected data for net income as reported, FV stock-based compensation expense for the FV companies, and pro forma net income for the IV firms as if the FV method had been used to account for stock-based compensation expense. The other variables (Tables 1 and 2) used in the analysis for the S&P 500 companies were obtained from the COMPUSTAT data base.

In 2002 only 19 of the 500 S&P firms used the fair value method in accounting for stock options; the other 481 firms used the intrinsic value method. In 2003 the number of fair value firms increased to 101, leaving 399 intrinsic value firms. The key variable of interest for our study was the ratio of stock-based compensation expense to reported net income. This ratio was computed for all companies that reported positive net income for the year. In 2002, 400 companies reported positive net income while 100 had losses, and in 2003, 435 firms were profitable while 65 had losses. In 2002, all 19 of the fair value firms were profitable, and in 2003 94 of the 101 fair value firms were profitable. The amount of stock-based compensation expense is not recorded as an expense by intrinsic value companies but is shown only as a disclosure item in a firm's "Notes to Consolidated Financial

Statements." This amount is reported as an expense by fair value firms, and thus reduces net income or increases a loss. Thus, the higher the ratio of stock-based compensation expense to reported income, the greater the chance a firm would prefer **not** to use the fair value method. For the FV firms, the ratio was computed by dividing reported stock-based compensation by reported net income; for the IV firms, the ratio was computed by dividing the amount of stock-based compensation disclosed in the "Notes" by adjusted net income.

Univariate tests of the differences between the means of the variables for the fair value and the intrinsic value firms were performed. T-tests of the null hypothesis that the mean values of each variable for the two groups of firms are equal were performed using the SPSS. This statistical procedure is appropriate when comparing the average performance of two groups.

VI. Results

The evaluation of differences in means revealed statistically significant differences between fair value companies and intrinsic value companies. The ratio of stock-based compensation expense to reported net income, the key variable of interest for our study, was significantly higher (at the .01 level) in both 2002 and 2003 for companies using the intrinsic value method (see Table 1 for the 2002 results and Table 2 for the 2003 results). In 2003, the mean value was 27% for intrinsic value firms and 6% for fair value firms. When this ratio exceeds one, a reported profit becomes a loss. Our review of the firms' annual reports revealed that eleven profitable intrinsic value companies in both 2002 and 2003 would have reported a loss if they had used the fair value method.

Our analysis also revealed that in 2002, none of the 19 companies using the FV method reported a loss, whereas 100 (or 21%) of the 481 companies using the intrinsic value method reported a loss (see Table 3). For firms reporting losses, none chose to expense options; but firms that were profitable, 5% (19/400) had chosen the fair value approach that expensed options. The results were similar in 2003, where only 7 (7%) of the 101 companies using the FV method reported a loss, but 58 (17%) of the intrinsic value companies reported a loss (see Table 4). For firms reporting losses, 11% (7/65) chose to expense options; but firms that were profitable, 22% (94/435) chose the fair value approach. It is reasonable, then, that a firm that is reporting a loss would not wish to increase that loss by using a procedure which treats a transaction as an expense when an alternative accounting method of handing that transaction exists.

The earnings before interest and taxes margin (EBIT) was significantly higher for the fair value firms in both 2002 and 2003, indicating more relative earnings to absorb the option expense. Actually, fair value firms had a lower stock option expense than the intrinsic value firms, as indicated by their significantly lower ratio of option expense to reported income. The higher profitability of these firms may be due in part to their low stock option expense. The decision to expense stock options is relatively easy to make when the amount involved is relatively small. We recognize that firms with low stock option costs may have higher personnel costs since stock options provide an alternate source of executive and employee compensation. The fair value firms in the S&P 500 appear to have managed all of their compensation and other expenses in such a manner that resulted in a higher EBIT margin.

Firms with higher EBIT margin may reflect higher quality of earnings. EBIT is calculated before adjustments for nonrecurring items, value changes in investment securities, write-down of assets, gains or losses from discontinued operations, other income, and other extraordinary items. It is in these areas that there are significant opportunities to "manage" reported earnings. Although the components of EBIT (and EBIT margin) can also be "managed" to some extent, it is likely that EBIT is a "purer" figure than net income. Firms with higher EBIT margin would be less likely to try to manufacture profits, and thus these firms could be said to have a higher quality of earnings.

Our analysis also suggests that the lower stock option cost and higher EBIT margin may have contributed to the fair value firms paying higher dividends, given the significantly higher dividend yield and the higher relative dividend yield for these firms. Higher dividend yield may also be a signal of greater earnings quality. Firms that pay out a large portion of their reported profits in dividends may have real earnings that have not been doctored; other firms, with large reported earnings but minimal dividend payments, may have reported earnings that have been disguised, falsified, or "adjusted". A firm cannot pay dividends unless sufficient real earnings and cash are available. Farinha and Moreira tested the relationship between dividend payments and earnings quality for the period 1987 – 2003. Using a sample of approximately 40,000 firm-year observations, they found a positive relationship between dividend payments and several measures of earnings quality (Farinha and Moreira 2007). These results are consistent with our findings that the more profitable FV firms share a larger portion of reported earnings with their stockholders than is the case for the IV firms.

Our results also indicate that it was the larger firms that took the lead in adopting the fair value method of accounting for stock option expenses. Although the growth rate was similar for both sets of firms, the level of total assets was significantly higher for fair value firms. Also, growth in sales was similar for both groups of firms, but the level of sales was higher for fair value firms. The difference in the level of sales was statistically significant in 2003 but not in 2002, again indicating that larger firms made the switch to the fair value method.

Risk and return characteristics of firms are of paramount interest to security analysts and investors. A common measure of a firm's risk, the beta coefficient, was significantly lower for fair value firms. It is expected that lower market risk would be accompanied by lower market return, and indeed this is the case. The 5 year total return, which consists of price appreciation, dividend reinvestment and dividends earned on reinvested dividends, was significantly lower for the fair value companies in both 2002 and 2003. While the 3 YEAR total return was also significantly lower for the fair value companies in 2002; the difference was not significant in 2003; nor were there significant differences for the 1 year total return in either year. Although the low risk, low return characteristics of the fair value firms have an appeal to some investors, it should be noted that the intrinsic value firms cannot be considered highly "risky." With a beta of 0.95 in 2003 and 1.03 in 2003, these firms exhibit average market risk, while fair value firms are less risky than the market average.

The low risk, low return characteristics of the FV firms is a signal of their more transparent financial statements and higher earnings quality. This relationship has been

verified by several researchers who have evaluated the relationship between earnings quality and the cost of capital. In an exhaustive review of over 35 articles on this issue, Habib found that higher earnings quality was associated with lower cost of capital in virtually all cases. Since risk is positively related to the cost of capital, lower risk firms can be expected to have a higher quality of earnings (Habib 2006).

Finally, we calculated the ratio of interest expense to reported net income and found it was statistically the same for both the IV and FV companies; the differences between the two in both years were not statistically significant. We also evaluated the relation between interest expense and option expense. Did firms that have high option expense also have high interest expense? Or did they tend to have low interest expense? We calculated the correlation coefficients between option expense/reported net income and interest expense/reported net income for 2002 and 2003. We found the correlation to be very low in both years. The correlation was -0.013 in 2002 and 0.011 in 2003. Thus, we conclude that there is no relation between option expense and interest expense; the amount of interest expense is not a factor in the decision to grant options and the resulting option expense.

VII. Conclusions

The decision to use the fair value method or the intrinsic value method in accounting for stock options was a choice that corporations had freely made. Since the proposed amendment to FASB 123 and 95 has become effective, however, firms no longer have that choice; they are required to use the fair value method. The results of this paper suggest that there are significant differences between firms that expensed their stock options and those that had chosen not to. Clearly, the impact on the bottom line appeared to have been paramount to the decision to expense stock options given that it resulted in a decrease in net income or an increase in a net loss. Our study reveals that firms reporting a loss were less likely to use the fair value method, presumably, because of the negative impact it had on earnings.

Fair value firms had a significantly higher EBIT margin, indicating that they had relatively more earnings to absorb the option expense. Not surprisingly, the ratio of option expense to reported income was significantly lower for FV firms. The lower stock option cost and higher EBIT margin were also found to be associated with a higher dividend payout by fair value firms. Both of these results are consistent with FV firms providing a signal to investors that they are committed to reporting transparency and earnings quality.

The rate of growth was also similar for both groups of firms, but size was significantly different. As measured by total assets, fair value firms were significantly larger in 2002 and 2003. The level of sales was also higher for fair value firms, although the difference was not significant in 2002.

Our results also confirmed the expected risk-return relationships that investors require. The 5-year total return was lower for the fair value firms in both 2002 and 2003, and the 3-year total return was also lower in 2003. Risk, as measured by beta, was also lower in both years, indicating that fair value firms provide a low risk, low reward investment compared with their intrinsic value brothers. Lower risk was also related to signaling higher earnings quality.

One justification for requiring FV expensing of stock options is to improve the transparency of financial reporting. Based on this research analysis, our results are consistent with a signaling explanation -- that FV firms are indeed sending a signal that they are more committed to transparency in financial reporting and earnings quality. The lower beta, higher EBIT margin, and higher dividend yield are components of a signal to investors that the FV firms can be expected to have higher earnings quality and greater transparency in financial reports.

Table I

Mean Values and Standard Deviations for Selected Variables in 2002 for S&P 500 Firms Accounting for Stock Option Expense Using the Intrinsic Value Method and the Fair Value Method

Variable	Intrinsic Value Firms (n = 481)	Fair Value Firms (n = 19)	t-statistic	Standard Error Difference
EBIT margin	12.99 (26.00)	28.50 (24.46)	-2.704**	5.74
Beta	0.95 (0.66)	0.68 (0.37)	2.968***	0.09
3 year average total asset growth	19.01 (30.59)	14.80 (16.30)	1.055	3.99
3 year average sales growth	15.34 (23.68)	13.03 (16.82)	0.576	4.01
Level of total assets	31,524 (90,444)	135,047 (177,382)	-2.531**	40,903
Level of sales	12,317 (21,346)	22,772 (29,320)	-1.538	6,796
Dividend yield	1.45 (1.58)	3.23 (2.35)	-3.279***	0.54
Dividend yield to dividend yield of the S&P 500	96.10 (107.06)	216.27 (129.38)	-3.891***	30.89
1 year total return	0.41 (35.13)	3.49 (28.1)	-0.451	6.82
3 year total return	7.99 (20.32)	-2.12 (9.42)	4.187 ***	2.41
5 year total return	13.84 (16.46)	8.06 (7.90)	2.868***	2.02
Option expense to reported income*	27.16 (104.725)	5.89 (6.20)	3.832***	5.55
Interest expense to reported income*	58.71 (237.75)	44.3 (39.95)	0.794	18.14

Notes. Mean values are presented with standard deviations in parentheses. Total assets and sales are expressed in millions of dollars; means are expressed as percentages.

*Only firms reporting positive net income are included here; 400 of the 500 S&P firms reported positive income in 2002 and all 19 fair value firms were profitable.
**Significant at 5 percent level
***Significant at 1 percent level

Table II

Mean Values and Standard Deviations for Selected Variables in 2003 for S&P 500 Firms Accounting for Stock Option Expense Using the Intrinsic Value Method and the Fair Value Method

Variable	Intrinsic Value Firms (n = 399)	Fair Value Firms (n = 101)	t-statistic	Standard Error Difference
EBIT margin	12.24 (24.47)	21.86 (20.24)	-4.080***	2.36
Beta	1.03 (0.78)	0.85 (0.52)	2.702***	0.07
3 year average total asset growth	12.58 (19.21)	11.23 (16.43)	0.709	1.90
3 year average sales growth	7.87 (15.99)	9.21 (19.03)	-0.652	2.06
Level of total assets	17,039 (35,178)	118,391 (204,502)	-4.962***	20,425
Level of sales	8,984 (11,459)	25,148 (40,441)	-3.977***	4,065
Dividend yield	1.62 (2.24)	2.88 (2.41)	-4.742***	0.27
Dividend yield to dividend yield of the S&P 500	81.17 (116.48)	135.43 (111.96)	-4.314***	12.58
1 year total return	-14.42 (29.70)	-16.53 (22.76)	-0.777	2.72
3 year total return	-3.29 (22.50)	-2.33 (18.70)	0.429	2.24
5 year total return	2.47 (14.10)	-0.29 (9.94)	2.164**	1.28
Option expense to reported income*	21.92 (59.12)	8.47 (15.61)	3.755***	3.58
Interest expense to reported income*	67.20 (511.93)	72.26 (135.5)	-0.14	35.97

Notes. Mean values are presented with standard deviations in parentheses. Total assets and sales are expressed in millions of dollars; means are expressed as percentages

*Only firms reporting positive net income are included here; 435 of the 500 S&P firms reported positive income in 2003 and 94 of the 101 fair value firms were profitable.
**Significant at 5 percent level
***Significant at 1 percent level

Table III

NUMBER OF FIRMS REPORTING PROFITS OR LOSSES FOR 2002

	Firms reporting losses	Firms reporting profits	Total
Intrinsic value firms	100	381	481
Fair value firms	0	19	19
Total	100	400	500

Table IV

NUMBER OF FIRMS REPORTING PROFITS OR LOSSES FOR 2003

	Firms reporting losses	Firms reporting profits	Total
Intrinsic value firms	58	341	399
Fair value firms	7	94	101
Total	65	435	500

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Do Changes In Corporate Reputation Impact Subsequent Stock Price Performance?

Thomas M. Krueger, Mark A. Wrolstad, and Shane Van Dalsem

Abstract

This study of firm reputations finds that firms with improved reputations, as measured by Harris Interactive, provide higher average rates of return on the announcement date than those firms with diminished reputations. Somewhat surprisingly, firms with improved reputations earned an 8.3% return over the following year whereas firms with diminished returns earned a higher 15.4 % return. One can only speculate that firms with diminished reputations might be making management decisions that enhanced profitability at the expense of positive public perceptions of the firm. Sharpe and Treynor measures, based on median returns, were significantly greater for those firms with above average changes in reputation.

I. Introduction

This study looks at the relationship of changes in a firm's reputation and the subsequent stock price performance. A corporation's reputation reflects the public's perception of the ethical standards and behavior it exhibits while providing goods and services to its customers. Ethical behavior dictates that an organization treats others legally, fairly, and honestly. For businesses to be successful in the long-run, they must have the trust and confidence of their customers, employees, and owners, as well as the community and society within which they operate. Nearly everyone agrees that firms have a responsibility to provide safe products and services and to afford safe working conditions for employees. We also expect them to protect the environment and not pollute it. Laws and regulations exist to ensure minimum levels of compliance. When a company meets and exceeds our expectations, we generally deem them to be ethical and have a good reputation.

In this research we use a measure of corporate reputation called the Reputation Quotient^{sm} (RQ). The RQ is a comprehensive measuring method of corporate reputation that was created by Harris Interactive Inc. and Professor Fombrun (Fombrun & Shanley, 1990). They jointly developed this standardized assessment tool to capture the perceptions of corporate stakeholder groups such as consumers, investors, employees, and key influentials. It is created from data received by the Harris Poll Online which has a proprietary global database of over 4.2 million cooperative respondents. The instrument enables research on the drivers of a company's reputation as well as comparisons of reputation both within and across industries.

The methodology to evaluate companies and calculate the quotient is conducted in two phases. In the first phase, Harris Interactive conducts over 4,500 online and telephone interviews with respondents throughout the United States. People are asked to nominate the companies they believe to have the best and worst reputations. In the second phase, another 10,830 respondents are asked to provide detailed ratings of the 60 most frequently mentioned companies. On average, each of the companies is evaluated by approximately 445

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respondents. All ratings are weighted to be representative of the U.S. population. The business reputation model has the following six drivers of corporate reputation: emotional appeal, products and services, vision and leadership, workplace environment, financial performance, and social responsibility.

II. Literature Review

There is a growing body of literature that applies the RQ methodology to firms in various countries around the world (Gardberg, 2006). The value of the Reputation Quotient is that it provides an objective, credible way to quantify the different levels of positive or negative public perception of companies that are a part of our everyday life.

In a study of the relationship between reputations and financial success, it was found that a company's reputation for financial success can adversely affect its overall reputation (Porritt, 2005). The author reports that firms perceived as making large profits at the expense of customers can have their reputations adversely affected. The author called this phenomenon "The Bottom-Line Backlash Effect". This could possibly explain why companies with poor reputations are sometimes more profitable than other companies with better reputations.

The most relevant research done on the topic of the investment performance of firms with good and bad reputations as measured by the Reputation Quotient is the more recent research done by Krueger and Wrolstad (Spring 2007). They find that portfolios with the top RQ ratings provided a higher return than portfolios with the bottom RQ ratings on both the announcement date and the following year. Due to the limited sample size, these findings were found to be statistically insignificant. The study also reports that portfolios of the highest RQ firms have statistically significant lower investment risks as evidenced by both lower standard deviations and betas.

III. Empirical Results

Comparison of Firms with Improved versus Diminished Reputations

Firms with improved reputations from the prior report provide higher average rates of return on the announcement date than those firms with diminished reputations, as shown in Table I. On the day of the announcement, the average return of the firms with improved RQs was a negative 0.10%, while those with diminished RQs had an average return of -0.42%. The median difference in return was very similar at thirty basis points.

On average, firms with improved RQs earned 8.30% over the following year, as exhibited in the second column of Table I. Those with diminished reputations earned a 15.4% average rate of return over the following year, perhaps due to a rebounding reputation over that period.

Despite the seemingly large disparity in average return values over the subsequent 365 days, the difference was not found to be statistically significant.

A better measure of the relative impact on subsequent returns of firm reputation changes is to compare the performance relative to the market overall. In this research, the Standard & Poor's 500 Index (SP) was used as the market surrogate. All of the values that

are statistically significant at the 0.05 level or less are tied to the SP values. Though negative, the average return of the SP that coincided with the 128 advances in RQ (e.g., -0.09%) was significantly greater than the market surrogate's return that coincided with the 140 RQ declines (e.g., -0.50%). The median SP return coinciding with the 128 firms with improved reputations is also significantly better (e.g., -0.03 – (-0.41%) = 0.38%) at the 0.01 level. On the announcement date, the average and median returns of both the firms with positive and negative RQ changes is within 0.10 percent of the market return. However, due to the higher standard errors of the firm returns compared to the market returns, the return of the portfolio of firms with positive RQ changes is not statistically different from that of the portfolio of firms with negative RQ changes.

The other significant difference shown on Table I is the difference between the average SP returns during the following year. When reputations improved in the previous period, the SP return was 3.83% on average. However, when reputations decline, the stock market recovered nicely. The annual return of 9.84% is statistically significantly higher at the 0.01 level.

Over the year following publication of RQ information, the average return for improved firms was 4.47% (i.e., 8.30% - 3.83%) higher than the average market return, while the median return was 1.61% higher. The average return of firms with reductions in reputations also exceeded the SP, with a market excess return of 5.56% (i.e., 15.40% - 9.84%) on average and 3.23% using median returns. The SP performance coinciding with firms with reduced reputations is over two times its counterpart and the market-excess returns of firms with diminished reputations also exceed the market-excess returns of firms with improved RQs.

Sample Analysis

Over the 1999-2006 period corporate reputations declined as measured by the RQ. As shown in the top row of Table II (Panel A), the average corporate reputation rose in only three of the seven years. Interestingly, these were all bunched in the 2004-2006 period. The sum of the three most recent years of RQ increases together results in a value that is less than the reputation decrease in the year 2002 alone. The economic challenges of the period immediately following the terrorist attacks on this country may have adversely impacted corporate reputations.

Another way to examine RQ changes over time is to examine the frequency of advancing and declining reputations, as is shown in the Panel B of Table II. The number of firms with advancing or declining reputations parallels the information in Panel A. As detailed in the third row of Table II (Panel C), the range of the annual change in reputation varies from 11.0% in 2000 to 28.9% in 2005. Given the substantial changes in reputation quotient, it is important to do more than study the performance of the firms with the highest and lowest RQs, as done by Krueger and Wrolstad (2007). Depending on the number and magnitude of outliers, the number of firms experiencing a reputation change greater than average can vary dramatically.

In Panel D you can see that in 2000, when the second biggest drop in corporate reputation occurred, about two-thirds of the firms experienced an increase in corporate

reputations. When RQs rose by 1.04% in 2004, about two-thirds of the firms experienced a RQ decline. In fact, over the years, more than 129 firms have beaten the average increase, while a larger 139 have fallen short.

Changes in Corporate Reputation Relative to the Mean

The average RQ values change from year to year, as shown in Table II. Panel A of Table III presents the performance of firms with a RQ increase that exceeded the average increase (or in years when the average RQ declined there was less of a decline) versus those that didn't keep pace with the average change. The returns on announcement dates are very similar on an average or median basis. Over the subsequent year, those firms with better than average RQ changes earned an average return that was 1.3 percent (i.e., 12.7% – 11.4%) greater than firms with below average RQ changes. On a median basis, firms with better than average RQ changes had a return that was 5.4 (i.e., 10.6% - 5.2%) percent better. Although not statistically significant, the implication seems to be that firms with improved reputations relative to the market tend to provide better investment results.

Extreme changes in Corporate Reputation

The prior study by Krueger and Wrolstad (2007) looked only at the ten firms with the highest RQs and firms with the lowest RQs. This analysis takes that analysis forward and examines the performance of the ten firms with the most positive and negative reputation changes. As shown in Panel B of Table III, the announcement date reaction is very similar. Over the subsequent year, the ten firms with the greatest positive changes in RQ earned a return that was 4.4 (i.e., 13.7% – 18.1%) percent less than the ten firms with the largest negative changes in reputation. However, the median rate of return over the following year was 1.78 percent better for the ten firms with the greatest positive RQ change, though neither of the differences is statistically significant.

Analysis of Risk

An analysis of Sharpe values provides some additional insight. Most Sharpe measures were not significantly different, whether looking at mean or median values as exhibited in the first row of each data set in Table IV. The one exception to this was the Sharpe measures for the comparison of firms with above and below average changes in reputation. The median 1.20 Sharpe value for firms with above average changes in reputation was statistically greater than the median 0.23 Sharpe value for firms with below average changes in reputation, at the 0.10 level. These findings are supportive of those found by Krueger and Wrolstad (2007) for the RQ rankings themselves.

The beta values across RQ change portfolios are relatively similar, as exhibited in the second row of each data set in Table IV. The mean difference never exceeds 0.10, while the largest median difference is a virtually non-perceivable 0.02 Treynor measures are also insignificantly different in all but one case. In that instance, shown in Panel B of Table IV, the Treynor measure of firms with above average changes in RQ exceeds the Treynor measure of firms with below average changes in RQ at the 0.05 level.

IV. Summary and Conclusion

This research found that the median returns for firms with improved reputations, relative to the market, did provide better investment results. The reason for the superior average performance of firms with diminished reputations continues to be unclear. The most

likely explanation is the limited observation population but the "Bottom-Line Backlash Effect" discussed earlier may have played a role. The answer to our initial question is that changes in reputation as measured by the RQ, provides very limited new information useful to guide investment decisions.

Corporate reputation, as measured by RQ, declined from 1999 through 2003 and then increased in every subsequent year in the study. Over time, approximately half of the firms experienced an advancing RQ. Some RQ change-related, significant differences in financial performance were found. Although one would have expected firms with improved reputations, reputation improvements that exceeded the average change, and the portfolio of firms with the best changes to do significantly better than their alternative, such is not the case.

Table I

Comparative Holding Period Returns of Firms with Improved Reputations versus Diminished Reputations

Portfolio returns measurements that are statistically different at the 0.05 level are marked with corresponding small case letters. Those that are statistically different at the 0.01 level are marked with a corresponding capital superscript.

N values are the summation of observations reported in Panel B of Table 2.

	N	Announcement Date Return	Following Year Holding-Period Return
Firms with Improved Reputations			
Average return	128	-0.10%	8.30%
Median return	128	-0.11%	6.17%
Standard & Poor's 500			
Average return	128	-0.09%^{A}	3.83%^{C}
Median return	128	-0.03%^{B}	4.56%
Firms with Diminished Reputations			
Average return	140	-0.42%	15.40%
Median return	140	-0.41%	8.25%
Standard & Poor's 500			
Average return	140	-0.50%^{A}	9.84%^{C}
Median return	140	-0.41%^{B}	5.02%

The Treasury bills rate is being used as the surrogate for the risk-free rate in this research. Its average return ranged from 3.30 percent over the years following RQ improvements to 2.73 percent over the years following RQ declines.

Table II - Demographic Data Related to Reputation Quotient Changes.

The total number of observations (N) is number of firms in the Harris Interactive Reputation Quotient Survey that are included in the survey in the reported year and the prior year less any of the firms that did not trade in the stock market during the period between the two survey dates.

Year	2000	2001	2002	2003	2004	2005	2006
N	14	21	42	46	48	49	48
Panel A. Average and Median Changes in Reputation Quotient by Year							
Average Change in Reputation Quotient	-1.39%	-0.44%	-3.30%	-0.93%	1.04%	0.44%	1.08%
Median Change in Reputation Quotient	-0.70%	-0.64%	-2.50%	-1.13%	0.25%	0.76%	1.51%
Panel B. Frequency of Advancing and Declining Reputations							
Advancing	6	8	8	16	29	30	31
Declining	8	13	34	30	19	19	17
Panel C. Reputation Quotient Change Extremes							
Largest Positive Change	4.01%	6.32%	3.44%	9.04%	13.3%	17.5%	8.02%
Largest Negative Change	-7.02%	-5.50%	-22.3%	-7.01%	-12.1%	-11.4%	-13.3%
Range of Reputation Quotient Changes	11.0%	11.8%	25.7%	16.1%	25.4%	28.9%	21.4%
Panel D. Frequency of Changes Relative to Average Change							
More Positive	9	8	26	18	15	25	28
More Negative	5	13	16	28	33	24	20

Table III

Analysis of Relative Risk: Comparative Measures of Returns of Firms with Reputation Changes Above and Below Average and the Ten Firms with Greatest Reputation Improvement and Decay

Portfolio returns measurements that are statistically different at the 0.05 level are mark with corresponding small case letters. Those that are statistically different at the 0.01 level are marked with a corresponding capital letter superscript.

N values reported in Panel A below are the summation of observations reported in Panel D of Table II.

	N	Announcement Date Return	Following Year Holding-Period Return
Panel A. Firms with Above and Below Average Change in Reputation			
Firms with Above Average Changes in Reputations			
Average	129	-0.24%	12.7%
Median	129	-0.23%	10.6%
Firms with Below Average Changes in Reputations			
Average	139	-0.29%	11.4%
Median	139	-0.24%	5.20%
Panel B. Ten Firms with Most Positive and Negative Reputation Changes in Each Year.			
Ten Firms with Most Positive Reputation Changes			
Average	68[1]	-0.33%	13.7%
Median	68[1]	-0.25%	7.98%
Ten Firms with Most Negative Reputation Changes			
Average	67[1]	-0.37%	18.1%
Median	67[1]	-0.20%	6.20%

[1]There were only 14 firms in the 2000 change sample. In 2002 three firms had no change in reputation, resulting in a tie among the top 10 positive changes and 11 firms being included in that year.

Table IV - Comparative Measures of Risk

Portfolio returns measurements that are statistically different at the 0.10 level are marked with corresponding numbers. Those that are statistically different at the 0.05 level are marked with corresponding small case letters. Those that are statistically different at the 0.01 level are marked with a corresponding capital superscript.

	N	Mean	Median
Panel A. Firms with Improved and Diminished Reputations			
Firms with Improved Reputations			
Sharpe	128	0.84	0.30
Beta	128	0.97	0.92
Treynor Measure	128	0.12	0.02
Jensen Measure	128	4.53%	3.93%
Firms with Diminished Reputations			
Sharpe	140	1.78	0.94
Beta	140	0.93	0.92
Treynor Measure	140	0.13	0.05
Jensen Measure	140	5.37%	2.30%
Panel B. Firms with Above and Below Average Changes in Reputations			
Firms with Above Average Changes in Reputation			
Sharpe	129	1.47	1.20[1]
Beta	129	0.93	0.93
Treynor Measure	129	0.19	0.08[a]
Jensen Measure	129	4.22%	4.52%
Firms with Below Average Changes in Reputation			
Sharpe	139	1.20	0.23[1]
Beta	139	0.97	0.91
Treynor Measure	139	0.07	0.01[a]
Jensen Measure	139	5.66%	1.77%
Panel C. Ten Firms with Most Positive and Negative Reputation Changes in Each Year.			
Ten Firms Most Positive Changes in Reputation			
Sharpe	68[*`]	1.43	0.71
Beta	68[*]	1.00	0.96
Treynor Measure	68[*]	0.15	0.06
Jensen Measure	68[*]	14.2%	6.19%
Ten Firms with Most Negative Changes in Reputation			
Sharpe	67[*]	2.10	0.44
Beta	67[*]	0.91	0.95
Treynor Measure	67[*]	0.08	0.03
Jensen Measure	67[*]	18.3%	5.24%

[*]There were only 14 firms in the 2000 change sample. In 2002 three firms had no change in reputation, resulting in a tie among the top 10 positive changes and 11 firms being included in that year.

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Changes in Both Dividends Per Share and Important Characteristics ofDividend Paying Firms Over Time

Susan F. Havranek, John Consler, and Greg M. Lepak

Abstract

The market break of 2000 appears to have changed how companies perceive dividends. This study shows dividends appear to be more important during the post-2000 period. While some financial variables had significant relationships with dividends per share (DPS) over both pre-2000 and post-2000 periods, others such as current ratio, beta risk measure, and net profit had significant relationships with DPS in only one period. This knowledge may help investors improve decisions regarding dividend-paying firms.

I. Introduction

The purpose of this study is to characterize the trends in dividends per share for all firms reported in CRSP paying cash dividends any time between the last quarter of 1994 and the first quarter of 2006. The first quarter of 2000 includes a market downturn in stock prices. Study results show dividends per share prior to this time (pre-2000) generally declined, while they increased in the post-2000 period.

In addition, the relationship between dividends per share and selected time-varying financial variables are tested for differences between the two periods. An unbalanced panel data methodology is used to assess the data. This is a longitudinal analysis of a cross-section of firms which allows firms to enter and exit the data set. Study results show market value to book value, asset size, number of shares outstanding, and debt ratio are significant in both time periods. Liquidity ratio is significant only in the pre-2000 period, while net profit and beta are only significant in the post-2000 period.

II. Literature Review

Articles since 2000 provided the relevant literature review. Kalay and Michaely (2000) find no evidence of a link between tax structure and dividend yield. This would argue that dividend tax changes in 2003 should not affect dividend yields or influence study results.

Pan (2001) showed managers change dividends proportionally larger than the change in permanent earnings. This linkage demonstrates the importance of changes in permanent earnings to the study of dividends. Several earnings components will be addressed in the current work as a result.

Fama and French (2001) provide the best study of firm characteristics relevant to dividends. These characteristics have changed over time (1978 to 1999), resulting in more small firms with low profitability and strong growth opportunities which are not likely to pay dividends. They also find, regardless of characteristics, firms have become less likely to pay dividends. Relevant variables for dividends proved to be profitability, investment

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opportunities, size, market value to book value, and share repurchase.

Baker et al. (2001) found based on managers' responses the most important causes of dividend decisions are the pattern of past dividends, stability of earnings, and the level of current and expected future earnings. These factors were relevant for firms listed on both NASDAQ and the New York Stock Exchange. They also found great differences between financial versus non-financial firms.

Nissim and Ziv (2001) find dividend changes are positively related to earnings changes in each of two years after the dividend change. Once again, expected future earnings have great relevance for current dividends.

Grullon and Michaely (2002) investigate the relationship between share repurchases and dividends. They find that firms are repurchasing shares with funds that otherwise would have been used to increase cash dividends. Larger firms have not tended to cut their dividends. Firms have gradually substituted repurchases for dividends. Based upon this, common shares outstanding is an important variable for the current work.

Arnott and Asness (2003) provide support for the signaling hypothesis, higher dividend payout forecasts future aggregate earnings growth. Relatively low current dividend payouts (compared to historical rates) do not predict good earnings ahead. Once again the strong linkage between dividends and expected future earnings appears to be evident.

Mougoué and Rao (2003) study the temporal behavior of dividends and earnings. Non-utility firms that followed the signaling hypothesis tended to be smaller, have a lower growth rate of total assets, and have a higher leverage ratio. All variables are relevant for the current work.

Baker and Wurgler (2004) propose dividend decisions are driven by prevailing investor demand. Investor demand for dividends changes over time and firms react. They find non-payers tend to initiate dividends when demand is high. Payers tend to omit dividends when demand is low. Demand is based upon the relative stock price on dividend payers. Both past capital gains and future returns are part of the dividend model used.

De Angelo et al. (2004) build upon the work of Fama and French (2001). They find a concentration of dividends has occurred. Aggregate real dividends from industrial firms increased over the past 20 years, even though the number of dividend payers has decreased by over 50%. Increased dividends from top payers overwhelm the slight dividend reduction from the loss of many small payers. The largest aggregate dividend payers in 2000 account for over 50% of all dividends paid by industrial firms. When looking at a sample for future work, it had best represent these large, dominant, dividend payers to be relevant.

Chetty and Saez (2005) document a 20 percent increase in dividend payments by non-financial, non-utility publicly traded firms following the 2003 dividend tax cut. This should support an expectation of increasing dividends per share in the post-2000 period of the current study.

Zhou and Ruland (2006) find that high dividend pay out companies tend to experience

strong, not weak, future earnings. This may have implications for dividends per share.

DeAngelo, DeAngelo, and Stulz (2006) find a large increase in negative retained earnings from 1978 to 2002. These firms were found to have no propensity to change their payment of dividends while those with positive retained earnings were more likely to change.

Consler and Lepak (2007) build upon Fama and French's (2001) earlier work. Different characteristics such as price, size, debt level, shares outstanding, and profits are found to vary by risk and dividend level for firms paying dividends.

Denis and Osobov (2008) provide international results on dividends. In the U.S., Canada, UK, Germany, France, and Japan, the propensity to pay dividends is higher among larger, more profitable firms, and those for which retained earnings comprise a large fraction of total equity. Aggregate dividends were found to have not declined.

An event (Chetty and Saez 2005) can have an effect upon level of dividend payment. The level of dividends changes over time (Consler and Lepak 2007). This study builds upon this prior work. An event, the market downturn of 2000, is used to divide into pre- and post-periods to see if traditional variables identified in prior work as important to dividend paying companies change over time.

III. Sample and Data

Firms that declared cash dividends, excluding payments made as part of liquidations, acquisitions or reorganizations, during the period of 1/1/95 to 3/31/06 were identified in CRSP. It was assumed that dividend declarations made during the last 15 days of a quarter and anytime during the following quarter prior to the last 15 days were dependent on the quarter of interest. For example: if the first quarter runs 1/1 – 3/31, dividends declared 3/16 until 6/15 would be assumed to be dependant on financial activity during the first quarter.

Some industries were observed to have monthly dividend payments or multiple types of cash dividends as coded by CRSP. When this was the case, the multiple dividend amounts were summed and reported as a single observation for the quarter. In order to use a panel data methodology, time identifications based on calendar quarters were assigned. Firms with fiscal quarters ending between 10/1/94 and 12/31/94 are labeled as time period 0. All fiscal year and quarter ends were retained in the sample. Quarterly beta was calculated for fiscal quarters using daily prices and NYSE equal-weighted market index data from CRSP. Monthly high and low market prices, quarterly balance sheet and income statement values and outstanding share data were collected from Compustat. Observations with missing balance sheet and income statement data were deleted. Missing data for high and low market price and outstanding shares was hand collected where possible; otherwise the observations were deleted. In addition, firms with the term "Trust" in the company name were deleted from the sample.

The response variable used in this study contains quarterly cash dividends per share (DPS, $ per share) from the fourth quarter of 1994 to the first quarter of 2006. The data has been partitioned into two time periods; pre- and post-2000. The authors believe it is

reasonable to assume that the market downturn in stock prices during the first quarter of 2000 will have an impact on dividend policy. Quarterly measurements were not obtained for all firms at all forty-six time points; in fact, the number of measurements on dividends per share for each firm varied from 1 to 46, producing a median of 13 observations per firm. There were a total of 48478 observations involving 2672 firms in all industries. In the pre-2000 set there were 23,098 observations over 21 quarters from 1,852 firms. The median number of observations per firm was 13. In the post-2000 set there were 25,390 observations over 25 quarters from 2,011 firms. The median number of observations per firm was 11.

The trend in the mean response is represented by a *lowess18* smoothed curve using two time spans in Figure 1: the fourth quarter of 1994 to the fourth quarter of 1999 (time span 0-20) and the first quarter of 2000 to the first quarter of 2006 (time span 21-45). We believe investors shifted their perception of dividends as the market rapidly declined. Before 2000, dividends were not as important as after.

In order to reduce skewness, all analyses are based on the natural log transformed DPS values, log (DPS values + 1). Figure 1 shows a very distinctive difference in movement in the log DPS values before and after the first quarter of 2000. The curves show generally that the values decline before the first quarter of 2000, and increase thereafter. Clearly, a time trend can be influenced by the exact choice of starting dates. However, there are quite evident trend differences in time span 0-20 versus time span 21-45. It appears that a linear curve is a reasonable approximation to model both the decline and increase in log DPS values. Accordingly, this study employs a model for the mean response that allows the rates of change in the DPS values to differ between and within firms using the separate time spans. The response pattern for each firm in each time span consists of an intercept at baseline and a slope, where the intercepts and slopes are allowed to vary randomly.

One of the objectives of this study is to assess the effect of selected time-varying covariates on DPS values. Quarterly data were obtained on several financial variables at all measurement occasions at which a DPS value was available: common shares outstanding (SHARES, millions shares), closing price per share in third month of quarter ($ per share), total stockholders' equity (millions $), total assets (ASSETS, millions $), total liabilities (millions $), net income/loss (NET, millions $), total current assets (millions $), total current liabilities (millions $), and monthly high and low stock prices. Some ratios that were calculated include book value per share (total stockholders' equity ÷ common shares outstanding), market to book value ratio (average price per share ÷ book value per share), debt ratio (DEBT, total liabilities ÷ total assets), current liquidity measure (total current assets ÷ total current liabilities) and the quarter's beta. An indicator variable to represent the fourth fiscal quarter (IQTR) was included based on prior research.

To address non-normality in some of the data a log transformation is performed on the values for ASSETS, SHARES and DEBT: log(ASSETS), log(SHARES+1), and log(DEBT+1). Calculated values for market to book, current liquidity, and beta were assigned to deciles to limit the effect of non-normality, negative values, and outliers (Market, Liquidity, BETA respectively). NET appeared to have a reasonably normal distribution

18 The Loess process used a span of 0.3.

therefore raw values were used in the analysis. In the next section, we test whether time-dependent covariates are associated with changes in dividends per share over time.

IV. Analysis and Results

A. Fourth Quarter 1994 – Fourth Quarter 1999

The investigation starts by fitting a linear mixed effects model (see, for example, Pinheiro and Bates 2000) to the pre-2000 data. This flexible approach can be used in financial analysis to model population characteristics that are common to all firms as well as random response patterns that correspond to individual firms over time. Both between-firm and within-firm sources of variation are used to describe changes in the population mean dividends per share. Linear mixed effects models allow the analyst to account parsimoniously for the covariance structure of data collected over time. They accommodate inherently unbalanced longitudinal data as well, i.e. the number of measurements on each firm can be different and the measurements need not be collected at the same set of measurement occasions.

We consider the following linear mixed effects model in each of the two time spans:

$$E(Y_{ij} \mid b_i) = (\beta_1 + b_{1i}) + (\beta_2 + b_{2i})\, t_{ij} + \beta_3\, MARKET_{ij} + \beta_4 \log(ASSETS)_{ij}$$

$$+ \beta_5 \log(SHARES)_{ij} + \beta_6 \log(DEBT)_{ij} + \beta_7\, NET_{ij} + \beta_8\, LIQUIDITY_{ij}$$

$$+ \beta_9\, BETA_{ij} + \beta_{10}\, IQTR_j + \varepsilon_{ij}, \quad i=1,...,N;\ j=1,..., n_i\ ,$$

where Y_{ij} represents the log DPS value for the ith firm at the jth measurement occasion, t_{ij} is the time since baseline ($t_{ij} = 0$ in the fourth quarter of 1994); $IQTR_{ij}$ is a 4th quarter indicator, i.e., $IQTR_{ij}=1$ if the jth measurement occasion for the ith firm is in the 4th quarter and 0 otherwise. The fourth quarter DPS are expected to be larger than the other three quarter DPS figures. The vectors of random coefficients $b_i = (b_{1i}\ ,\ b_{2i})$ are independent and identically distributed with a multivariate distribution N(0, G), and the ε_{ij} are within-firm errors, which are independent and identically distributed with a $N(0, \sigma^2)$ distribution, independent of the random effects. The random effects corresponding to the intercepts and slopes induce covariance among the repeated measures.

Results of fitting the model in time span 0-20 using restricted maximum likelihood estimation are given in Table 1. Hausman (1978) specification test confirmed the need for random intercepts and slopes (see also Greene 1997). The principal findings regarding the estimated fixed effects and variance components in time span 0-20 are as follows:

1) There is an approximate 0.12% quarterly decrease in mean DPS from baseline to quarter 20, while controlling for other variables in the model. The estimated decrease in mean DPS during the first 21 quarters is 2.5%. The estimated variances of the random effects in Table 1 indicate significant firm-to-firm variability in the rates of change in DPS values in time span 0-20. Specifically, approximately 95% of firms are expected to have changes in log DPS values from baseline to quarter 20 between -0.0136 and 0.0112. While the majority of firms (nearly 58%) are expected to have

decreases in log DPS values, a large percentage of firms (approximately 42%) are expected to have increases during the first 21 quarters. There is also a significant component of variability corresponding to measurement error.

2) A 10% increase in ASSETS is associated with approximately a 0.9% increase in DPS in time span 0-20.
3) A 10% increase in SHARES is associated with approximately a 1.0% decrease in DPS in time span 0-20.
4) A 10% increase in DEBT is associated with a 2.6% decrease in DPS in time span 0-20.
5) NET does not have a significant impact on DPS at the 0.05 level in time span 0-20.
6) An increase in beta to the next decile is associated with a marginally significant (p-value = 0.0539) decrease of 0.03% in DPS in time span 0-20.
7) A one decile increase in the distribution of market to book ratios is associated with a 0.2% increase in DPS in time span 0-20.
8) A one decile increase in the distribution of current liquidity measures is associated with a 0.1% decrease in DPS in time span 0-20.
9) DPS values increase by 0.3% in the fourth quarter in time span 0-20.
10) Findings are not significantly impacted by the inclusions of dummy variables for exchange.
11) Findings are not significantly impacted by the exclusion of firms with one observation or firms with two or fewer observations.

B. First Quarter 2000 – First Quarter 2006

Results of fitting the model in time span 21-45 using restricted maximum likelihood estimation are given in Table 1. Likelihood ratio tests confirmed the need for random intercepts and slopes. Note that for this analysis, $t_{ij} = 0$ in the first quarter of 2000.

The principal findings in time span 21-45 are as follows:

1) There is an approximate 0.23% quarterly increase in mean DPS in time span 21-45, while controlling for other variables in the model. The estimated increase in mean DPS during the 25 quarters beginning in the first quarter of 2000 and ending in the fourth quarter of 2006 is 5.9%. Table 1 indicates that there is more variability in the slopes during time span 21-45 compared with time span 1-20. Beginning in the first quarter of 2000 through the first quarter of 2006, 95% of firms have changes in log DPS between -0.0141 and 0.0187. Nearly 61% of firms are expected to have increases in log DPS but a large percentage of firms (approximately 39%) are expected to have decreases during this time span.
2) A 10% increase in ASSETS is associated with approximately a 0.8% increase in DPS in time span 21-45.
3) A 10% increase in SHARES is associated with approximately a 0.9% decrease in DPS in time span 21-45.
4) A10% increase in DEBT is associated with a 2.2% decrease in DPS in time span 21-45.
5) A one unit increase (million dollars) in NET is associated with a 0.0008% increase in DPS in time span 21-45.

6) A one decile increase in the distribution of beta is associated with a 0.066% decrease in DPS in time span 21-45.
7) A one decile increase in the distribution of market to book ratios is associated with a 0.4% increase in DPS in time span 21-45.
8) LIQUIDITY does not have a significant impact on DPS at the 0.05 level in time span 21-45.
9) DPS values increase by 0.4% in the fourth quarter in time span 21-45.
10) Findings are not significantly impacted by the inclusions of dummy variables for exchange.
11) Findings are not significantly impacted by the exclusion of firms with one observation or firms with two or fewer observations.

V. Conclusion

DPS declined prior to 2000 and increased thereafter. The market break of 2000 appears to have changed how investors perceive dividends. Firms responded by increasing DPS. The tax change in 2003 most likely helped to continue the increase in DPS. Dividends appear to be more important during the post-2000 period.

Market/book value, size of assets, number of shares outstanding and debt ratio are all significant variables related to DPS in both periods of the study. Net profit is significant only in period two. Perhaps, in the late 1990's market price dominated with the speculative market bubble ongoing. After 2000 when it burst completely, profit became relevant again.

The inverse significant relationship between current ratio (LIQUIDITY) and DPS for only period one says that as liquidity increases, DPS decreases. This makes sense if cash is necessary to pay a cash dividend. Firms prefer not to borrow money to pay dividends. Why this isn't significant in the second period is unknown.

Beta (risk measure) shows a negative significant relationship to DPS only in period two. Apparently risk wasn't as much of a consideration during the market bubble years at it was later. After 2000 riskier firms were less likely to have high DPS than previously.

The fourth quarter dividend did prove to be significant in both periods as would be expected. Any bonus dividends are normally paid in the fourth quarter.

Since all firms in all industries were included in this study, a next logical step for future work would be to see if differences exist in dividend levels between different industries. Such information would be useful to investors seeking dividend opportunities.

Also work on identifying the relationships between macro economic variables and important characteristics for dividend-paying firms over time would be of significance to investors.

Figure I. Loess smoothed curve for log(DPS+1) against quarter for (a) time span 1-20 and (b) time span 21-45.

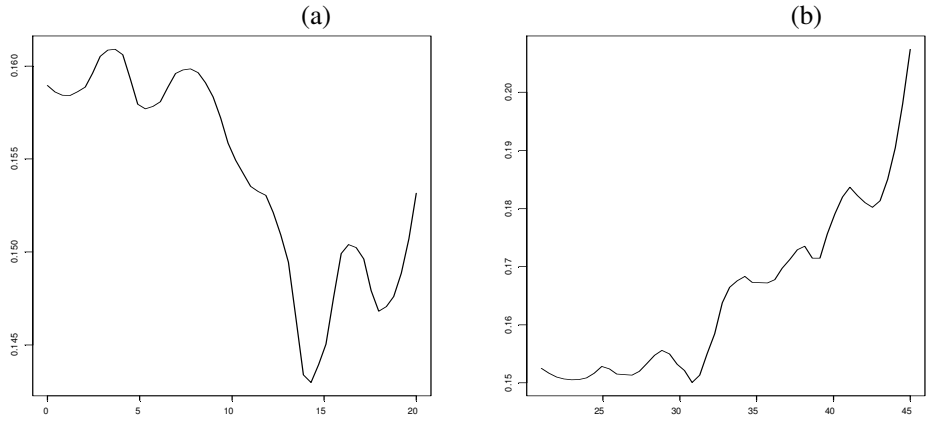

Table I. Estimated Model for Different Time Spans

Estimated Model: Time Span Quarters 0-20				Estimated Model: Time Span Quarters 21-45			
	Estimate	SE	p-value		Estimate	SE	p-value
Constant	0.0487	0.0137	0.0004	Constant	0.0152	0.0171	0.3751
t_{ij}	-0.0012	0.0002	< 0.0001	t_{ij}	0.0023	0.0002	< 0.0001
MARKET	0.0020	0.0003	< 0.0001	MARKET	0.0041	0.0005	< 0.0001
log(ASSETS)	0.0906	0.0025	< 0.0001	log(ASSETS)	0.0808	0.0032	< 0.0001
log(SHARES)	-0.1025	0.0026	< 0.0001	log(SHARES)	-0.0884	0.0036	< 0.0001
log(DEBT)	-0.2589	0.0127	< 0.0001	log(DEBT)	-0.2160	0.0182	< 0.0001
NET	0.000004	0.000003	0.1831	NET	0.000008	0.000002	0.0004
LIQUIDITY	-0.0012	0.0004	0.0060	LIQUIDITY	0.0009	0.0006	0.1189
BETA	-0.0003	0.0002	0.0539	BETA	-0.00066	0.00029	0.0225
IQTR	0.0030	0.0008	0.0003	IQTR	0.0040	0.0013	0.0023
$Var(b_{1i})$	0.03882			$Var(b_{1i})$	0.0366		
$Var(b_{2i})$	0.00004			$Var(b_{2i})$	0.00007		
$Cov(b_{1i}, b_{2i})$	-0.00050			$Cov(b_{1i}, b_{2i})$	0.00055		
$Var(\varepsilon_{ij})$	0.00286			$Var(\varepsilon_{ij})$	0.00748		
AIC	-58389.24			AIC	-41617.68		

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REIT Valuation Multiples

Olgun Fuat Sahin

Abstract

This paper examines the accuracy of valuation multiples in the Real Estate Investment Trusts (REITs) Industry. We evaluate fifteen multiples based on share price, enterprise value, and adjusted enterprise value. We construct benchmark multiples by grouping REITs into property categories. We place a given REIT into a group based on its property focus reported by SNL Financial and National Association of Real Estate Investment Trusts (NAREIT). The accuracy of valuation multiples are examined by using errors defined as the natural log of the estimated value to actual value ratio. Findings suggest that valuation errors are within a 15% threshold, mostly for enterprise value to EBITDA and enterprise value to EBIT multiples. In addition, we find that REIT specific multiples such as price-to-funds from operations, price-to-adjusted funds from operations, and price-to-NAV produce valuation errors less than that of earnings based multiples.

I. Introduction

Value of an asset should be based on present value of its expected cash flows discounted at a rate consistent with risk of those expected cash flow. The discounted cash flows (DCF) method may not be appropriate when expected cash flows cannot be estimated due to lack of data or significant uncertainty about future. Valuation multiples can be used to generate reasonable estimates when a firm is in bankruptcy or possibility of filing one is high, going through an initial public offering or leveraged buyout.

A valuation multiple is applied by taking the product of value source by a relevant benchmark multiple, typically a median of comparable companies. This method incorporates market expectations on similar companies into the estimation because benchmark multiples are established using market values. The use of benchmark multiples does not necessarily make the process more accurate since differences in financial leverage or accounting practices reduce similarity among firms. Nevertheless, valuation multiples have been used in many cases. These include Kaplan and Ruback (1995) with leveraged transactions, Hotchkiss and Mooradian (1998) and Gilson, Hotchkiss, and Ruback (2000) with bankrupt companies, Kim and Ritter (1999) with IPOs, Berger and Ofek (2002) with diversified firms, and Osmundsen, Asche, Misund, and Mohn (2005) with international oil companies.

In addition to the applications of multiples, there are studies focusing on examining the performance of valuation multiples including Kaplan and Ruback (1995), Baker and Ruback (1999), Cheng and McNamara (2000), Lie and Lie (2002), Liu, Nissim, and Thomas (2002 and 2006), Yoo (2006), and Schreiner and Spremann (2007). General findings of these articles suggest that multiples based on forward earnings perform relatively well.

In this study, we aim to contribute to literature by examining accuracy of valuation multiples in the REIT industry by using traditional multiples as well as multiples commonly used with REITs. Though some of the previous research uses industry based benchmarks, results are typically reported on aggregate. Baker and Ruback (1999) and Liu, Nissim, and

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Thomas (2002) report industry level accuracy of multiples; however, Baker and Ruback (1999) sample is based on the S&P 500 Index that did not include any REITs in 1995 and Liu, Nissim, and Thomas (2002) sample does not report results for REITs. We choose the REIT industry due to its unique nature and source of value. REITs may be viewed as closed-end funds that invest in real estate and report earnings in a different format than most other publicly owned companies. In addition, REITs must maintain certain qualifications to be exempt from corporate income taxation.19

We establish benchmark multiples by grouping REITs into property categories. Property categories are based on property focus reported by SNL Financial and National Association of Real Estate Investment Trusts (NAREIT). The accuracy of valuation multiples are examined by using errors defined as the natural log of the estimated value to actual value ratio. Findings suggest that valuation errors are within a 15% threshold, mostly for enterprise value to EBIT and enterprise value to EBITDA multiples. In addition, we find that REIT specific multiples such as price-to-funds from operations, price-to-adjusted funds from operations, and price-to-NAV produce valuation errors less than that of earnings based multiples.

The paper proceeds as follows. Section II reviews relevant literature. Section III describes the sample and methods used. Section IV presents the results and Section V provides robustness analysis using the harmonic mean method. Section VI concludes the paper.

II. Literature Review

Valuation multiples provide a quick way of assigning a value to a security since it requires minimal data on a security. The estimated value is determined by multiplying its value source by the multiple of comparable firms. According to Kaplan and Ruback (1999) valuation multiples rely on two assumptions: first, a security and relevant comparables must have similar risk and return prospects. Second, the association between value source and relevant multiple is linear.

We examine the related literature while focusing on two aspects: the use and accuracy of valuation multiples. Valuation multiples have been used in many different context. Kaplan and Ruback (1995) compare market values of highly levered transactions to valuation obtained from discounting future cash flows. Kaplan and Ruback (1995) use the EBITDA multiple with comparable companies (in the same industry), comparable transactions, and comparable transactions in the same industry as benchmarks. Results of Kaplan and Ruback (1995) suggest that the EBITDA multiple estimates value just as well as the discounted cash flow model if benchmarks are based on comparable transactions or comparable transactions within the same industry. Hotchkiss and Mooradian (1998) examine a sample of 55

19 These restrictions include: (1) seventy-five percent of the assets must consist of real estate mortgages, real estate equities, cash, or government securities (2) at least seventy-five percent of income must be derived from rents, mortgages, and gains from real estate sales (3) at least ninety percent of the taxable income must be distributed to shareholders each year and (4) no more than 50 percent of REIT shares must be held by five or fewer individuals during the last half of a taxable year.

bankruptcy filings from October 1979 to December 1992 that were eventually acquired by public companies. Hotchkiss and Mooradian (1998) use enterprise value to sales and enterprise value to assets multiples to determine enterprise value of companies acquired while in bankruptcy filings. Gilson, Hotchkiss, and Ruback (2000) compare market value of firms that come out of Chapter 11 bankruptcy proceedings to value implied by projected cash flows and multiples (EBITDA). Their sample contains 63 such firms that filed for bankruptcy between 1979 and 1992. Gilson, Hotchkiss, and Ruback (2000) find that multiples based on EBITDA produce larger valuation errors than that of valuations based on projected cash flows. Kim and Ritter (1999) apply several multiples to value IPOs. These multiples include price-to-earnings, market-to-book, price-to-sales, enterprise value-to-sales, and enterprise value-to-operating cash flow. The sample of the study includes 190 domestic IPOs between 1992 and 1993. Kim and Ritter (1999) report that multiples using forecasted earnings perform better than multiples based on historical earnings. Berger and Ofek (2002) use the market-to-sales multiple to value segments of a diversified firm based on a sample of 356 acquisitions between 1980 and 1995. They determine a benchmark multiple based on stand-alone firm multiples in the same industry as the segment. Osmundsen, Asche, Misund, and Mohn (2005) examine the relationship between the enterprise value-to-debt-adjusted cash flow multiple and return on average invested capital for 11 international oil companies for the period 1997-2002.

In addition to the above research, there is also a growing list of studies that focus on establishing the accuracy of multiples. Baker and Ruback (1999) examine the accuracy of EBITDA, EBIT, and Revenue multiples for the S&P 500 Index constituents in 1995. The results of Baker and Ruback (1999) suggest that the EBITDA multiple provides the best estimates among three multiples considered. The accuracy of the EBITDA multiple seems to be consistent across industries. Cheng and McNamara (2000) examine the accuracy of price-earnings and price-book and a combination of price-earnings and price-book multiples using a sample of firms from 1973 to 1992. Cheng and McNamara (2000) find that the combined multiple of price-earnings and price-book with industry level comparables provide the most accurate estimates. Lie and Lie (2002) examine how various valuation multiples perform in estimating value of companies in a broader context. Their data set includes 8,621 companies from COMPUSTAT with data for the fiscal year 1998 with earning forecasts for the fiscal year 1999. Lie and Lie (2002) establish benchmark multiples as the median of comparable firms within the same three-digit SIC code. Lie and Lie (2002) results generally find negatively biased value estimates suggesting that multiples underestimate the actual market value of companies. Median valuation errors are typically zero. They find that forecasted earnings and EBITDA multiples perform better than current earnings and EBIT multiples and that adjusting cash levels for enterprise value multiple does not improve accuracy. For financial companies, asset value multiples yield better results compared to sales and earnings based multiples. Liu, Nissim, and Thomas (2002) examine the accuracy of various multiples to determine their accuracy. Their sample includes 19,879 firm-year observations from 1982 to 1999. Liu, Nissim, and Thomas (2002) report that the forward earnings multiple performs best followed by the historical earnings multiple. Cash flow and book equity multiples perform similarly and the revenue multiple performs the worst. Their analysis across industries provides similar results. Liu, Nissim, and Thomas (2006) extend authors' previous work (Liu, Nissim, and Thomas (2002)) in several dimensions including the use of forecasted cash flows, dividends, individual industries, and cross border data. They confirm that the forward earnings multiple performs better than other multiples across industries and countries.

Yoo (2006) examines the accuracy of a combination of valuation multiples. Results suggest that a combination of historical multiples outperforms a single historical multiple; however, a combination of forward earnings and historical multiples is inferior to the forward earnings multiple alone. Schreiner and Spremann (2007) examine the accuracy of multiples in US and European markets. Their primary sample includes companies in the Dow Jones STOXX 600 Index. Schreiner and Spremann (2007) find that the equity value multiple and the two-year forward earnings multiple are superior to that of the entity multiple and trailing earnings multiple, respectively.

We contribute to this literature by examining the accuracy of well known and REIT specific valuation multiples in the REIT industry. REIT specific valuation multiples include funds from operations (FFO), adjusted funds from operations (AFFO), and net asset value (NAV). Block (2002) presents these variables as sources of value for REITs together with cash flow based valuation methods. There exist studies examining the performance of multiples at an industry level including Baker and Ruback (1999) and Liu, Nissim, and Thomas (2002). However, the Baker and Ruback (1999) sample is based on the S&P 500 Index that did not include any REITs in 1995 and the Liu, Nissim, and Thomas (2002) sample does not report results for REITs. We choose the REIT industry due to its unique nature and source of value. REITs may be viewed as closed-end funds that invest in real estate and report earnings in a different format than most other publicly owned companies. In addition, REITs must maintain certain qualifications to be exempt from corporate income taxation.

III. Data and Methodology

A. Data

The data for this research is obtained from SNL Financial and contains valuation related accounting variables based on regulatory filings, market price, and analyst estimates as of the end of 2007. These variables include: property concentration, price (P), earnings per share (E), forecasted earnings per share (FE), funds from operations (FFO), forecasted funds from operations (FFFO), adjusted funds from operations (AFFO), forecasted adjusted funds from operation (FAFFO), total assets (TA), book value of equity (BVE), number of common shares, cash and cash equivalents, earnings before interest and taxes (EBIT), earnings before interest taxes depreciation and amortization (EBITDA), net asset value (NAV), and total revenues (TR). Enterprise value (EV) is TA less BVE plus the product of price and number of common shares. Adjusted enterprise value (AEV) is EV less cash and cash equivalents (Cash). This adjustment is based on the notion that there is no reason to apply a multiple to value cash since its value is readily available.

We use adjusted enterprise value-to-book value of equity, adjusted enterprise value-to-EBIT, adjusted enterprise value-to-EBITDA, adjusted enterprise value-to-total revenues, enterprise value-to-book value of equity, enterprise value-to-EBIT, enterprise value-to-EBITDA, and enterprise value-to-total revenues.

Multiples used in REIT valuation include price-to-adjusted funds from operations, price-to-earnings, price-to-forecasted adjusted funds from operations, price-to-forecasted funds from operations, price-to-funds from operations, price-to-forecasted earnings, and price-to-net asset value.

Funds from Operations is computed using a method suggested by NAREIT as "FUNDS FROM OPERATIONS means net income (computed in accordance with generally accepted accounting principles), excluding gains (or losses) from sales of property, plus depreciation and amortization, and after adjustments for unconsolidated partnerships and joint ventures. Adjustments for unconsolidated partnerships and joint ventures will be calculated to reflect funds from operations on the same basis."20

AFFO is computed by making adjustments to FFO to make it more on a cash basis. These adjustments include deduction of capital improvement expenditures and amortization of debt principal, and accounting for variations in rent. The rent adjustment would reflect actual rent collections because the reported rental income is based on straight-line rent collection over leases and their terms. The data source for FFO, AFFO, and their forecasted values for fiscal year 2008 is SNL Financial.

A REIT's NAV is net value of equity investments in properties owned on a per share basis. This requires the estimation of private transaction value of properties owned by a REIT. Analysts use different methods to estimate NAV leading to variation in estimates. Typically, an analyst may estimate the value of a property by using the income capitalization approach where Net Operating Income (NOI) of subject property is divided by its capitalization rate. These individual property values are aggregated to determine the value of all properties owned by a REIT. Most NAV computations ignore the management's ability to create or destroy value. We use consensus NAV estimates as reported by SNL Financial in December 2007.

We compute benchmark valuation multiples using property type matches from SNL Financial and NAREIT. REIT property types and (number of REITs) within each group as reported by SNL Financial is as follows: Office (16), Multi-Family (14), Shopping Center (13), Health Care (12), Diversified (11), Hotel (11), Regional Mall (8), Specialty (8), Industrial (7), Manufactured Homes (4), Self Storage (4), Other (6). The total number of REITs is 114.

An alternative REIT property classification is also obtained from the January 2008 issue of "NAREIT REITWatch," for the month ending 12/31/2007.21 NAREIT property types and (number of REITs) within each group having financial data from SNL Financial is as follows: Office (14), Mixed – Office/Industrial (6), Industrial (6), Shopping Center (14), Regional Malls (7), Free Standing (5), Manufactured Homes (4), Apartments (14), Lodging/Resorts (11), Health Care (10), Diversified (8), Specialty (6), Self Storage (4), Hybrid (4). The total number of REITs is 113. Note that this count does not match the SNL Financial property type count because NAREIT REITWatch had no data on one REIT.

We also report results for broader property types that combine some of the property types based on NAREIT REITWatch classification. These types include (1) Industrial/Office including Office, Mixed – Office/Industrial, and Industrial, (2) Retail including Shopping

20 This definition can be found at http://www.nareit.com/policy/accounting/whitepaper.cfm
21 This issue is available at http://www.reit.com/

Center, Regional Malls, and Free Standing, and (3) Residential including Manufactured Homes and Apartments.

Table 1 shows descriptive statistics for variables and multiples used in this research. The distribution of variables displays skewness similar to data used in previous research.

B. Methods

We first estimate the value of multiples for each REIT in the sample. Once the value of a multiple is determined for each REIT in the sample, we then determine the median value of each multiple using REIT property types as benchmarks. Lie and Lie (2002) require at least five three-digit SIC company matches to determine median benchmark multiples. The property type benchmarks for REITs include at least five REITs for most property types. The median value of a multiple for a property type group is the benchmark multiple to be used to estimate value of a REIT. Then the estimated value of a REIT is the product of the median multiple of comparable companies (benchmark multiple) based on property types and the relevant value source. For example, the estimated enterprise value of a REIT using the EBIT multiple is the product of benchmark enterprise value-to-EBIT and EBIT of subject REIT.

Similar to Lie and Lie (2002), we define valuation error as the natural logarithm of estimated value to market value.

$$\text{Valuation Error} = \ln\left(\frac{\text{Estimated enterprise value of subject REIT}}{\text{Enterprise value of subject REIT}}\right)$$

We report mean and median valuation errors as well as absolute valuation errors. Similar to previous studies, we also compute the fraction within 15% that is the number of valuation errors with a magnitude ±15% divided by the total number of estimates for a given multiple.

IV. Results

Table 2 shows the results of analysis for SNL Financial and NAREIT property type benchmarks across different multiples. It appears that the property type classifications by SNL Financial or NAREIT produce relatively similar results except for price-to-adjusted funds from the operations multiple. Similar to other studies, there is a general tendency to underestimate value considering the sign of mean valuation errors. The fraction of valuation errors with an absolute magnitude of 15% are between 17% and 43% across multiples excluding price-to-NAV. Enterprise value-to-EBITDA places about 43% of estimates within the 15% range when benchmarks are based on SNL Financial classification of property types.

The Panel B of Table 2 shows the results based NAREIT property type classification. The results are similar to panel in terms of the rankings of multiples, however, fractions within 15% are larger.

The results of Table 2 also suggest that historical or forward earnings based multiples are not useful for REITs contrary to finding of Liu, Nissim, and Thomas (2002 and 2006).

This should not be surprising since REIT earnings are not particularly informative about their prospects, however, multiples based on FFO do not perform well either.

Table 2 also reports valuation multiples based on price-to-NAV. Among all the valuation multiples, this particular multiple can place over 60% of companies within a 15% error range. This should not be all that surprising because the historical average REIT premium or discount to NAV is close to zero. However, there are also time periods in which premiums and discounts exceeded twenty percent. At the end of 2007, REITs were selling at a discount of about 3% on average according to Table 1. Note that 25th and 75th percentiles suggest there are REITs with premium-to-NAV exceeding 8.89% and REITs with discounts-to-NAV worse than 7.92%. If the data is available about the NAV estimates of the subject and comparable REITs, this multiple appears to produce value estimates that are quite close to actual market values.22

Among the three broader property type groups, it appears that the enterprise value-to-EBIT generates estimates that are more accurate for Residential REITs while enterprise value-to-EBITDA appears to be more accurate for Retail REITs. This may be due to distortions that depreciation and amortization expenses may have on Retail REITs EBIT. Removing these items appears to better approximate value. EBITDA and EBIT based multiples both perform well for the Industrial/Office group.

V. Robustness Analysis

According to Baker and Ruback (1999) valuation errors are positively related to stock price making the harmonic mean superior to simple mean or median. The harmonic mean gives relatively low weights to firms with high stock prices since these firms would likely have high valuation errors. Therefore, we use the harmonic mean estimator when generating benchmark multiples to examine if previous results are sensitive to stock prices. We then compute the prediction error for the enterprise value similar to Liu, Nissim, and Thomas (2002) as

$$\text{Prediction Error} = \left(\frac{\text{Estimated enterprise value of subject REIT}}{\text{Enterprise value of subject REIT}} \right) - 1$$

The distributions of prediction errors across multiples are shown on Table 4. The results indicate that price-to-NAV and EBITDA based multiples still perform well. SNL Financial property type based benchmarks place 65% of REITs within 15% prediction errors. EBITDA based multiples produce prediction errors that has the smallest ranges from 25th to 75th percentile. These findings are similar regardless of property type classification source. Price-to-FFFO and price-to-FFO multiples perform better with the harmonic mean method, but they are still behind EBITDA based multiples.

22 We replicate the Panel A of Table 2 using data from 2008 in light of the recent market downturn as recommended by reviewers. Although the accuracy of the multiples was lower, the ranking remained the same. For example, price-to-NAV was still the most accurate multiple placing 55% of REITs within 15% prediction errors. These results are available upon request.

VI. Conclusion

This paper examines the performance of valuation multiples in the REIT industry. We find that price-to-NAV is the most effective multiple in REIT valuation. The availability of data may be a problem when using price-to-NAV since consensus NAV estimates are required. Price-to-NAV is followed by enterprise value-to-EBITDA and enterprise value-to-EBIT. We also find that adjusted enterprise value-to-EBITDA and EBIT produce relatively low valuation errors. Depending on the property focus of a REIT, enterprise value-to-EBIT performs better for Residential REITs, while enterprise value-to-EBITDA produces more accurate results for Retail REITs.

Table I. Descriptive Statistics

This table shows the valuation multiples evaluated for REITs. The data for this research is obtained from SNL Financial and contains valuation related variables based on regulatory filings, market price, and analyst estimates as of the end of 2007. These variables include: property concentration, price (P), earnings per share (E), forecasted earnings per share (FE), funds from operations (FFO), forecasted funds from operations (FFFO), adjusted funds from operations (AFFO), forecasted adjusted funds from operation (FAFFO), total assets (TA), book value of equity (BVE), number of common shares, cash and cash equivalents, earnings before interest and taxes (EBIT), earnings before interest taxes depreciation and amortization (EBITDA), net asset value (NAV), and total revenues (TR). Enterprise value (EV) is TA less BVE plus the product of price and number of common shares. Adjusted enterprise value (AEV) is EV less cash and cash equivalents (Cash).

Variable		Mean	Median	25%	75%
Cash and Cash Equivalents / Total Assets,	(Cash/TA)	0.0270	0.0084	0.0040	0.0215
EBITDA / Total Assets,	(EBITDA/TA)	0.0824	0.0828	0.0705	0.1001
EBIT / Total Assets,	(EBIT/TA)	0.0505	0.0513	0.0382	0.0652
Enterprise Value (000),	(EV)	5,364,761	3,010,652	1,364,266	6,439,801
Total Assets (000),	(TA)	3,911,736	2,164,951	1,055,833	4,890,760
Total Revenues (000),	(TR)	638,708	306,895	151,321	796,071
Adjusted Enterprise Value / Book Value of Equity,	(AEV/BVE)	5.5511	4.1285	3.1380	5.7478
Adjusted Enterprise Value / EBIT,	(AEV/EBIT)	33.1345	24.7196	20.3000	31.4220
Adjusted Enterprise Value / EBITDA,	(AEV/EBITDA)	15.0117	15.1011	12.8270	17.8894
Adjusted Enterprise Value / Total Revenues,	(AEV/TR)	9.9137	9.5535	7.1283	12.0772
Enterprise Value / Book Value of Equity,	(EV/BVE)	5.6641	4.2060	3.2170	5.7901
Enterprise Value / EBIT,	(EV/EBIT)	33.4490	25.0677	20.4963	31.5658
Enterprise Value / EBITDA,	(EV/EBITDA)	15.1338	15.2376	13.1363	17.9539
Enterprise Value / Total Revenues,	(EV/TR)	10.1404	9.8197	7.2293	12.4872
Price / Adjusted Funds From Operations,	(P/AFFO)	20.2602	14.6907	12.2808	21.3051
Price / Earnings,	(P/E)	1.7013	26.4989	14.3347	43.1818
Price / Forecasted Adjusted Funds From Operations,	(P/FAFFO)	4.0018	14.6045	11.6375	18.0513
Price / Forecasted Funds From Operations,	(P/FFFO)	12.7686	12.3126	9.6686	15.0689
Price / Funds From Operations,	(P/FFO)	13.7778	13.1557	9.9021	15.6486
Price / Forecasted Earnings,	(P/FE)	10.6006	26.4630	16.7188	41.2703
Price / Net Asset Value,	(P/NAV)	0.9671	0.9228	0.8314	1.0537

Table 2. Valuation Errors

This Table reports the valuation errors across multiples used in the study. In Panel A benchmarks multiples are established by using SNL Financial property type classification. Panel B is constructed in exactly the same manner, however, the benchmarks multiples are based on classification of REITs by NAREIT.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. SNL Financial Property Type Benchmarks															
Mean	-0.0241	-0.0493	-0.0193	0.0078	-0.0304	-0.0556	-0.0232	0.0042	0.0128	-0.2786	-0.0015	-0.0205	-0.0040	-0.0657	0.0092
Median	-0.0168	-0.0042	-0.0202	-0.0117	-0.0201	-0.0096	-0.0158	0.0037	0.0027	-0.1841	-0.0204	-0.0218	-0.0176	-0.0871	-0.0053
Mean Absolute Error	0.4832	0.3166	0.2269	0.3019	0.4826	0.3127	0.2224	0.3057	0.4641	0.6216	0.2786	0.2882	0.3001	0.6044	0.1429
Median Absolute Error	0.3290	0.1959	0.1703	0.2309	0.3300	0.1898	0.1631	0.2352	0.3259	0.4168	0.2318	0.2655	0.2619	0.4477	0.1141
Fraction within 15%	0.2946	0.4144	0.4234	0.2655	0.2500	0.4144	0.4324	0.2743	0.2667	0.1739	0.3061	0.3232	0.2952	0.2192	0.6162
25th Percentile	-0.2919	-0.2124	-0.1918	-0.2326	-0.2973	-0.1977	-0.1992	-0.2352	-0.3460	-0.6570	-0.2082	-0.2655	-0.2536	-0.4603	-0.1141
75th Percentile	0.3712	0.1888	0.1589	0.2165	0.3718	0.1898	0.1522	0.2232	0.3057	0.1859	0.2629	0.2675	0.2619	0.3672	0.1144
Number of Observations	112	111	111	113	112	112	111	113	30	90	98	99	105	73	99
Panel B. NAREIT Property Type Benchmarks															
Mean	-0.0642	-0.0462	-0.0026	0.0175	-0.0690	-0.0516	-0.0029	0.0211	0.0047	-0.3194	-0.0063	-0.0179	0.0049	-0.0646	0.0092
Median	-0.0176	-0.0042	-0.0083	0.0000	-0.0125	-0.0096	-0.0009	-0.0070	0.0098	-0.1821	0.0026	-0.0023	0.0104	-0.0640	0.0095
Mean Absolute Error	0.5255	0.3236	0.2069	0.3022	0.5281	0.3181	0.1973	0.3029	0.4811	0.6803	0.2892	0.2954	0.2772	0.5888	0.1403
Median Absolute Error	0.3729	0.2098	0.1553	0.2341	0.3691	0.2015	0.1495	0.2413	0.3440	0.4316	0.2584	0.2655	0.2398	0.4495	0.1121
Fraction within 15%	0.2883	0.3604	0.4775	0.2589	0.2613	0.3784	0.5045	0.2768	0.1852	0.1556	0.3061	0.2828	0.3558	0.1944	0.6263
25th Percentile	-0.3535	-0.2134	-0.1511	-0.2369	-0.3539	-0.2058	-0.1255	-0.2382	-0.3469	-0.6630	-0.2310	-0.2655	-0.2267	-0.4678	-0.1141
75th Percentile	0.3783	0.2098	0.1606	0.2315	0.3880	0.2015	0.1545	0.2434	0.3057	0.2533	0.2669	0.2675	0.2558	0.3942	0.1108
Number of Observations	111	111	111	112	111	111	111	112	27	90	98	99	104	72	99

Table 3. Valuation Errors Across REIT Property Types

This Table reports the valuation errors across multiples used in the study. In all panels, the benchmark multiples are based on classification of REITs by NAREIT. Panel A, B, and C report the valuation errors for three general property grouped by NAREIT, Industrial/Office, Retail, and Residential.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. Valuation Multiples for Industrial/Office															
Mean	-0.0810	-0.0368	0.0184	0.0492	-0.0857	-0.0442	0.0228	0.0572	0.0240	-0.2126	-0.0271	-0.0131	-0.0007	-0.1425	-0.0103
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1680	-0.1936	-0.0166	-0.0491	0.0000	-0.0991	0.0185
Mean Absolute Error	0.3815	0.3422	0.2433	0.3495	0.3827	0.3391	0.2314	0.3646	0.4476	0.8148	0.2558	0.2920	0.3340	0.6563	0.1589
Median Absolute Error	0.2505	0.1980	0.2506	0.3135	0.2655	0.1986	0.2310	0.3166	0.5620	0.5303	0.2522	0.2841	0.2656	0.5686	0.1044
Fraction within 15%	0.3462	0.3846	0.3846	0.0000	0.3462	0.3846	0.3846	0.0000	0.1250	0.0000	0.2917	0.1667	0.2692	0.1765	0.6800
25th Percentile	-0.2316	-0.2574	-0.2577	-0.3105	-0.2655	-0.2603	-0.2171	-0.3112	-0.5620	-0.7163	-0.2747	-0.3459	-0.2328	-0.4604	-0.0801
75th Percentile	0.2694	0.1820	0.2435	0.3321	0.2654	0.1807	0.2452	0.3902	0.4731	0.4098	0.2472	0.2587	0.2822	0.5686	0.1044
Number of Observations	26	26	26	26	26	26	26	26	8	23	24	24	26	17	25
Panel B. Valuation Multiples for Retail															
Mean	-0.2215	0.0250	-0.0274	-0.0127	-0.2284	0.0178	-0.0240	-0.0089	0.0622	-0.0095	0.0000	0.0153	0.0289	-0.0798	0.0203
Median	-0.1005	0.0000	-0.0277	0.0398	-0.1006	0.0000	-0.0030	0.0000	-0.3440	-0.0749	-0.0948	0.0000	0.0467	0.0293	0.0184
Mean Absolute Error	0.5125	0.2205	0.1858	0.2192	0.5280	0.2117	0.1759	0.2166	0.5228	0.3494	0.2889	0.3249	0.3052	0.4390	0.1297
Median Absolute Error	0.3592	0.1991	0.1560	0.2235	0.3710	0.1887	0.1257	0.2303	0.3469	0.3338	0.3009	0.3117	0.3210	0.3615	0.1123
Fraction within 15%	0.3333	0.3462	0.4615	0.3462	0.2917	0.4231	0.5769	0.3462	0.0000	0.1667	0.2400	0.2500	0.3077	0.2000	0.6250
25th Percentile	-0.5388	-0.1773	-0.2353	-0.2466	-0.5434	-0.1444	-0.1553	-0.2443	-0.3469	-0.3222	-0.2879	-0.2976	-0.3181	-0.4391	-0.1123
75th Percentile	0.2235	0.2098	0.0944	0.1825	0.2263	0.2015	0.0969	0.1849	0.8774	0.3508	0.3009	0.3168	0.3920	0.3449	0.1146
Number of Observations	24	26	26	26	24	26	26	26	3	24	25	24	26	20	24
Panel C. Valuation Multiples for Residential															
Mean	-0.1155	-0.1239	-0.0288	-0.0048	-0.1177	-0.1249	-0.0312	-0.0061	-0.0194	-0.8650	0.0197	-0.0247	0.0078	0.2769	0.0068
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0461	-1.0907	0.0164	0.0442	0.0136	0.3925	0.0071
Mean Absolute Error	1.0558	0.3425	0.2413	0.2143	1.0554	0.3425	0.2418	0.2101	0.2814	1.0144	0.2981	0.3535	0.2825	0.9521	0.1054
Median Absolute Error	0.6453	0.1181	0.2074	0.2334	0.6404	0.1107	0.2053	0.2284	0.1644	1.0907	0.1758	0.2489	0.2566	0.5723	0.0401
Fraction within 15%	0.0000	0.6111	0.3333	0.3889	0.0000	0.6111	0.3333	0.3889	0.1429	0.2727	0.4375	0.3125	0.2941	0.0000	0.6875
25th Percentile	-0.8977	-0.1030	-0.2045	-0.2373	-0.9018	-0.0956	-0.2063	-0.2335	-0.3976	-1.5547	-0.1596	-0.2377	-0.2566	-0.5723	-0.0656
75th Percentile	0.6276	0.1437	0.2104	0.2296	0.6203	0.1449	0.2043	0.2232	0.1644	-0.0516	0.2172	0.2489	0.2319	0.7548	0.0250
Number of Observations	18	18	18	18	18	18	18	18	7	11	16	16	17	11	16

Table 4. Harmonic Mean Prediction Errors

This Table reports the valuation errors across multiples used in the study based on the harmonic mean method. In Panel A benchmarks multiples are established by using SNL Financial property type classification. Panel B is constructed in exactly the same manner, however, the benchmarks multiples are based on classification of REITs by NAREIT.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. SNL Financial Property Type Benchmarks															
Mean	0.0476	0.1704	0.0457	0.0281	0.0483	0.1597	0.0435	0.0279	0.1037	-1.4924	0.0262	0.0164	0.0129	0.6488	0.0041
Median	-0.0572	0.0129	0.0308	-0.0764	-0.0625	0.0316	0.0274	-0.0750	0.0407	-0.0699	-0.0321	-0.0015	-0.0576	0.1149	-0.0313
Mean Absolute Error	0.4382	0.6133	0.3346	0.3214	0.4378	0.5918	0.3252	0.3201	0.4136	3.2990	0.3098	0.2804	0.2743	1.6662	0.1401
Median Absolute Error	0.3259	0.2460	0.1905	0.2238	0.3304	0.2316	0.1814	0.2261	0.2877	1.0488	0.2114	0.2434	0.2434	0.7180	0.1077
Fraction within 15%	0.2544	0.3246	0.4123	0.3333	0.2456	0.3333	0.4386	0.3509	0.2333	0.0877	0.3100	0.3400	0.3238	0.1446	0.6465
25th Percentile	-0.3241	-0.1816	-0.1389	-0.2402	-0.3220	-0.1839	-0.1399	-0.2375	-0.2925	-1.5749	-0.2013	-0.2147	-0.2274	-0.4711	-0.1132
75th Percentile	0.3324	0.3996	0.2183	0.1687	0.3464	0.3517	0.2163	0.1641	0.2829	0.6860	0.2411	0.2679	0.2580	0.8662	0.0911
Number of Observations	114	114	114	114	114	114	114	114	30	114	100	100	105	83	99
Panel B. NAREIT Property Type Benchmarks															
Mean	0.0616	-0.0507	-0.2770	0.0466	0.0608	-0.0475	-0.2294	0.0465	0.3853	-0.5211	0.0364	0.0206	0.0133	-0.7370	0.0052
Median	-0.0572	-0.0602	-0.0206	-0.0664	-0.0467	-0.0477	-0.0191	-0.0755	-0.0256	-0.0656	-0.0319	0.0063	-0.0347	0.0139	-0.0183
Mean Absolute Error	0.4642	0.5237	0.5712	0.3380	0.4621	0.5170	0.5195	0.3366	0.7222	3.4388	0.3245	0.2884	0.2670	3.0383	0.1429
Median Absolute Error	0.2959	0.2061	0.1815	0.2385	0.3044	0.1980	0.1661	0.2335	0.3576	0.9018	0.2379	0.2453	0.2198	0.6708	0.1089
Fraction within 15%	0.2655	0.3274	0.4336	0.3097	0.2566	0.3540	0.4425	0.3274	0.1852	0.0973	0.3100	0.3200	0.3365	0.1341	0.5859
25th Percentile	-0.3574	-0.2211	-0.1895	-0.2415	-0.3566	-0.2076	-0.1666	-0.2467	-0.3989	-1.0116	-0.2058	-0.2151	-0.2198	-0.4882	-0.1231
75th Percentile	0.2500	0.1771	0.1613	0.2116	0.2552	0.1909	0.1571	0.2216	0.3576	0.6999	0.2747	0.2675	0.2177	0.8485	0.0939
Number of Observations	113	113	113	113	113	113	113	113	27	113	100	100	104	82	99

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