

A CASE AGAINST THE EFFICIENT MARKET HYPOTHESIS

by

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ABSTRACT

This study critically evaluated the applicability of the Efficient Market Hypothesis to real financial markets from a behavioral finance basis with a focus on the value anomaly. Specifically, a study was composed to analyze the risk and return characteristics of value stocks in order to gain a greater understanding of the anomaly in which value stocks frequently outperform. The study examined the returns and risk characteristics of value stocks relative to growth stocks over both positive and negative market environments, with special attention given to the change in the return and risk profile of value stocks as the environment moved from positive to negative. The study found that value stocks consistently outperform in all market environments, a finding inconsistent with the Efficient Market Hypothesis. The study also showed that the degree of outperformance of value stocks is likely due to more than a risk premium alone.

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INTRODUCTION

The Efficient Market Hypothesis (“**EMH**”) is a theory that was developed by Eugene Fama during the 1960’s at the University of Chicago. While theory supporting random walk stock prices and efficient markets can be traced back to the 1800’s, Fama was the first to define an “efficient” market. The hypothesis itself asserts that financial markets continually and instantly price in all relevant information available (Fama 1970). The resulting application of this theory insinuates that all market prices reflect the true value of each security. Of course, most active management practitioners who participate in the estimated \$118 trillion asset management industry consider the EMH to be absurd, as the theory asserts that these practitioners are engaging in a game of chance, and not skill, as any outperformance is due to higher risk and not skillful and prudent investment selection. Many of these practitioners believe that while the EMH applies well to a theoretical market loaded with assumptions, it cannot be applied effectively to real markets because the EMH assumes market participants always act logically and rationally. However, there has been an increasing amount of evidence that disproves this assumption.

All would be well if the EMH was considered what it truly is - an academic theory that is difficult to holistically apply to real markets. However, despite being disregarded by many practitioners and the emergence of evidence against the hypothesis, the EMH is still widely taught to students to this day. Therefore, this paper will attempt to uncover additional evidence of market inefficiencies in a hope that future students may be spared from this theory going forward.

Research and evidence began to question and combat the EMH with the emergence of behavioral finance. However, there has been research that attempts to analyze the

validity of the EMH beyond its behavioral assumptions, such as Grossman and Stiglitz (1980) who developed a theoretical model that argued that the markets are not in perfect equilibrium, but instead exist in a level of equilibrium disequilibrium due to information costs. However, the most relevant articles to the discussion at hand include those with behavioral evaluations and tests of market efficiency. Dreman and Berry (1995) looked at the effect of both positive and negative earnings surprises on value and glamour stocks, while De Bondt and Thaler (1985) observed the performance of portfolios that had recently undergone extreme price movements. Furthermore, Rosenberg, Reid and Lanstein (1985) developed a book to price and specific return reversal stock selection strategy to test market efficiency, while Basu (1977) performed a similar test by constructing portfolios of various price to earnings (P/E) levels, and analyzed the risk/return profiles of each portfolio and compared the return of low P/E portfolios to the market. Finally, Lakonishok, Shleifer and Vishny (1994) again tested the performance of value versus glamour stocks and analyzed whether the performance of value strategies was due to their higher inherent risks, while Scott, Stumpp and Xu (1999) provided a new framework for behavioral biases and extended the exploitation of biases to stock selection strategies other than those with a value orientation.

Previous research has tested the performance of a variety of value-oriented strategies over both extended periods of time and during an unexpected event. However, no work has been done thus far that analyzes the return and risk characteristics of value stocks in both positive and negative market environments, with a focus on the change in the return and risk profile of value stocks when moving from a healthy to a turmoil filled environment. The focus on, and subsequent comparison of, negative and positive market

environments for periods of measurement is key as it concentrates the empirical test on times of both fear and greed in the market place. This will serve to highlight the fallacy of the assumption that market participants act rationally and logically. The absence of completely rational and logical actions by the market as a whole means that even though information may be reflected into a security's price, it may not be priced-in correctly.

This paper will first include an in-depth review of previously published literature that involves the EMH and is relevant to this study. Then, relative returns of value versus growth stocks will be compiled over an extended period of time. This data will then be used in conjunction with three different sets of scenarios that contain both positive and negative market environments: Economic Recessions & Expansions, Short-term Up & Down stock markets, and Long-term Bear/Non-Bear stock markets. The resulting data will be analyzed and tested with multiple empirical regression tests that will provide insights into the return and risk profiles of value stocks versus glamour stocks in times of positive/healthy market environments and negative/tumultuous market environments.

LITERATURE REVIEW

The following pages will review relevant existing literature that involves the efficient market hypothesis, with a focus on literature that attempts to assess the validity of the EMH. However, Fama's two original landmark articles on the subject will also be reviewed to provide context to the discussion. Articles that evaluate the EMH will include those that analyze the hypothesis' practicality given information costs, as well as those that analyze the existence of over-extrapolation, investor overconfidence, herd behavior and the use of mental accounting by investors in the financial market place.

Pro-EMH Literature

The EMH is generally understood as the argument that the markets are informationally efficient as the value of the assets traded reflects *all* existing information, and that investors are analyzing this information in a rational way in order to lead to optimal outcomes. However, in *Efficient Capital Markets: A Review of Theory and Empirical Work* (1970), Eugene Fama posits that if *all* information were reflected in market prices it would be very difficult for the hypothesis to be literally true, as the hypothesis itself is too broad to ever be practically empirically tested. To combat this over-generalization Fama developed three categorizations, or forms (weak, semi-strong, and strong), that better define what it means for prices to “fully reflect” all available information, therefore allowing the testability of the hypothesis depending what one considers “all available” information (Fama 1970).

The weak form classification of the EMH focuses on information that is limited to historical prices and returns of securities and argues that such data cannot be used to make outperforming profits (Fama 1970). This classification possesses the most supportive evidence, as though some dependencies between prices have been found, they are extremely short term and do not offset any transaction costs (Fama 1970). The semi-strong form of the EMH, what the current paper will evaluate, expands the information set beyond asset prices and return data to include all publically available information. The tests cited by Fama focus on the adjustment of stock prices to any new market information, thereby supporting the argument that stock prices reflect all publically available information. The final classification of the EMH is the strong form, which presumes that all information is reflected in stock prices as no individual possesses

monopolistic information. This form, however, will not be a major focus of this paper as even Fama admits it is a significant deviation from reality.

Following the original paper in 1970, Fama published a sequel to what many consider the primary foundation of all EMH thought in 1991. In this paper, entitled *Efficient Capital Markets: II*, Fama addresses several updates, concerns and challenges to his original work. Most relevant to the discussion at hand are the several anomalies, or events that seem to disprove the EMH, that Fama acknowledges in the 1991 paper that began to garner attention following his initial work on the subject. These anomalies lead Fama to highlight the “joint hypothesis” problem, in which any tests of market efficiency are also dependent upon the ability of an asset-pricing model to determine accurate equilibrium prices (Fama 1991). One of these anomalies in particular, the historical ability for value stocks to outperform the market, will be a key focus of this paper’s attempt to further chip away at the armor of theory surrounding the EMH.

Beyond responding to and addressing much of the literature critical of his 1970 study, Fama’s second work also contains implications for this paper in the form of providing more support for the semi-strong form of efficiency. Specifically, Fama even goes as far to say that the semi-strong form of the EMH possesses the cleanest evidence of market efficiency (Fama 1991). This updated view is predicated on the emergence of more flexible and accurate data that, according to Fama, has allowed the true speed of market pricing to be uncovered (Fama 1991).

EMH Critical Literature

Costs Contention of the EMH

An early evaluation of the EMH from a theoretical perspective was performed by Grossman and Stiglitz (1980), in which a model was developed that argued that markets do not in fact operate in equilibrium, but instead a equilibrium disequilibrium. The reason for this equilibrium disequilibrium is due to the fact that arbitrage is costly, so prices only partially reflect information in order to provide compensation to informed market participants who incur costs to obtain information (Grossman & Stiglitz, 1980). As a result, Grossman and Stiglitz argue that a perfectly efficient market would cause any competitive market to collapse as no market participants would be willing to bear the costs to price data into the market (Grossman & Stiglitz, 1980). However, EMH proponents contend that the negative abnormal returns of mutual funds exhibit that informed traders price data into the market without any compensation (Elton, Gruber, Das, and Hklarka, 1991), and therefore argue that the existence of information costs only further disproves the strong-form of the EMH (Fama 1970). Notwithstanding the EMH supporter's disbelief that information costs do not hamper the ability of the market to operate completely efficiently, the work by Grossman and Stiglitz is notable.

Behavioral Contention of the EMH

More applicable to the discussion at hand is the theory surrounding the so-called value anomaly, or specifically the behavioral finance backed theory that has led recent arguments against the EMH. As was previously mentioned, the EMH is essentially comprised of two assumptions: 1) that asset prices reflect all available information (though what level of "all information" depends on which form you are addressing), as

well as 2) that investors engage in rational behavior when analyzing and pricing in the information. This effectively means that the EMH can be viewed as the application of the rational expectations theory of macroeconomics to the financial marketplace (Jensen 1978). This can be seen when considering that the rational expectations theory essentially states that expectations are formed using all of the information possible to make the best-forecast decision (Mishkin 2001). It is this rational expectations component of the EMH, or the assumption that all investors act rationally, that both the value anomaly and its behavioral finance backing seem to undermine. As we will see, rather than operating in a completely efficient and rational manner, it seems that investors are susceptible to the behavioral inefficiencies faced by all humans. Therefore, because of behavioral inefficiencies, while asset prices may reflect all available information, the prices may not *accurately* reflect all available information. The consequence of the incorrect pricing of information is that investors will be able to capitalize on behavioral inefficiencies and outperform the market on a risk-adjusted basis.

Investor Over-Extrapolation

La Porta, Lakonishok, Shleifer and Vishny (1994) argue that instead of acting perfectly rationally as the EMH assumes, investors are often susceptible to over-extrapolating a company's past operating history and stock performance too far into the future. This can be seen when considering the fact that while it is well supported that a company's earnings often follow a random walk and therefore cannot be accurately forecasted for longer than two years, the large spread between the P/Es of companies with large growth expectations versus small growth expectations indicate the market is forecasting the continuation of earnings much further into the future than is reasonable

(La Porta, Lakonishok, Shleifer & Vishny, 1994). This over-extrapolation of earnings due to what would be deemed as irrational behavior has been attributed as a source of mispricing that drives the existence of the value anomaly.

La Porta, Lakonishok, Shleifer and Vishny (1994) tested the aforementioned argument by analyzing the market's reaction to earnings announcements to see if there were any systematic and consistent errors in the pricing of value stocks, or those stocks with low growth expectations. If investors were indeed over-extrapolating the expected results of the companies, then value stocks should outperform during earnings announcements, as those stocks would see large price increases as they surpass investor expectations (La Porta, Lakonishok, Shleifer & Vishny, 1994). The findings supported the argument that investors over-extrapolate information as value stocks saw a much larger increase in value associated with earnings announcements, the cause of which is attributable correction of the mispricing caused by investor's irrationally low forecasts of growth.

Lakonishok, Shliefer and Vishny (1994) also tested the tendency of investors to over-extrapolate growth into the future by forming portfolios of stocks based on their earnings/price and cash flow/price multiples (as the level of growth forecasted by the market is reflected in the price and therefore each of the multiples), as well as the explicit growth rate of sales. The result was consistent with the previous study in that the companies with the lowest market growth expectations proved to be a better investment than companies with higher market growth expectations as the correction of the mispricing caused by over-extrapolated growth forecasts allowed low growth stocks to outperform high growth stocks.

Investor Overreaction

Another well-documented instance of irrational investor behavior in the market takes the form of investor overreactions. While there are certainly a myriad of factors that comprise a person's reaction to a situation, one notable cause of overreactions involves the weighting that people place on information depending on its timing. Specifically, when people revise their beliefs based on new information, they tend to overweight new information and underweight data from prior periods, thereby abandoning any moderating considerations (De Bondt and Thaler, 1985). Furthermore, Dreman and Berry take a slightly different view in that they argue that many market overreactions are caused by the aforementioned over-extrapolation of growth that results in overreactions to past information (Dreman and Berry, 1995). While it is well documented that humans as a whole are susceptible to this behavioral shortcoming, it seems that investors are commonly affected as well.

De Bondt and Thaler (1985) attempted to prove the existence and predictability of overreaction in the financial markets by looking at the price movements of stocks that had recently seen large amounts of volatility. Among other things, De Bondt and Thaler attempted to develop a trading strategy that could profit off the mispricing of stocks caused by negative overreactions. The findings of the test were consistent with the hypothesis as De Bondt and Thaler found that portfolios comprised of stocks that had seen recent downside volatility outperformed those which had seen recent upside volatility. This outperformance of stocks following downside volatility is thought to be attributable to the correction of the mispricing initially caused by investor's sharp overreaction to short-term news.

Dreman and Berry (1995) further tested the existence of irrational investor overreactions in the market by measuring the performance of various stock classes (ie: growth, value) that experienced earnings surprises. Dreman and Berry essentially asserted that investors overreact to past information, and when an earnings surprise comes opportunities to earn abnormal returns exist as a result of the mispricing caused by the previous overreaction (Dreman and Berry, 1995). The test resulted in the finding that value stocks perform better than growth stocks in the case of both negative and positive earnings surprises. Again, value stocks were able to earn abnormal returns because of the previous overreaction that lead them to be priced at levels that were depressed relative to their true intrinsic value, thereby creating alpha. It can also be noted that these same results were replicated in international markets, further reinforcing the prevalence of investor's tendency to overreact (Bauman, Conover & Miller, 1999).

Investor Herd Behavior

Herd behavior results when investors forego performing their own analysis and instead decide to follow one or more other investors (Bikhchandani and Sharma, 2000). By its very nature herd behavior undermines one of the key assumptions of the EMH, that all information is priced into an asset (Scharfstein and Stein, 1990). Prices are only able to reflect all available information because it is assumed that every market participant independently analyzes a stock, with the aggregate effect being that the stock price reflects the analysis from the entire market and therefore all available information. However, as herd behavior becomes increasingly prominent, less investors are performing their own analysis, thereby decreasing the efficiency of asset prices as assets begin to reflect the valuation of fewer and fewer (Scharfstein and Stein, 1990). Some

argue that herd behavior, in some circumstances, can actually display rational thinking if an investor does not want to underperform their peers or the broader market (Bikhchandani and Sharma, 2000). However, Scharfstein and Stein (1990) would argue that by following others, an investor eliminates the ability to earn abnormal returns, as by following the consensus they will only experience a return on par with the consensus. It should also be noted that given the continually increasing interconnected nature of global financial systems, the inefficiencies created by herd behavior should continue to become more prominent, leading to continued investor irrationality in the future.

Predicated by the fact that many currency specific crises in the 1990s exhibited contagion and affected the global economy, Boyer, Kumagai and Yuan (2006), evaluated the co-movement of assets in emerging markets during high volatility periods. The fact that not all publically traded assets are available to be purchased by foreigners in certain emerging market countries allowed the test to assess whether market moves were due to changes in fundamentals or contagion (Boyer, Kumagai & Yuan 2006). Testing for contagion in emerging market countries confirmed the existence of herd behavior as co-movement of assets was observed during high volatility periods (Boyer, Kumagai & Yuan 2006). This can be seen as a deviation from rational behavior as in the tests the use of fundamentals for valuation was abandoned.

Similar to Boyer, Kumagai and Yuan (2006), Chiang and Zheng (2010) evaluated the existence of herd behavior, but on a much larger scale than any previous study by conducting tests in 18 countries throughout the world. The sample countries included both non-developed and developed countries as the cross-sectional stock return method utilized allowed the testing of both country classifications (Chiang and Zheng 2010).

Consistent with Boyer, Kumagai and Yuan (2006), Chiang and Zheng (2010), found evidence of herd mentality in 16 of the 18 countries through periods of both upwards and downwards volatility. This is notable as the study shows that the irrationalities associated with herd behavior are not confined only to small emerging market countries, but instead exist in the global marketplace.

Mental Accounting

Mental accounting, first coined by Robert Thaler in 1980, is the “set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities” (Thaler, 1999, p. 183). While mental accounting has been described with a wide variety of components and impacts, the most notable is the tendency for investors to group and assign capital to certain activities and uses, rather than make decisions from a total net-worth perspective (Thaler 1999). It is posited that mental accounting leads to investor irrationality because it violates the economic assumption of fungibility, or the availability of money to be a perfect mutual substitute between uses, thereby impacting decision making (Thaler 1999). This irrationality can be exhibited when considering a scenario where an individual holds a high level of high interest rate debt, but refuses to use a portion of lower interest rate savings on hand to pay down the debt in order to remain with a certain level of savings.

Barberis and Huang (2001) examine the impact of mental accounting in the financial markets by pairing mental accounting with the tendency for investors to exhibit loss aversion, or the predisposition for investors to avoid losses rather than acquire gains. Specifically, Barberis and Huang were concerned with the question of whether investors exhibit a higher magnitude of loss aversion toward individual positions or to their total

wealth. In order to test this, the stock returns in two hypothetical economies were analyzed. In one economy investors are loss averse over returns to their entire portfolio, while in another economy investors are loss averse to individual positions. The findings of this test are consistent with the previous assertion that mental accounting leads to irrationality as investors created a large value premium by focusing on individual positions rather than total wealth. This divergence is attributed to the observation that as stocks perform well (thereby becoming glamour stocks) investors view them as further “in the money” and therefore lower their risk required premiums, while as a stock performs poorly (thereby becoming value stocks) investors raise the risk required premiums. On the other hand, this value premium is missing from the total wealth focused economy because while investors engage in the adjustment of risk premiums with market fluctuations, they adjust their entire portfolios instead of certain positions.

Lim (2006) took a slightly different route than Barberis and Huang by integrating a test of mental accounting with the hedonic editing hypothesis, which asserts that investors integrate or segregate outcomes in a way that brings them the most pleasure (Thaler 1985). Lim hypothesized that investors would engage in mental accounting by preferring to integrate (or combine) the outcomes of losing investments while segregating the outcomes of winning investments (Lim 2006). This hypothesis was tested by analyzing the trading records of a large discount brokerage house. The results of the study proved that investors prefer to sell multiple stocks when losses are expected, while also showing that when selling positions with both losses and gains investors strategically combine the sale of winners and losers to achieve a favorable outcome (Lin 2006). The result of this test further supports the pervasiveness of mental accounting in the financial

markets, a behavioral tendency that can lead to inefficiencies as investors are making trading decisions based on perceived pleasure rather than the merits of an investment itself.

Summary & Hypothesis Development

The EMH is one of the most well-known theories in all of finance. However, despite its eloquence, the EMH is dependent upon a number of assumptions, some of which exhibit difficulties when applied to live markets. The emergence of behavioral finance has recently exposed a key assumption of the EMH - that investors act rationally and as a result *accurately* price in all available information. While reasonable in theory, one cannot forget that despite the ever-increasing computerization of the global financial markets, humans are still behind nearly every buy or sell decision in some form. As much of the aforementioned literature shows, humans are extremely susceptible to a wide variety of behavioral fallacies that undermine sound investment decisions. These behavioral fallacies are nothing more than natural predispositions for humans, but their existence casts doubt onto the assertion that humans act rationally in financial markets. Therefore, as a result of these behavioral inefficiencies, the market will fail to accurately reflect information in asset prices, causing the breakdown of the EMH's perfect risk/return relationship and allowing investors to earn a higher return without taking an elevated level of risk. These behavioral fallacies have led to the development of the following hypotheses:

H1: Value stocks will outperform during the times turmoil.

H2: Over time, value stocks are less risky than glamour stocks.

As the previous literature supports, many behavioral fallacies directly or indirectly cause investors to shun stocks that have performed poorly in the past and favor stocks that have done well, causing a divergence of valuation away from fundamentals. It is expected that while these behavioral fallacies will fuel a valuation divergence for a period of time, a major shock will drive a purge of speculation and a convergence of valuation to fundamentals. This largely drives hypothesis one as it is expected that various times of turmoil will drive the aforementioned convergence of valuation to fundamentals, causing value stocks to outperform without having a higher amount of risk. In the following section, this paper will attempt to further provide evidence supporting irrational investor behavior by analyzing the performance of value versus glamour stocks.

METHODOLOGY & RESULTS

Research Purpose

The following research includes an empirical regression study that provides insight into the long-term performance and risk of value stocks relative to glamour stocks. The study will analyze the risk and return of value versus glamour stocks in both positive and negative market environments. Special attention will be given to the difference in the relative performance and risk of value stocks during times of turmoil. This study will generate evidence that can be used to evaluate the EMH as the theory implies that either value stocks will not consistently outperform glamour stocks or value stocks may outperform but as a function of higher risk.

Research Design

Overall, the study is conducted by comparing the returns of value versus glamour stocks through a series of market and economic environments. Two regression equations

will be used that identify the return and risk profile of value stocks in these different environments.

The study relies on data sourced from Eugene Fama and Ken French that was obtained through Wharton Research Data Services. The data is comprised of monthly High-Minus-Low (HML) returns, the risk free rate as measured by the one month T-Bill and the excess return on the market from July 1926 to December 2014 (1062 months). The HML returns refer to the return of high book-to-market stocks (value stocks) minus the return of low book-to-market stocks (glamour stocks). The HML returns are specifically calculated by taking the average returns of a small cap and large cap value portfolio and subtracting the average returns of a small cap and large cap glamour portfolio, thus adjusting for any size related risk premium.

Prior to the primary analysis that compares the risk and return characteristics of value over growth in different time periods, an analysis of the entire data set was performed. The purpose of this initial test is to provide the context in which the other tests are performed. The analysis utilizes a regression in which the return of value stocks minus the return of glamour stocks ($R_v - R_g$ or HML) is the Y value. The intercept of the regression equation α_1 shows the beta-risk adjusted return of value stocks over growth stocks. This adjusted return is important as it provides a return after compensating for any nonzero HML beta. The X variable β_1 shows the beta of the HML returns.

$$R_v - R_g = \alpha_1 + \beta_1 + \epsilon$$

Following the brief analysis of the entire data set, three separate scenarios were developed in which the relative performance of value stocks (through HML data) would be tested. These scenarios include 1) market performance during economic

recessions/expansions, 2) monthly up/down markets and 3) long-term bear/non-bear markets. Each of the scenarios contains both a positive and negative market environment. In order to categorize the data within each scenario as either positive or negative, a possibly qualitative distinction, dummy variables were used to denote times of turmoil/health. The dummy variable 1 refers to times of a negative market environment while the variable 0 refers to times of a positive market environment. A brief description of the three scenarios is included below:

Economic Recession/Expansion
<p>Times of recession and expansion were identified through data provided by the National Bureau of Economic Research (NBER). The NBER classifies economic expansions/recessions by determining the monthly dates of both peaks and troughs in the domestic business cycle. The date of the peak to the date of the trough is classified as a recessionary period and received a dummy variable of 1, while the trough to peak dates received a dummy variable of 0. Out of the 1062 months of data tested, there have been 214 months, approximately 20%, that display characteristics of a recessionary economic environment. Furthermore, during this time period there have been 14 overall complete business cycles.</p>
Up/Down Market
<p>The up/down market scenario identified months where the return of the stock market was less than the return of the 1 month T-Bill. Months in which the stock market underperformed were designated a dummy variable of 1, while months that outperformed were designated a variable of 0. Out of the 1062 months in the study, 424,</p>

approximately 40%, were months in which the return of the stock market was less than the return of the one month T-Bill.

Bear/Non-Bear Market

The bear/non-bear scenario identified periods where the S&P 500 declined by 20% or more without a rally of at least 20%. This scenario is distinct from the previous up/down market scenario as it provides a more a more holistic view of market trends. This can be seen when considering the fact that a bear market can exist despite periods of slightly positive market returns. Thus, this scenario will complement the up/down scenario by analyzing the relative performance and risk of value stocks during longer-term market trends. The specific dates of the bear markets were sourced from Bank of America Merrill Lynch Research. The bear periods are denoted with a dummy variable of 1, while the non-bear periods are given a variable of 0.

Finally, two regression tests were applied to the data based on different periods: a simple linear regression and a multi-variable linear regression.

The first regression performed in each of the scenarios assigns the return of value stocks minus the return of glamour stocks ($R_v - R_g$ or HML) as the Y variable. The intercept α_1 shows the relative performance of value stocks when the dummy variable is 0 (or positive market periods). The X variable α_2 shows the change in the relative performance of value stocks when the dummy variable is changed to 1 (negative market environments). Consequently, the sum of α_1 and α_2 is equal to $R_v - R_g$ during negative market periods.

$$Rv - Rg = \alpha_1 + \alpha_2 D + \epsilon$$

The next regression test is an extension of the previous equation and provides insight into the risk of value stocks relative to glamour stocks. The multi-variable regression adds two additional X variables to the original equation, β_1 and β_2 . These variables represent the beta of the Rv-Rg returns, serving to measure the relative risk of the value stocks. The variable β_1 shows the beta of Rv-Rg when the dummy variable is 0, while β_2 shows the change in the beta of Rv-Rg when the dummy variable is changed to 1. Taking the return of value stocks and subtracting the return of glamour stocks is similar to creating a hedged long-short portfolio. Therefore, because Rv-Rg essentially creates a hedged position, if value stocks have equal risk to glamour stocks the beta of the hedged value position should be 0, while a positive beta means value is more risky than glamour and a negative beta means glamour is more risky than value. Furthermore, this regression also provides insight into the beta-risk adjusted return of the hedged portfolio.

$$Rv - Rg = \alpha_1 + \alpha_2 D + \beta_1 (Rm - Rf) + \beta_2 (Rm - Rf) D + \epsilon$$

Empirical Results

Entire Data Set

The results of the regression tests that included the entire data set is located in table 1 below. First, in order to substantiate earlier claims, a simple average of the HML data shows that value has outperformed growth by an average of .4% per month, or an annualized 4.86%. As can be seen below, over the entirety of the data value proved to be slightly more risky than growth, though the beta was still a low .1494. However, value outperformed growth by a beta-adjusted .3% per month, or 3.65% annually. This return is completely unaccounted for and unexplainable under the beta measure of risk. Therefore,

though value did have a slightly higher beta than growth, the outperformance of value appears to be more than a function of its elevated beta.

Table 1

		<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Multiple R					0.22832
R Square					0.05213
Adjusted R Square					0.05123
Standard Error					0.03445
Observations					1062
α_1	Monthly	0.30%	0.001064899	2.8066	0.0051
α_1	Annualized	3.65%			
	HML Beta	0.1494	0.019570427	7.6351	5E-14

Economic Recession/Expansion

The results of the regression tests under the economic recession and expansion scenario are included in tables 2 and 3 below. As was hypothesized, value stocks outperformed glamour stocks during an economic recession, as table 2 shows that value outperformed glamour by .20% per month, or an annualized 2.45%. However, there were also unexpected results. First, value stocks did not only outperform glamour stocks in recessionary periods, but also demonstrated outperformance in periods of economic expansion. Table 2 shows that value beat glamour by .45% per month during expansions, or an annualized 5.48%. While this does not contradict hypothesis one, it was not expected that value stocks would outperform glamour stocks regardless of the environment.

Regarding the risk of value stocks under the recession/expansion scenario, table 3 shows that the beta of $R_v - R_g$ during expansionary periods was an infinitesimal .0777. This is somewhat consistent with hypothesis two, as despite the outperformance of value stocks the level of risk was not significantly elevated. During recessionary periods the beta of the hedged value portfolio increased by .1583, bringing the total beta to .2360. This is not consistent with hypothesis two. However, after adjusting for the aforementioned beta, the

beta-risk adjusted return in both economic periods is material. After adjusting for beta, in periods of economic expansion value outperformed by .37% per month, or an annualized 4.54%, while in recessionary periods value outperformed by .33%, or an annualized 4.1%. Again, after adjusting for value's slightly higher beta value still outperformed.

Table 2

<i>Regression Statistics</i>	
Multiple R	0.027622722
R Square	0.000763015
Adjusted R Square	-0.00017966
Standard Error	0.035372953
Observations	1062

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
α_1 Monthly	0.45%	0.0012	3.6688	0.0003
α_1 Annualized	5.48%			
α_2 Monthly	-0.24%	0.0027	-0.8997	0.3685
α_2 Annualized	-2.88%			
HML Recession	0.20% (Monthly)			
	2.45% (Annualized)			

Table 3

<i>Regression Statistics</i>	
Multiple R	0.257775205
R Square	0.066448056
Adjusted R Square	0.063800933
Standard Error	0.034222869
Observations	1062

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
α_1 Monthly	0.37%	0.0012	3.0863	0.0021
α_1 Annualized	4.54%			
α_2 Monthly	-0.04%	0.0026	-0.1405	0.8883
α_2 Annualized	-0.44%			
β_1 HML Expansion Beta	0.0777	0.0264	2.9395	0.0034
β_2 Δ Beta	0.1583	0.0393	4.0279	0.0001
HML Down Beta	0.2360			
HML Down Beta Adjusted Return	0.33% (Monthly)			
	4.10% (Annualized)			

Up/Down Market Scenario

The results of the regression tests under the up/down market scenario are included in tables 4 and 5 below. Interestingly, the results of the test were similar to the results of the recession/expansion test above, thus providing mixed support for the hypotheses. As was expected, value outperformed glamour by .29% per month in months where the market is down, or an annualized 3.53%. However, again, this test shows that the relative returns of value were better in the positive market environment. In months in which the market was up, value outperformed glamour by .47% per month, or an annualized 5.76%. While these results do not contradict hypothesis one, they are unexpected.

The risk results of the up/down test differed significantly from the recessionary/expansionary test. Table 5 shows that in months in which the market was up the hedged value portfolio had a significant beta of .41. However, interestingly, during months in which the market was down the hedged value beta drastically fell by -.3014, giving the $R_v - R_g$ returns a beta of .1086. This beta, while still slightly elevated, is much

more consistent with the hypothesis that value stocks would not be significantly more risky than glamour stocks despite posting a higher return. There was also a large amount of variety in the beta-risk adjusted returns. The beta adjusted return in up markets was -1.08% per month, or an annualized -12.23%. However, similar to the beta results, in a down market value outperformed growth by .73% per month, or an annualized 11.78%.

Table 4					Table 5						
<i>Regression Statistics</i>					<i>Regression Statistics</i>						
Multiple R				0.0247	Multiple R				0.34056		
R Square				0.00061	R Square				0.11598		
Adjusted R Square				-0.0003	Adjusted R Square				0.11348		
Standard Error				0.03538	Standard Error				0.0333		
Observations				1062	Observations				1062		
<i>Coefficients Standard Error t Stat P-value</i>					<i>Coefficients Standard Error t Stat P-value</i>						
α_1	Monthly	0.47%	0.0014	3.3400	0.0009	α_1	Monthly	-1.08%	0.0019	-5.7196	0.0000
α_1	Annualized	5.76%				α_1	Annualized	-12.23%			
α_2	Monthly	-0.18%	0.0022	-0.8044	0.4214	α_2	Monthly	1.81%	0.0030	6.0762	0.0000
α_2	Annualized	-2.12%				α_2	Annualized	24.01%			
HML Down Market Return		0.29% (Monthly)				β_1	HML Up Beta	0.4100	0.0358	11.4406	0.0000
		3.53% (Annualized)				β_2	Δ Beta	-0.3014	0.0541	-5.5755	0.0000
						HML Down Beta		0.1086			
								0.73% (Monthly)			
						HML Down Beta Adjusted Return		11.78% (Annualized)			

Bear/Non-Bear Market Scenario

The results of the regression tests under the bear/non-bear scenario are included in tables 6 and 7 below. From a return perspective, the results of these tests are similar to the other scenarios. In the bear/non-bear scenario, value outperformed glamour in bear markets by approximately .11% per month, or an annualized 1.34%. However, again, the relative performance of value stocks was actually better in healthy, non-bear market environments as value stocks outperformed by .48% per month, or an annualized 5.97%. While not contradicting hypothesis one, these results were unexpected.

The risk results for the test were similar to the previous up/down test. Specifically, in a non-bear market the hedged value portfolio exhibited a meaningful beta of .2140. However, the beta for Rv-Rg returns fell -.1413 in a bear market, bringing the beta of the hedged value portfolio to .0727. Again, while the elevated beta displayed by value stocks

in non-bear markets does not support hypothesis two, the tempered beta of value stocks in bear markets is more consistent with expectations. The results of the beta-risk adjusted return in this test are not statistically significant.

Table 6

<i>Regression Statistics</i>	
Multiple R	0.04473741
R Square	0.002001436
Adjusted R Square	0.001059928
Standard Error	0.035351026
Observations	1062

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
α_1 Monthly	0.48%	0.0012	3.9048	0.0001
α_1 Annualized	5.97%			
α_2 Monthly	-0.37%	0.0026	-1.4580	0.1451
α_2 Annualized	-4.39%			
HML Bear Returns	0.11% (Monthly)			
	1.34% (Annualized)			

Table 7

<i>Regression Statistics</i>	
Multiple R	0.252101032
R Square	0.06355493
Adjusted R Square	0.060899604
Standard Error	0.034275857
Observations	1062

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
α_1 Monthly	0.10%	0.0013	0.7426	0.4579
α_1 Annualized	1.16%			
α_2 Monthly	0.24%	0.0028	0.8792	0.3795
α_2 Annualized	2.95%			
β_1 HML Bull Beta	0.2140	0.0265	8.0766	0.0000
β_2 Δ Beta	-0.1413	0.0439	-3.2182	0.0013
HML Down Beta	0.0727			
	0.34% (Monthly)			
HML Down Beta Adjusted Return	4.11% (Annualized)			

DISCUSSION

Entire Data Results

Though the primary focus of this paper is the scenario tests, which are discussed below, the results from the test that analyzed the data in its entirety is interesting and warrants discussion. Specifically, throughout the entire time period, value only had a slightly higher beta than growth. However, even after adjusting for this beta, value still outperformed growth. This means that value has outperformed growth to a degree that the outperformance cannot be explained by risk (as measured by beta) alone. These results provide substantial evidence against the EMH, as under the hypothesis this unexplainable return should not exist.

Scenario Return Results

Overall, the primary study yielded results that have both significant and broad based impacts on the application and practicality of the EMH. First, the most obvious conclusion from the study is that value stocks consistently outperform glamour stocks. The outperformance of value stocks over glamour stocks was consistent in all three scenarios

tested. Averaging the results from the three scenarios show that value outperformed growth stocks by .20% per month during negative market periods, or 2.44% annualized, affirming hypothesis one. However, the most notable result from the study is that, in addition to outperforming glamour stocks in negative market periods, value outperformed glamour in positive market periods as well. Furthermore, the degree of outperformance in positive periods was actually larger than the outperformance during the negative periods. This can be seen when considering an average of the tests yielded a .47% per month outperformance of value stocks versus growth stocks in positive periods, or 5.74% annualized. The fact that value outperforms glamour in both positive and negative market periods has important implications for the EMH, as the theory suggests that no one style of stock selection will consistently outperform. Specifically, according to the EMH, asset prices fully reflect all available information and thus follow a random walk pattern. However, as the study has shown, regardless of the market environment, value stocks consistently post higher returns than glamour stocks.

Furthermore, while the study's finding that value stocks outperform glamour stocks by a greater amount during positive periods does not contradict hypothesis one, the findings warrant discussion. It was initially posited that value would outperform glamour during negative market environments as the turmoil would purge speculation and drive a convergence of valuation to fundamentals. However, the logic underpinning this reasoning can still be reconciled with the results of the study. The most likely reason for the unexpected results is that the convergence of valuation to fundamentals takes place *after* the cessation of the negative market environment, rather than taking place *during* the negative period itself. Therefore, it is possible that the negative period simply serves to

remind the market of the divergence between valuation and fundamentals that has taken place, something that the majority of the market acts on only when market conditions improve. This rational proves logically sound, as though in the midst of a market or economic collapse/crisis many market participants realize the errors in their previous investment decisions, many find it difficult to remain a market participant. It is not until the dust settles and conditions show slight signs of improvement that the majority of market participants re-enter the market and begin to fully correct the valuations of value stocks.

Scenario Risk Results

Unlike the return results of the study, the findings of the study in regards to the risk of value stocks was less uniform across the three scenarios. From an overall perspective, the results of the tests were not as expected and consequently do not support hypothesis two. Specifically, on average, in times of both positive and negative market periods value stocks proved to be more risky than glamour stocks, as measured by beta. The average beta of the hedged value returns across the three scenarios in positive periods was .2338, while the average beta in negative periods was .1391. These findings are consistent with the EMH as the theory states that an investment's outperformance must be driven by an elevated level of risk.

However, several interesting details of the results should also be discussed. First, interesting information can be gleaned by analyzing the change in the beta of the hedged value returns as the market environment moved from positive to negative. Averaged across the three scenarios, the beta of the hedged value portfolio decreased by -.0948 to .1391 in negative periods. These results are counterintuitive. If value stocks were indeed inherently riskier than their glamour counterparts, their risk level should be higher, not

lower, in times when the risk of the overall market increases. In other words, the elevated risk of value stocks should be exacerbated as the market enters into a bear trend or other period of turbulence.

Furthermore, the hedged value beta in the up/down market scenario and the bull/non-bull scenario significantly differs from the recession/expansion scenario. The average hedged value beta during the negative periods of these two scenarios was a mere .0906. While this average beta still concludes that value stocks are riskier than glamour stocks in negative market periods, the beta is still very small, especially when considering the average 2.43% annualized outperformance of value during the same negative periods. Further support for this assertion can be seen in the beta-risk adjusted return in the expansion/recession scenario. Even after adjusting for beta in this scenario, value outperformed growth in both periods. A similar result can also be seen when considering the Up/Down scenario in which the down period had a significant beta-risk adjusted return. Therefore, while hypothesis two is still without support, the majority of the scenarios show that value stocks are able to generate a meaningful level of outperformance over growth stocks with only a small level of additional risk.

Conclusion

Overall, while not fully conclusive, the study resulted in the generation of meaningful and relevant evidence against the EMH. With regard to the risk results, the study did provide some support for the EMH by showing that value stocks are slightly more risky than glamour stocks. However, there are three anomalies that exist in the risk data. First, the beta of value stocks was reduced during negative market periods, something that is not likely to happen if value stocks are riskier than glamour stocks.

Also, in the majority of the scenarios' negative environments the beta of value stocks fell considerably, bringing the beta near 0, while value stocks still outperformed. Finally, in certain measurement periods value was able to generate a significant beta-risk adjusted return.

The study also showed that value stocks exhibit significant outperformance over glamour stocks, regardless of the prevailing economic or market environment. This consistent outperformance is unexplainable under the theory of the EMH, which posits that because all information is accurately reflected into asset prices, no investing style can consistently outperform over the long-run. However, the study clearly shows that purchasing undervalued stocks will lead to substantial outperformance over glamour stocks.

Taking into account both the return and risk results provides evidence that the outperformance of value stocks is not exclusively attributable to an elevated beta. Instead, the outperformance is likely due to the pervasive behavioral inefficiencies that exist in the financial markets. As was discussed at length in the literature review portion of the paper, while the market is undoubtedly able to rapidly adjust the prices of securities for new information, the lack of completely rational and logical actions frequently causes the market to diverge valuations from fundamentals. Therefore, due to the predisposition of humans to repeatedly engage in the same behavioral fallacies and inefficiencies, the market will persistently undervalue value stocks and overvalue glamour stocks, providing an opportunity for outperformance.

LIMITATIONS

A primary limitation of this study is the use of beta as a measure of risk. Beta is simply a measure of the volatility of a stock as it is calculated through a regression that determines the level of correlation of a security's returns to the price movements of the overall market. This relative volatility to the market is thought to be a measure of a stock's idiosyncratic risk. However, while beta is often used a proxy for risk, the reality is that beta is simply a calculation of volatility based on past price fluctuations. Beta therefore ignores any company specific fundamentals such as a firm's operations, valuation, or capital structure. Furthermore, because beta is a measure of volatility, using beta to measure risk means that both increases and decreases in a stock's price increase the level of beta-measured risk. Therefore, beta considers a rising stock price an indication of more risk, though an increasing stock price is positive for investors.

Furthermore, limitations also exist as a result of using a binary dummy variable to denote the positive or negative market environments within each scenario. In all three of the scenarios tested, a 1 denoted a negative environment while a 0 denoted a positive environment. However, no variable was given to denote neutral environments. For example, in the case of the expansion/recession scenario, while all periods fall under an expansionary or recessionary trend in the business cycle, some periods of economic growth are best described as neutral rather than recessionary or expansionary. However, due to the use of a binary dummy variable, a period must be classified as either expansionary or recessionary.

AREAS OF FURTHER STUDY

An interesting area of further study would be to conduct a similar series of tests that analyzes the risk/return profile of value stocks around bubbles. The pervasive existence of bubbles in financial markets has proven to be a significant anomaly for the EMH. Under the definition that a bubble is a two standard deviation move in real prices, a bubble should occur every 44 years (Montier 2009). However, under the aforementioned definition, studies have shown that 30 bubbles have occurred since 1925, or approximately one every three years (Montier 2009). While the current study analyzed up/down markets as well as bear markets, which are likely to reflect the consequences of bubbles in asset returns, this paper does not directly address the subject. Therefore, because of the preponderance of bubbles and the large effects on asset valuations, further study into this area is warranted.

Furthermore, another interesting area of further study would be to complete a similar test using a more holistic and comprehensive measure of risk. The limitations of using beta as a measure of risk have been thoroughly discussed above. The study could possibly be conducted using a better measure of risk that would incorporate beta, but also other factors such as a company's leverage and valuation.

IMPLICATIONS

Much like the results of the study, the implications of the paper as a whole are both broad based and meaningful. The discussion of behavioral inefficiencies and the study conducted in this paper are immensely relevant to not only professional investment managers, but every market participant.

The first implication of this paper is its relevance to investors making the decision to invest in either active or passive funds. Capital inflows to passive funds have rapidly increased in recent years as more passive investment vehicles are becoming available to investors. While it is true that the majority of managers are not able to consistently beat the market over extended periods of time, an investor should not make the decision to allocate capital to a passive fund based on the logic that the market is efficient. This paper has shown that while the EMH is theoretically eloquent, difficulties exist when trying to apply the theory to real markets. Consequently, investors should be aware that there are certain investing styles that enable the achievement of long-term outperformance.

Furthermore, the paper also contains implications to those investors choosing between active managers or selecting their own securities. Investing in high-flying glamour stocks is almost a natural disposition for most investors. These stocks are frequently involved in utilizing groundbreaking technology and innovation, and as a result generate excitement from investors. An investor will likely be overly exposed to a glamour stock as the investment merits will frequently be touted by the pundits on financial television networks as the stock's price rises higher and higher. After eventually seeing enough evidence of a glamour stock's investment merits in the form of large increases in price, the investor will add the glamour stock to their portfolio. The investor feels comfortable holding the stock, citing its strong historic performance and the feelings of safety knowing the market's favorable sentiment. Conversely, value stocks are shunned by the market as these companies lack luster when compared to a company

“revolutionizing” a product or an industry. The market looks down on these stocks with disdain, citing opportunities that are more exciting than these underperformers.

However, as the study included in this paper has shown, it is these demeaned value stocks that outperform the high-flying glamour stocks in the long-run, regardless of the current market environment. Therefore, investors who want to generate outperformance should guard themselves from being caught up in the allure of trying to find the next big glamour stock. These investors should instead invest in areas that others won't. Undertaking this contrarian perspective will allow investors to capitalize on the pervasive and systematic behavioral errors of market participants that frequently cause the market value of securities to diverge from the intrinsic value.

CONCLUSION

The purpose of this paper was to evaluate the merits of the Efficient Market Hypothesis by analyzing the risk and return profiles of value stocks. Since the debut of the EMH in the 1960's by Eugene Fama, numerous papers have been written that erode the assumptions on which the theory is dependent. Papers have frequently examined the returns of different value portfolios and situations in which a certain type of stock is likely to outperform. However, this paper adds to existing research by analyzing the relative performance and risk of value stocks versus glamour stocks over a multitude of market environments, from economic expansions to bear markets. Thus, this paper has made an attempt to contribute to existing critical evaluations of the EMH in a hope that the process by which this theory loses its perceived validity is accelerated.

The study found direct evidence against the applicability of the EMH to real markets in the consistent outperformance of value stocks over glamour stocks in both

positive and negative market environments. According to the semi-strong form of the EMH, asset prices follow a random walk and no publically available information can be used to select stocks that will routinely outperform. While it was hypothesized that value stocks would outperform during negative market environments as the turmoil would correct behavioral errors and cause the market to adjust security prices to intrinsic values, it was not expected that value stocks would also outperform during positive environments. According to the theory of the EMH, no indicator, metric, or investing style can help investors achieve long-term outperformance. However, this study shows that consistent outperformance in any market environment is clearly possible.

The EMH found more merit in the risk results of the study. The study did not support hypothesis two as it was concluded that value stocks are slightly more risky than glamour stocks. However, the results were contradictory in that if value stocks were more risky, the risk of value stocks would not decrease during negative market environments as they did in the study. Furthermore, during several of the tested scenarios value stocks maintained only a slight level of elevated risk while still providing outperformance versus glamour stocks, and in some periods value achieved a material beta-risk adjusted return.

By combining the overall consistent outperformance of value stocks with the inconsistent risk data, this study shows that the outperformance of value stocks is attributable to more than a risk premium. The performance of value stocks over glamour stocks, and the consequent shortcomings of the EMH, is instead driven by the inability of market participants to judge and evaluate pertinent information in a frequently logical and rational manner. Market participants frequently inadvertently over extrapolate company results, overreact to market or company news, engage in herd behavior and utilize mental

accounting. Understanding these behavioral tendencies and possessing the willingness to act opposite of the market allows a contrarian investor to outperform.

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