MUTUAL FUND RETURNS AND THE REVERSAL OF THE SIZE AND VALUE PREMIUMS

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ABSTRACT

Size, price/earnings (PE), and price-to-book (P/B) anomalies where stocks with smaller values tend to outperform have been known for more than 30 years. Fama & French's (1992) infamous three-factor model was developed as a direct result of these identified premiums. This study examines these anomalies from 1996-2015 to determine if mutual fund returns are consistent with theoretical returns.

Findings show mutual funds weighted toward size and value premiums have returns relatively consistent with theoretical projections after considering expense ratios, although there are major discrepancies in the small value and small growth categories. The bigger issue for investors is these premiums have reversed over the last ten years resulting in negative relative performance instead of positive. Since the size and value "premium" have become so well known, future use of these factors as a long-term investment strategy to attain excess returns seems far less likely.

INTRODUCTION

Market anomalies are generally defined as trading on stock traits that appear to outperform the market after adjusting for risk. This is in direct contrast to the Efficient Market Hypothesis first put forth by Fama (1965), winner of the 2013 Nobel Prize in Economics. Although there is a great deal of research on the existence of anomalies and how excess returns are theoretically available, there is little research on whether equity funds have been able to successfully implement trading strategies to take advantage of these anomalies. This question has been left unanswered mainly due to the relatively short time period that funds dedicated to these strategies have been in existence.

However, some funds based on these anomalies have now been in existence for more than 20 years with a substantial number available for at least 10 years. This is long enough to justify research into whether these funds have been able to replicate the theoretical results found in the academic literature. This study intends to answer two questions: 1) have excess returns been theoretically available from trading on market anomalies during these fund's existence, and 2) have mutual funds based on these trading strategies attained excess returns consistent with theoretical results. These are important questions as some in the academic literature suggest profitable trading on anomalies is unlikely due to anomaly inconsistency and trading costs, Silver (2009).

The remainder of this paper is organized as follows. Section two reviews the literature while Section three describes the data and methodology. Section four presents the results for theoretical portfolios and mutual funds. The paper concludes with a short analysis along with the practical implications of this research.

LITERATURE REVIEW

The most commonly agreed upon anomalies are size, price/earnings (PE) ratio, price-to-book (PB), volatility, and momentum. The first three, (where smaller is better) have been known for more than 30 years, (See Banz 1981 (size); Nicholson, 1960 and Basu, 1977 (PE); Rosenberg, Reid, & Lanstein, 1985 (PB); Jensen, Black, & Scholes, 1972 (volatility)). Jegadeesh & Titman (1993) first identified the momentum anomaly in which stocks that go up the most tend to keep going up, and stocks that fall tend to continue that trend. The interest in low volatility stocks has seen a resurgence in the literature with Ang, et. al. (2006, 2009) studies showing stocks with low volatility tend to generate higher returns than stocks with high volatility. Fama & French (1992, 1996, 2008) have reaffirmed these anomalies. Recent studies suggest these anomalies are still going strong, (Zacks, 2011; Silva, 2012).

Dijk (2011) did an exhaustive study on prior research into the size effect showing the question remains as to whether the size effect is truly an anomaly. Fama & French (2012) find value premiums decrease in size in a variety of international markets, but no size premium per se, while Asness et. al. (2013) also present evidence value and momentum premiums appear to be internationally relevant. Silver (2009) questions whether these anomalies can be taken advantage of in practice. This study tries to answer Silver's question while limiting itself to the size and value premiums as there are significantly more funds with longer histories for these anomalies.

Data & Methodology

This study examines both theoretical portfolio and mutual fund returns based on size and value factors. Theoretical data was attained from Ken French's website. Portfolios are sorted into three value weighted groups, 30/40/30 based on market value of equity, P/B, and P/E ratios. Mutual fund data is based on 96 stock mutual funds from the three largest mutual fund companies ranked by assets (Fidelity Investments, Vanguard Group, and American Fund). Thirty-three of these mutual funds have existed for more than twenty years. Return data for these mutual funds was attained from The Center for Research in Security Prices (CRSP) mutual fund database.

In order to confirm anomalous factors affect returns, the Fama-French three-factor model is applied to mutual funds. This model is a modification of the CAPM and is designed to describe stock returns by using company size, company P/B ratio, and market risk. The model is:

$$R_p - r_f = \alpha + \beta_p(K_m - r_f) + \beta_s(SMB) + \beta_v(HML) + \varepsilon \quad (1)$$

where R_p is the portfolio's rate of return, r_f is the risk-free return rate, and K_m is the return of the market portfolio. SMB (Small minus Big) is defined by Fama & French as the difference between the average return of three small portfolios and three big portfolios, and HML (High

minus Low) is defined as the difference between the average return of two value portfolios and two growth portfolios.

The values of SMB and HML are attained from Ken French's website. Regressions are run for each mutual fund and funds are categorized based on statistical significance at the 5% level. Excess fund returns statistically significant and positive to both factors are classified as small value funds. A fund found statistically negative to both factors is classified as a large growth fund. Funds found to be statistically significant to only one or the other are classified as small (positive to SMB), large (negative to SMB), value (positive to HML), or growth (negative to SMB).

As a final test to insure the mutual fund selection is unbiased, mutual funds in the small value, small growth, large value, and large growth categories as defined by Morningstar are also examined separately to confirm the results. This results in another 516 funds to be examined.

The Jan. 1996 to Dec. 2015 period and the two 10-year sub-periods are examined. This time frame is three years after the Fama & French (1992) study allowing adequate time for managers to implement strategies to take advantage of possible size and value premiums.

To evaluate the risk of these portfolios, both the Sharpe and Sortino (Sortino & Price, 1994) ratios are calculated. The Sharpe Ratio is given as:

$$\frac{R_p - r_f}{\sigma_p} \tag{2}$$

where R_p is the return to the portfolio, r_f is the risk-free rate and σ_p is the annualized standard deviation from the monthly returns. The Sortino ratio is a modification of the Sharpe ratio and focuses on the downside deviation to measure risk-adjusted returns. The larger the ratio, the greater the return per unit of downside risk. The Sortino ratio is calculated as:

$$S = \frac{R-T}{TDD} \text{ where } TDD = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(\text{Min}(0, X_i - T))^2} \tag{3}$$

where R = the return, T is the target return (set at zero), N is the total number of returns and X_i is the ith return.

RESULTS

Theoretical SMB and HML Returns

Fama and French's SMB and HML 10-year geometric annualized excess returns are shown in Figure 1 from July 1926 to Dec. 2015. Dates correspond to the end of each 10-year period on a rolling monthly basis. On average, small stocks outperform large cap stocks by 2.01% while the HML value premium is 3.98%. These premiums have varied with the SML factor being more volatile, 3.5% to 2.4% respectively. The value premium has been consistently positive except for the period ending with 2000 tech crash and the 10-year periods ending at the start of 2014.

Whether the disappearance of both premiums has been traded away over the last 10 years due to the anomalies being known, or is a temporary blip remains to be seen. At the very least, it would appear there is increased uncertainty as to whether the premiums will reappear and remain

positive over long periods of time in the future. In addition, investors who have been swayed by the historical returns to these factors have certainly been disappointed over the last 10 years.

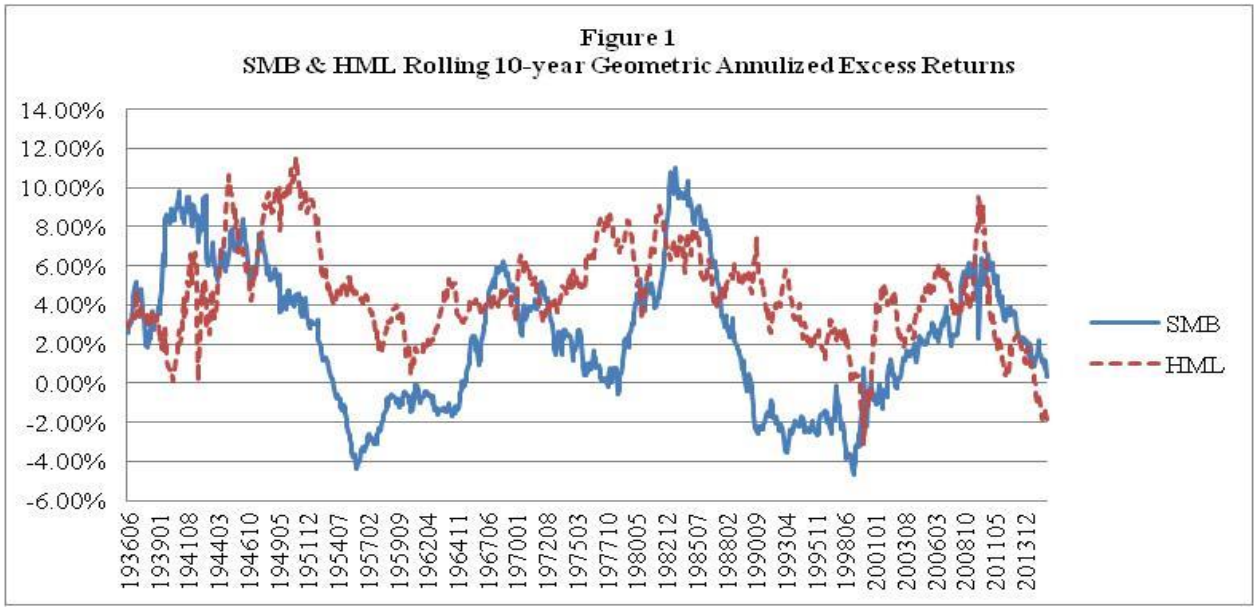
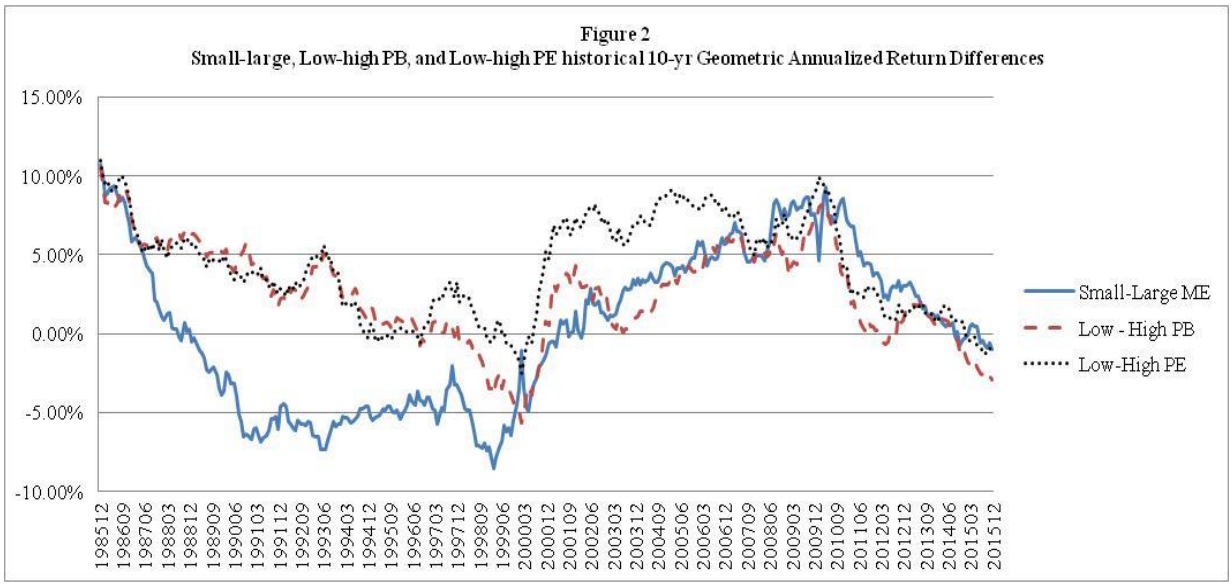


Figure 2 shows rolling 10-year geometric annualized return differences based on small minus large market value of equity, low minus high P/B, and low minus high PE portfolios for the Dec. 1986 to Dec. 2015 period. These results confirm the SMB and HML results above and clearly show there has been no size or value premium over the more recent 10-year holding periods.



Theoretical Size Anomaly

Table 1 shows theoretical returns based on size for the last 20 years along with two 10-year sub-periods. Results for the last 20 years still show a relationship between size and returns, although this is entirely dependent on the first 10 years. For the last 10 years, mid-caps stocks outperform while the small minus large anomaly has completely reversed itself.

Table 1
Annualized 10 year geometric returns for size ranked portfolios

	Low 30		Mid 40		High 30	
Jan. 1996-Dec. 2015	10.09%		9.96%		8.27%	
Jan. 1996-Dec. 2005	13.85%		11.42%		9.10%	
Jan. 2006-Dec. 2015	6.46%		8.52%		7.46%	
Sharpe and Sortino Ratios						
Jan. 1996-Dec. 2015	0.40	0.54	0.45	0.61	0.40	0.57
Jan. 1996-Dec. 2005	0.60	0.71	0.60	0.63	0.28	0.53
Jan. 2006-Dec. 2015	0.25	0.37	0.54	0.58	0.54	0.62

From a risk perspective, both the Sharpe and Sortino ratios generally suggest for the 20-year period small cap stocks are not generating excess returns per unit of risk. In fact, they have smaller Sharpe and Sortino ratios relative to both mid cap and large market value of equity stocks. Thus, even long-term investors are not realizing a size anomaly.

Theoretical P/B Anomaly

Table 2 shows geometric annualized returns for portfolios sorted by P/B. Although the first 10-year period does show lower P/B outperforms the highest, the mid quintile does best. For the last 10 years, high P/B portfolios clearly dominate. Both Sharpe and Sortino ratios are significantly higher over the last 10 years for high P/B portfolios. Even for the 20-year period, "value" stocks do not appear to be associated with anomalous excess returns after adjusting for risk as evidenced by the Sharpe and Sortino ratios.

Table 2
Annualized geometric returns for P/B portfolios

	Low 30		Mid 40		High 30	
Jan. 1996-Dec. 2015	9.10%		9.36%		8.68%	
Jan. 1996-Dec. 2005	12.31%		12.60%		8.44%	
Jan. 2006-Dec. 2015	5.98%		6.22%		8.92%	
Sharpe and Sortino Ratios						
Jan. 1996-Dec. 2015	0.40	0.57	0.45	0.67	0.40	0.60
Jan. 1996-Dec. 2005	0.60	0.96	0.60	0.95	0.28	0.42
Jan. 2006-Dec. 2015	0.25	0.35	0.31	0.44	0.54	0.82

Theoretical PE Anomaly

Another value indicator for stocks is the PE ratio where low PE stocks have been found to outperform high PE stocks. Table 3 shows portfolios with low PEs still outperform. For the 20-year period, low PE portfolios outperform high PE portfolios by 3.27% annually. However, the result is again based on the first 10 years, as the returns reverse over the last 10 years. Sharpe and Sortino ratios are directly related to returns. This suggests the higher returns for low PE stocks in the first 10 years and high PE stocks for the second 10 years are not associated with excess risk.

Table 3
Annualized geometric returns for PE Ranked portfolios

	Low 30		Mid 40		High 30	
Jan. 1996-Dec. 2015	11.49%		9.42%		8.22%	
Jan. 1996-Dec. 2005	16.09%		11.49%		8.13%	
Jan. 2006-Dec. 2015	7.06%		7.38%		8.31%	
Sharpe and Sortino Ratios						
Jan. 1996-Dec. 2015	0.56	0.84	0.49	0.75	0.36	0.54
Jan. 1996-Dec. 2005	0.80	1.30	0.54	0.88	0.27	0.41
Jan. 2006-Dec. 2015	0.35	0.50	0.44	0.63	0.45	0.67

Theoretical Small Value and Growth versus Large Value and Growth

Table 4 shows portfolios sorted by market cap and sorted again by small, mid, and large P/B. The small value (SV), small growth (SG), large value (LV), and large growth (LG) portfolios are shown. For the 20-year period, small value outperforms, and this is especially true over the first 10 years with an annualized return differential of almost 10% a year. However, like above, the last 10 years have shown just the opposite results.

Table 4
Annualized geometric returns Size and value ranked portfolios

	SV		SG		LV		LG	
Jan. 1996-Dec. 2015	12.34%		6.05%		7.93%		8.90%	
Jan. 1996-Dec. 2005	18.72%		4.96%		10.21%		8.75%	
Jan. 2006-Dec. 2015	6.31%		7.15%		5.71%		9.05%	
Sharpe and Sortino Ratios								
Jan. 1996-Dec. 2015	0.51	076	0.15	0.22	0.32	0.46	0.42	0.63
Jan. 1996-Dec. 2005	0.87	1.41	0.05	0.07	0.43	0.67	0.30	0.46
Jan. 2006-Dec. 2015	0.24	0.34	0.30	0.43	0.24	0.33	0.56	0.85

Summary of Theoretical Results

There is a vast literature on the size, P/B, and PE anomalies, but the results over the last 20 years suggest excess returns based on these factors may no longer be consistently available. Although the last 10-year period is not a complete outlier, it is only the second time that a 10- year period since 1936 has seen both the size and value premium turn negative. As these anomalies

have been publicized, the number of funds forming portfolios based on these anomalies has increased. At this point, it may be the case the excess returns that were once consistently available may simply have been traded away. The next section shows how mutual funds using these factors have performed.

Mutual Fund Results

Ninety-six (American (16), Fidelity (48), and Vanguard (32)) equity funds are regressed on the Fama-French 3-factor model to identity which funds are based on size, value, or both. As an example, Table 5 shows the regression results for five of these funds. Funds with statistically significant positive coefficients to the SMB and HML factors are assumed to be forming portfolios to some degree based on the size and value anomalies. An asterisk represents significance at the 5% level.

Table 5
Fama-French Three Factor Model regressions

	Mkt-Rf	T-stat	SMB	t-stat	HML	t-stat	Adj R-Sq
FNCMX	1.12	43.47*	0.28	6.21*	-0.37	-8.65*	0.95
FBGRX	1.02	61.38*	-0.07	-2.98*	-0.14	-5.74*	0.95
FLGEX	1.01	70.82*	-0.07	-2.43*	-0.23	-8.83*	0.98
FDSVX	1.00	38.17*	0.01	0.31	-0.20	-5.58*	0.89
VSEQX	1.03	45.28	0.27	8.95	0.35	10.66	0.91

If a fund has both factors significantly positive, it is classified as a small value fund, such as VSEQX in Table 5; if both negative, the fund is classified as a large growth fund such as FBGRX and FLGEX. In sum, there are eight categories, small, large, value, growth (FDSVX for example), small value, small growth, large value, and large growth. Returns from these mutual funds are compared to the theoretical returns reported earlier in this study.

Table 6 shows the results along with the return differences from the theoretical returns. The number of funds for each 10-year period are shown on the top row. Theoretical value returns are based on the average of the P/B and P/E values. For the entire 20-year period, small stock funds outperform large stock funds with similar returns relative to the theoretical numbers after considering expense ratios, 8.92% vs 10.09% and 6.48% vs 8.27% respectively. However, there is only one mutual fund for the 20-year period in the large only category so results should be interpreted cautiously. Interestingly, small cap mutual funds outperform their large only counterparts in both decades, albeit by very little in the 2006-15 decade.

Table 6
Annualized geometric returns and fund minus theoretical return difference

Number of funds in each 10 yr period =	Small 5 & 11	Large 1 & 3	Value 3 & 8	Growth 1 & 3	SV 5 &12	SG 8 &13	LV 18 & 26	LG 5 & 6
Jan. 1996-Dec. 2015	8.92%	6.48%	9.05%	6.48%	9.48%	8.69%	7.87%	7.33%
MF - Theoretical	-1.17%	-1.79%	-1.24%	-1.97%	-2.86%*	2.64%	-0.06%	-1.57%*
Jan. 1996-Dec. 2005	11.81%	7.43%	12.04%	7.43%	12.31%	9.53%	9.49%	7.14%
MF - Theoretical	-2.04%	-1.67%	-2.16%	-0.86%	-6.41%*	4.57%*	-0.72%*	-1.61%
Jan. 2006-Dec. 2015	6.75%	6.61%	6.23%	6.61%	6.67%	8.18%	6.30%	7.67%
MF - Theoretical	0.29%	-0.85%	-0.29%	-2.01%*	0.36%	1.03%	0.59%	-1.38%*

Value mutual funds beat growth which is also found in the theoretical results, although the value funds held their own against growth in the second decade as the three growth mutual funds fell -2.01% short of theoretical returns. Mutual fund results are better than the theoretical P/B returns but worse than the theoretical PE returns. This suggests funds are investing in value stocks based on a combination of P/B and PE and likely other factors as well.

Over the first 10-year period, small value mutual funds perform very well, but completely reverse in the following 10-year period where large growth funds outperform. The largest discrepancy from the theoretical results occurs for small value and small growth mutual funds in the 96-05 decade, with both differences statistically significant. It appears mutual fund managers are using other metrics besides P/B to determine value and growth stocks. Unlike the theoretical results, small growth funds outperform large growth funds in the second decade.

To confirm the above mutual funds results, all small value (50 funds), small growth (96), large value (171), and large growth (199) no transaction fee mutual funds based on Morningstar's fund categorization are also examined. The results are shown in Table 7 for those with complete data that cover the 10-year sub-periods.

Table 7
Annualized geometric returns for Morningstar categorized mutual funds

Number of funds in each 10 yr period =	SV 7 & 27	SG 22 & 64	LV 48 & 88	LG 71 & 134
Jan. 1996-Dec. 2015	9.47%	8.89%	7.34%	7.65%
MF – Theoretical	-2.87%*	2.84%*	-0.59%*	-1.25%*
Jan. 1996-Dec. 2005	11.56%	10.44%	8.95%	7.86%
MF – Theoretical	-7.16%*	5.48%*	-1.26%*	-0.89%*
Jan. 2006-Dec. 2015	5.41%	6.61%	5.73%	7.08%
MF - Theoretical	-0.90%	-0.54%	0.02%	-1.97%*

This broader sample reaffirms the results above where small value and large growth funds switched places over the last 20 years. The returns themselves are generally less than 0.5% different from the funds above with the biggest difference being the small growth funds in the 2006-2015 decade, 8.18% compared to 6.61% for the Morningstar sample.

However, most of the differences between the theoretical returns are quite significant and statistically so with the larger mutual fund sample size. Small value funds fell -7.16% short of the theoretical small value portfolio but are 5.48% better relative to small growth. The same type of result occurred for the funds from Fidelity, Vanguard, and American funds. Thus, the distinction between growth and value seems to be blurred in the small fund category, along with the fact factors in addition to P/B are clearly being used by fund managers to determine value versus growth stocks. If one combines the small value and small growth return differentials, much of the discrepancy can be explained by expense ratios. As an example, small value funds have an average expense ratio of 1.33%.

CONCLUSION

The size and value anomalies have been known for more than 30 years. The infamous Fama & French (1992) three-factor model is based on these known anomalies. However, the value of trading on these anomalies is no longer apparent. Over the last 10 years, large growth has outperformed small value by 2.74% and 1.67% annually based on theoretical portfolios and mutual funds respectively. This is the exact opposite of what one might have expected.

This study initially set out to determine if mutual funds using the small and value premiums could equal the performance of what theoretical portfolios suggest is possible. To match theoretical portfolio returns, funds must overcome several headwinds such as small stock liquidity, tax issues with rebalancing, expense ratios, manager flexibility, and fund flows. Despite these issues, average returns for funds are similar to what is theoretically expected after accounting for expense ratios. The main exception is for small value and small growth funds where small value underperforms substantially, but small growth outperforms. This is likely due to fund managers blurring the distinction between growth and value for small firms, and more relevant, value and growth stocks are chosen based on additional factors other than the P/B used by the Fama-French HML factor. The bigger return issue for investors is the small firm, P/B and PE anomalies reversed themselves during the period of this study.

This study examined the three largest fund providers along with more than 500 funds based on Morningstar's fund categorization starting three years after the Fama-French study was published. Although the first 10 years of this study period did indeed show the small firm and value premium was positive, this was not the case over the last 10 years. It is interesting to note for these three fund companies, only one large growth fund was added from the first 10-year period to the second 10-year period, while eight small value funds were added. It is possible excess returns have simply been traded away at this point. Because so many funds are chasing small value stocks, their prices have been bid up to the point where excess returns have been eliminated. The consistency of the size and value premium over long holding periods may be at an end.

REFERENCES

Ang, A, R.J. Hodrick, Y. Xing, & X. Zhang (2006). The cross-section of volatility and expected returns. *The Journal of Finance*, 61(1), 259-299.

Ang, A, R.J. Hodrick, Y. Xing, & X. Zhang (2009). High idiosyncratic volatility and low returns: International and further U.S. evidence. *Journal of Financial Economics*, 91, 1-23.

Asness, C., T.J. Moskowitz, & H.L. Pedersen (2013). Value and momentum everywhere. *The Journal of Finance*, 68(3), 929-985.

Banz, R.W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, 9, 3-18.

Basu, S. (1977). Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis. *The Journal of Finance*, 32(3), 663-682.

Dijk, van M.A. (2011). Is size dead? A review of the size effect in equity returns. *Journal of Banking and Finance*, 35(12), 3263–3274.

Fama, E.F. (1965). Random walks in stock market prices. *Financial Analysts Journal*, 21(5), 55–59.

Fama, E.F. & K.R. French (1992). The cross section of expected stock returns, *The Journal of Finance*, 67(2), 427-465.

Fama, E.F. & K.R. French (1996). Multifactor explanations of asset pricing anomalies. *The Journal of Finance*, 51(1), 55-84.

Fama, E.F. & K.R. French (2008). Dissecting anomalies. *The Journal of Finance*, 63(4), 1653-78.

Fama, E.F. & K.R. French (2012). Size, value, and momentum in international stock returns. *Journal of Financial Economics*, 105(3), 457-472.

Jegadeesh, N. & S. Titman (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance*, 48(1), 65-91.

Jensen, M.C., F. Black, & M.S. Scholes (1972). The capital asset pricing model: Some empirical tests. *Studies in the Theory of Capital Market.* Westport, CT: Praeger Publishers Inc.

Nicholson, F. (1960). Price-earnings ratios. *Financial Analysts Journal*, 16(4), 43-45.

Rosenberg, B.R., KR. Reid, & R. Lanstein (1985). Persuasive evidence of market inefficiency. *Journal of Portfolio Management*, 11(3), 9-17.

Silva, H. (2012). Exploiting the volatility anomaly in financial markets. *CFA Institute Conference Proceedings Quarterly*, March, 47-57.

Silver, T. (2009). Making sense of market anomalies. Retrieved February 19, 2013, from http://www.investopedia.com/articles/stocks/08/market-anomaly-efficient-market.asp

Sortino, F.A. & L. N. Price. (1994). Performance measurement in a downside risk framework, *The Journal of Investing*, 3(3), 59-54.

Zacks, L. (2011). *Handbook of equity market anomalies: Translating market inefficienies into effective investment strategies*, Hoboken, NJ, Wiley.