

Exploiting Behavior Bias in the Financial Market:
A Study of Fuller & Thaler Asset Management

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Behavioral Finance

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Executive Summary

Behavioral finance theory states that there are important psychological and behavioral variables involved in investing in the stock market that provide opportunities for smart investors to profit. In other words, it focuses upon how investors interpret and act on information to make informed investment decisions. Before the behavioral financial theory emerged, Efficient Market Hypothesis (EMH) was the most widely used theory in financial markets. EMH states that prices in financial markets accurately incorporate all publicly available information. Therefore, it believes that one cannot beat the market in the long run. However, EMH could not completely explain why the frequent occurrence of anomalies exist in the market.

The purpose of this study was to find whether or not the behavioral finance theory could be used in making correct investment decisions in the real financial market. Through analyzing Fuller and Thaler's investment strategies and their mutual funds' performances, we intended to confirm whether they could successfully apply behavioral finance theory to achieve an above-average performance in the market. We also wanted to find out if the behavioral finance theory could help Fuller and Thaler succeed in the market for a long run.

We explained the methods that Fuller and Thaler used to predict the market, and the process they used to determine the common investors' mental mistakes. Then we determined how they tried to take advantage from studying these behavioral biases to benefit the returns of their funds. We gave detailed analysis of the Undiscovered Manager Behavioral Growth Funds and Undiscovered Manager Behavioral Value Funds, two of major mutual funds of Fuller and Thaler, in order to systematically demonstrate the process that Fuller and Thaler used to apply the behavioral finance theory in the real market.

After we carefully compared the Fuller and Thaler's mutual fund performance to its benchmark Russell 2000, 2500 and Vanguard Growth funds, we believed that Fuller and Thaler

had generally achieved an above-average performance. But after we carefully analyzed the risk and operating expense of F&T mutual funds, we believed that it was very uncertain if Fuller and Thaler could maintain its above-average performance in a long run. Another reason we had doubt was that although Fuller and Thaler seemed successful in the past few years, the behavioral finance theory was still a relatively new field, and Fuller and Thaler's investment strategies still need more time to prove its competitive advantage and performance.

Introduction

The financial market is efficient, but investors' behaviors are not always rational. From the tulip-bulb craze of Holland in 17th century, to England's South Sea Bubble in the 18th century, to the American stock market crash in the 1920s, and up until the big Internet bubble burst at the end of 20th century, investors' irrational behavior in the stock market has always been one of most interesting topics for financial scholars and experts to study.

In recent years, while rationalists continually promote the Market Efficient Hypothesis (EMH) and the "Random Walk" theory, the Theory of Behavioral Finance emerged and became one of most popular and controversial topics in economics and finance field. According to behavioralists, "Behavioral Finance is the integration of classical economics and finance with psychology and the decision-making sciences, and is an attempt to explain what causes some of the anomalies that have been observed and reported in the finance literature. Behavioral finance is the study of how investors systematically make errors in judgment or 'mental mistakes'" (Fuller, 2000).

Russell Fuller and Richard Thaler are leading behavioralists who are actively involved in behavioral finance study and implementation. In fact, Dr. Richard Thaler is a well-known scholar and researcher in the field of behavioral finance, and he has gained objective insights into investor's biases and the negative actions they produce. He is a behavioral finance professor at University of Chicago, and his publication of "The Winner's: Paradoxes and Anomalies of Economic Life" and "Quasi-Rational Economics" set the principle of behavioral science to finance. Dr. Russell Fuller is an economist and a former stock analyst that has decades of professional investment experiences in financial markets.

Fuller and Thaler Asset Management Inc. was founded in 1993 and is based in San Mateo, California. The firm manages total assets about \$2.4 billion and its major clients include NFL Player association, Whirtpool, and Chrysler. Fuller and Thaler attempt to achieve above market returns by capitalizing on market inefficiencies caused by investor's mis-processing of information, and it combines fundamental research with insights from behavioral finance to gain a competitive edge over the market. The two mutual funds that F&T are involved with are the Undiscovered Manager Behavioral Growth Fund and Undiscovered Manager Behavioral Value fund. JP Morgan Chase manages the funds, and Fuller and Thaler Asset Management are advisors who recommend which stocks to purchase for the funds. The Value Fund offers only institutional class shares that require \$250,000 investment minimums, and the investor class Growth Fund requires \$10,000 investment minimums.

How exactly does the firm gain their market niche through implementing behavioral finance theory? What methods did Fuller & Thaler use to make decisions in buying and selling stocks? Did Fuller & Thaler successfully apply their investment strategies in the real market place and will it be successful in the long run? We have analyzed the Behavioral Growth Fund and the Behavioral Value Fund in order to answer these questions.

Methods that Fuller and Thaler Use

Fuller and Thaler use a three-step investment process when deciding which stocks to pick. They start with quantitative screens then move on to fundamental analysis, and lastly to behavioral analysis. Underlying Fuller and Thaler's quantitative analysis is the concept of Standard Unexpected Earnings (SUE). SUE is based on publicly available information and can be determined easily and accurately by an investment company. It is not based on behavioral financial theories, but on mathematical formulas. SUE is computed by taking the quarterly

earnings surprise for a publicly traded company and scaling by the standard deviation of earnings surprises:

$$\text{SUE} = \frac{\text{Reported earnings per share} - \text{Estimated earnings per share}}{\text{Standard error of estimate for the estimating regression equation}}$$

(Jones, 1977)

For the purpose of our analysis, SUE can be simplified to:

$$\text{SUE} \approx \text{Earnings Surprise} = \text{Reported Earnings} - \text{Expected Earnings}$$

Analysts predict a corporation's expected earnings for a quarter by looking at its past earnings and its average past growth rate. They generally agree on a company's expected earnings, and a corporation's expected earnings are well known within the investment community. When corporations report their actual quarterly earnings, Fuller and Thaler immediately compute their SUES. In fact, Fuller and Thaler compute the SUES of about 4,000 companies (Sports Betting, 2003). They then pick out the companies with the highest SUEs in order to analyze them further. Even though quantitative analysis is vital to Fuller and Thaler, it is in no way unique to their company. Many other investment firms use SUE to make investment decisions.

Fundamental analysis, the second step in the investment process, is more difficult to successfully accomplish. It determines whether the earnings increase is temporary or permanent. F&T fund managers do not try to forecast earnings the way other firm managers do. Instead, they screen for dozens of signs including wider gross and operating margins, cost reductions, and stock buybacks to determine whether the gain is a one time event or not. They also look at companies that have had financial difficulties to see whether there is a management change and whether there is an attempt to modernize the company (Levy, 2003). One of the easiest and most successful ways for F&T to determine whether an initial surprise earning is a trend is to wait to see if there is a significant surprise earning in the subsequent quarter. However, according to

Fuller, if they simply purchased the stocks with permanent earnings surprises, they would be using a “momentum strategy” of jumping on fast-moving stocks as they rise and selling before they peak. However, F&T believe the third step in their investment process, behavioral analysis, separates them from momentum investors (Glassman, 1999).

F&T are associated with two mutual funds: the Undiscovered Manager’s Behavioral Growth Funds and the Undiscovered Manager’s Behavioral Value Funds. The main difference between these two funds is that the Growth Fund is invested in fairly healthy companies, and the Value Fund is invested in companies that have had financial difficulties or are in a mature industry. For the Growth Fund, Fuller and Thaler use behavioral analysis to determine if the market is under-reacting to sustainable increases in a company’s earnings. This is how they believe behavioral mistakes influence the market and leave an opening for their investment firm to make a profit: When a company shows an initial earnings increase, the stock price generally does not rise significantly. In other words, the market does not react when a company has larger than expected profits. F&T believe that this is due to overconfidence and anchoring. Analysts give no weight to the new information. They believe that their formulation of expected earnings were expertly deduced and, therefore, the earning surprise must be a fluke. In fact, Fuller states that it generally takes three to four quarters of earning surprises for managers to throw off overconfidence and anchoring and start making sensible forecasts based on the new information that they had previously rejected (Glassman, 1999). Because the analyst’s investment companies do not put out “buy orders” for stocks with earnings surprises, the stock prices do not rise. F&T believe that this gives them a window of opportunity to purchase the stocks that look promising based on fundamental analysis at a bargain price. They hold on to the stocks for an average of nine months then sell them to the investment companies who are just starting to realize that the stock has momentum (Glassman, 1999).

For the value fund, F&T use behavioral analysis to determine if the market is over-reacting to a company whose stock has been underperforming for several quarters before having an earnings surprise. Overreaction is caused by the fact that analysts are anchored in their belief that if a stock has had a downward trend, then that trend will continue. Subsequently, they dismiss the earnings surprise, and the stock does not rise. F&T use the same technique as they use in their growth fund: They jump in early and buy the stock at a bargain price.

F&T point to several cases that they claim prove that they have successfully applied the behavioral finance theory in their investment practice.

- **Anchoring:** According to Mr. Frederick Stanske, senior vice-president at F&T, Coach is a good example of capitalizing on investor anchoring. He found that analysts dismissed strong earnings from Coach Inc, a maker of handbags and briefcases, when concern rose about the leather prices. However, he also observed that investors appeared not to notice that Coach was relying less on leather than it had in the past. Mr. Stanske bought the stock at the beginning of year 2003 at \$20s and closed it at \$33.65 on the November. (Glassman, 2003)
- **Under-reaction:** Stanske also believes that the purchase of AirTran's stock in Jan. 2002 again proves the success of capitalizing on investor under-reaction: "Stanske remembers thinking the rise wasn't enough - not after AirTran's profit had blown away Wall Street's average forecast of 3.6c a share by 178 percent. Stanske bought blocks of AirTran stock. As of June 30, Fuller & Thaler held 1.26 million shares, about 2 percent of the firm. And so far, Stanske's bet has paid off big: AirTran shares rose more than threefold to \$16.88 on September 19 since January 28. Stanske's trading that day was based on the theory that most investors react too slowly to information that will boost stocks over the long haul" (Bloomberg, 2003).

- **Over-reaction:** According to Mr. MacMillan, senior vice president and portfolio manager, the case of Sola International Inc. is a good example of capitalizing investor over-reaction. Sola International Inc. is a maker of eyeglass lenses whose shares were unduly depressed due to emergence of laser surgery. Investors had also largely ignored new management efforts to correct longstanding corporate problems. Mr. MacMillan bought shares in \$5 range in the summer of 2002 and closed it at \$14.22 on Nov. 2003. (Harris, 2001)
- **Overconfidence:** Qlogic Corp makes products for computer boards, its stock shot up \$16 to \$36 immediately after an earning surprise was announced. F&T were convinced the price didn't reflect the new information; analyst remained too anchored and over-confident. They bought at \$36 and now at \$130. (Glassman, 1999)

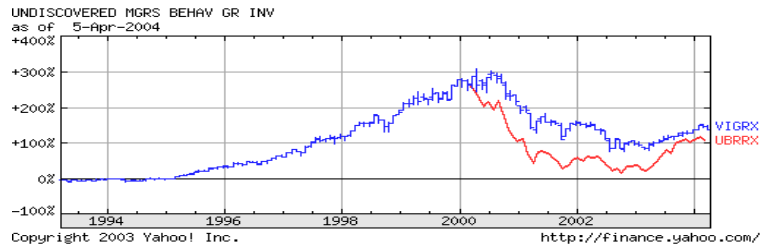
Fuller and Thaler Mutual Funds Performance

According to the New York Times, "Fuller & Thaler Asset Management ...has been investing privately for nine years, trying to put the academic theories to work using real money. And it has been quite successful. It says it has produced a 21 percent annualized return for the growth style of investing, about double the gain of its benchmark, the Russell 2500 Growth Index. Over the same period, the S&P 500 Index has raised an average of 14 percent a year" (Harris, 2004). However, while the strategy brought success to most of firm's separate accounts, F&T's two mutual funds have not yet prove its success during its shorter life span.

In order to further evaluate F&T's mutual funds performances, Undiscovered Managers Growth Fund (UBRRX) with the Vanguard Growth Fund (VIGRX) since they are similar types of funds:

5-Year		
Statistic	UBRRX	VIGRX
Alpha (against Standard Index)	9.31	-2.65
Beta (against Standard Index)	1.19	1.06
Mean Annual Return	5.86	-3.25
R-squared (against Standard Index)	50	88
Standard Deviation	31.81	18.86

The chart to the right compares the two funds:



In addition, Behavioral Growth Fund (UBRRX) requires \$10,000 investment minimum, but Vanguard Growth Fund only requires a \$3000 investment minimum. Also, the expense ratio is 1.65% for Behavioral Growth Fund and 0.23% for Vanguard Growth Fund. Vanguard Growth fund was incepted for more than 8 years and Behavioral Growth fund was incepted only about 4 years ago. Generally both funds had an above-average performance.

Are the Two Funds Good Long-Term Investments?

Many times benchmarks are used to show how well a mutual fund has performed. Some organizations that give out financial information (like finance.yahoo.com and e-trade) compare the two mutual funds to the S&P 500:

Growth of \$10,000					
Return %	2000	2001	2002	2003	2004
UBRRX	-26.8	-22.4	-17.5	57.5	3.2
+/- S&P 500	-17.7	-10.5	4.6	28.8	1.5
Returns %	YTD	3 year	5 year		
UBRRX	8.18	15.27	5.89		
+/- S&P 500	4.29	13.66	7.2		

Growth of \$10,000					
Return %	2000	2001	2002	2003	2004
UBVLX	11.8	12.9	-16.1	62.4	8.5
+/- S&P 500	20.9	24.8	6	33.7	6.9
Returns %	YTD	3 year	5 year		
UBVLX	12.21	19.38	22.44		
+/- S&P 500	8.32	17.77	23.74		

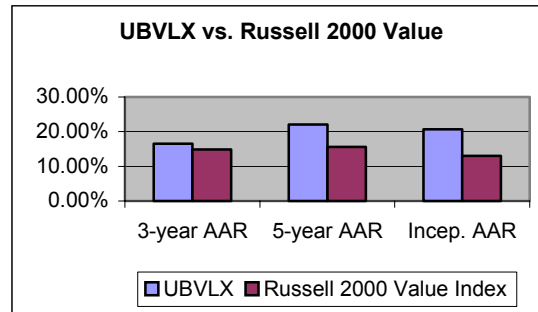
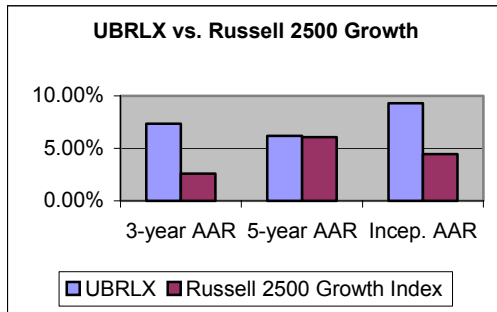
It is obvious that the two mutual funds have beaten the S&P so far (see year to date in charts). However, in 2000-2002 there was a bear market, and the S&P gave better returns than the two funds. After that, the stock market began to improve and the funds outperformed the S&P. This confirms that the funds are riskier than the S&P, and does not necessarily prove that they will perform better in the long run.

Furthermore, F&T use the Russell 2000 Index as a benchmark for the Behavioral Value Fund, and they use the Russell 2500 Growth Index for the Behavioral Growth Fund. According to the prospectus, the Growth Fund has beaten its benchmark five out of the last six years, and has had returns that are 4.74% higher. The Value Fund has beaten its benchmark four out of the last six years and has had returns that are 7.7% higher. The two mutual funds look like they give

superior performance at first glance. However, are the Russell Indexes the most appropriate benchmarks to use?

	1998	1999	2000	2001	2002	2003	3-year AAR	5-year AAR	Incept. AAR
UBRRX	33.20%	65.67%	-26.77%	-22.40%	-17.45%	57.47%	7.36%	6.18%	9.29%
Russell 2500 Growth Index	3.10%	55.48%	-16.09%	-10.83%	-29.10%	46.31%	2.60%	6.06%	4.45%
UBVLX	5.36%	33.11%	11.75%	12.87%	-16.07%	62.37%	16.54%	22.06%	20.72%
Russell 2000 Value Index	3.53%	-1.49%	22.83%	14.03%	-11.43%	46.03%	14.87%	15.63%	13.02%

The charts below compare 3 and 5 year average returns of F&T mutual funds to its benchmark Russell 2500 growth Index and Russell 2000 value Index. UBRRX is the growth fund. UBVLX is the value fund.



The Value Fund has a Beta of 1.13, which makes the stock moderately risky. However, the Russell 2000 value index only has a Beta of .83 (finance.yahoo.com). This index is safer than the market as a whole. One should not expect these funds to give the same returns which means that comparing them may not yield useful data. Furthermore, there does not seem to be an index that gives an apples-to-apples comparison. One can, however, get a good idea of how well the fund is doing by comparing it to a fairly large sample of similar funds with similar Betas. It ranks 16th out of 233 funds that are considered to be in the same general category considering returns for the last five years (finance.yahoo.com). This confirms the fact that this fund has been giving higher than expected returns. On the other hand, the Growth Fund has a Beta of 1.19 and the Russell 2500 Index has a Beta of approximately 1.05. These two are not necessarily

comparable either. Another way to measure risk/return is to compare the fund against other small cap funds. The Beta for funds in the same category (1.21) is almost the same as the growth fund. Other funds in this category have a five-year average return of 6.78% compared to 5.86% for the Behavioral Growth Fund. Furthermore, the growth fund ranks 188th out of 328 similar funds (www.etrade.com). This confirms that this fund has not been performing as well.

One also needs to look at other consequences of risk when deciding whether to invest. For example, another of F&T's funds lost a large percentage of its value when a stock they invested in heavily dropped dramatically. They invested 5% of a small cap mutual fund in HPL Technologies in 2002. The company looked promising, but the returns were fraudulent. The mutual fund lost over 2 million dollars almost instantly when the fraud was publicly exposed (<http://securities.stanford.edu>). This lowered profits for the fund dramatically. The Growth and Value Funds are susceptible to the same type of problem because they tend to invest heavily in some risky companies.

When deciding whether to invest in either the Undiscovered Manager's Growth Fund or the Behavioral Growth Fund, according to the Behavioral Growth Fund Prospectus, its investor class shares have had an average annual total return of 6.41% since it was started in 1998. JP Morgan Chase, which is contracted to operate and market the fund, must cap net expenses at 1.65%. By their estimates, this means that an investor will pay a total of \$2,109 in operating expenses with an initial \$10,000 investment over the next ten years, assuming 5% growth. This is a significant amount, but still within range of other small cap funds. Currently, JP Morgan is absorbing a .17% fee waiver and expense reimbursement. However, the cap of 1.65% will expire at the beginning of 2007. At this time a .17% fee waiver and expense reimbursement that JP Morgan is absorbing can be passed along to customers, so that annual expenses may rise to 1.82%. Interestingly, there are other banks that sell shares of these funds to investors, and these banks can charge

additional fees above and beyond what is charged by JP Morgan. This could further lower profits for investors.

The Behavioral Value Fund has had an average return of 19.20% since its commencement date in 1999. It has an expense ratio cap of 1.40%. However, the prospectus states that they have an option to charge up to .35% in 2b-1 fees. They are not charging this now, but can do so as they see fit. JP Morgan is also deferring .35% of expenses until 2007, but could bring total expenses up to 2.1%. Since this fund has shown strong profits, charging these extra fees may not in itself deter investment. If returns do drop, however, this could take a big bite out of returns. F&T have probably placed fairly low caps on both of these funds in order to attract investors to the funds since they are fairly new. They may raise expense fees further as more money is placed in the funds.

F&T place a significant amount of weight on Standard Unexpected Earnings when deciding which stocks to invest in. In order for their investment process to work, SUEs must be a valid indicator of how stocks are likely to perform in the future. Charles Jones of the University of North Carolina conducted a comprehensive study that looked at the correlation between stock prices and SUE in the market between 1975 and 1996. According to his research, there are overwhelming indications that an earning surprise – especially if it is reported by a company over two subsequent quarters – eventually leads to a significant jump in the stock price. He concludes that this creates an opportunity for an investor to buy the stock immediately and make profit (Jones, 1997). This may lead one to conclude that SUEs have been a valid investment tool in the past and are useful today.

When looking at whether F&T's funds are good long-term investments, however, one must determine whether SUE will still be a useful investment tool in the future. The problem with F&T relying so heavily on SUE in order to make investment decisions is that there is

evidence that it is becoming less reliable. CEOs are learning to manipulate earnings, and the way government regulations are currently written, companies can do this legally. Corporations now routinely hold back or accelerate sales and profits towards the end of the earnings quarter to ensure earnings surprises. Earning surprises are now common and are not necessarily an indicator of how healthy a company is. According to Jamie Coleton, earning surprises were less highly correlated with future stock prices in the 1990s than in the 1980s, and in 1999, the correlation turned out to be negative over 50% of the time. Since SUE is the foundation from which F&T make their investment decisions, the decline of the validity of SUE could have a severe impact on how accurately F&T can pick good stocks.

Other Investment Firms Using the Same Analysis as F&T

The process F&T use to pick stocks for their funds are well known. If these stocks are successful in the market, other firms will start to copy their investment process. In fact, other firms are using similar techniques to pick stocks. They are not basing their investment processes directly on F&T, but are happening to find the same anomalies that F&T do by other means. For example, Margaret Stumpp of Prudential Investments has developed a computer program that tracks stocks that are undervalued because of the slow reaction of investors to the companies' earnings improvements. She runs \$6 billion of the \$35 billion she is in charge of investing through the computer system (Levy, 2003). It is not that other companies do not use behavioral analysis, they just don't rely on it as heavily as F&T do. Also, other companies are doing similar things with quantitative funds that use technical analysis to interpret investment managers' behavior towards a company. Other investment funds, like Neuworld Financial, use computer systems that take pains to make sure that they take emotion out of picking stocks, the less behavioral biases will influence the market. (Williams, 2004) As more people use

behavioral analysis, the anomalies that they use to beat the market may start to disappear. If this happens, F&T will have to jump in and buy the stocks earlier, before they are sure that they are good buys. This will make the process riskier. Either that or they will have to find new cues.

Also, Investors use regression of the mean to explain the increases and decreases in mutual funds, stocks, and other investments. It is a statistical phenomenon that occurs whenever you have a nonrandom sample from a population and two measures that are imperfectly correlated. Basically, it is the rational response to changes in the stock market. Unusual changes in stock prices correct themselves over time (up or down) mainly because it is a statistical, group, and relative phenomenon. It can happen between any two stocks. The more extreme the sample group and the less correlated the two variables the greater the regression to the mean. Regression to the mean is one of the complex threats to validity. Great researchers sometimes fail to catch a potential regression artifact

The Opponents

The creators of the efficient market hypothesis are the primary opponents of experts like Fuller and Thaler. Eugene Fama, founder of EMH, believes that the empirical evidence is weak. He argues that they do not have a logical theory. There has to be a methodical alternative that can replace the EMH, therefore without that one does not have a valid theory. The EMH states that at any given time the prices reflect all available information. The idea is that markets are efficient and that price movements do not follow any patterns. This theory believes that prices follow a random walk. Fama and others like Malkiel believes that individuals like Fuller and Thaler go against this simple idea with their games of chance. According to Fama, there will be some that receive better investments returns because some people perform above the average and others below. In the end, he says “In these circumstances, no information or analysis can be expected to result in out performance of an appropriate benchmark. Because of the wide

availability of public information, it is nearly impossible to beat the market consistently.” In addition critics of Fuller and Thaler suggest that the market does not work like behaviorist think, because of herding. The information is misleading and does not work due to the fact that behavioral approach cannot be used to manage money. Individual irrationality cannot be a long-term success mechanism. The adversaries believe that their theory is an attitude not an investment approach. Thaler refutes by stating that if there is nothing else but investor irrationality other than indexing which would not be efficient if everyone used it.

However, some researchers tested behavioral finance theories using trends and sequences in finance performance. They examined a central psychological bias, representative ness, which underlines many behavioral-finance theories. “Overall, thee results suggest that multi-month momentum and long-term reversal are not due investor’s mental biases as modeled in the behavioral theories...Our results suggests pricing is not as if investors extrapolate firms’ growth rates too far into the future...All of these conclusion cast doubt on the representativeness heuristic-based theories of behavioral finance.” (Chan, Frankel and Kotari, 2002)

Conclusion

Behavioral finance might very well provide a profound approach to help us to continually discover the answers in the financial market, but it is still relatively new. It is true that market anomalies have existed throughout history. Just as one of behavioral finance experts said: “As along as there is a large enough majority of people are making these little mistakes, there’s probably an opportunity to make money by being on the other side” (Harris, 2001). F&T have some hurdles to overcome, however, if the Value and Growth Funds are to become good long-term investments. They must keep one step ahead of the game, always trying to outwit a relatively efficient market and always trying to outrun other similar behavioral funds. Investors also have to be cautious of the risk involved and the high fees. Furthermore, your opinion about

whether these two mutual funds are good investments mostly lies in your beliefs about EMH.

Proponents of EMH believe that the funds will only give an average performance over their lifetime, and they will point to the fact that the Growth Fund has only been giving average returns. Proponents of behavioral finance will point to the fact that the Value Fund has given superior returns and will excuse the returns of the Growth Fund by saying that the cues just need to be used better. To conclude, the financial behavior theory and F&T's investment strategies are very interesting approaches, but they need more time to develop and prove themselves.

According to Robert Shiller, " In judging the impact of behavioral finance to date, it is important to apply the right standards. Of course, we do not expect such research to provide a method to make a lot of money off of financial market inefficiency very fast and reliably ".

Therefore, we suggest investors should study and apply financial behavioral theory carefully if they want to use it in making investment decisions.

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