Evaluating Stock and Bond Portfolio Allocations using CAPER and Tobin's Q

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ABSTRACT

I test whether an investor can increase the returns on their portfolio over the long-term by timing the market using measures of market value, such as the Tobin's q ratio and the Cyclically Adjusted Price Earnings (CAPE or Shiller-CAPE). To test this proposition, I examine contrarian investor strategies proposed by Smithers and Wright (2000) and investor strategies based on different equity-fixed income combination portfolios. I seek to determine whether these strategies produce higher risk-adjusted returns than buy-and-hold equity strategies such as those proposed by Siegel (2014) for long-term portfolios. I also examine whether Siegel's theory that stocks are better investment vehicles than bonds for investment horizons greater than 20 years.

In my study, buy-and-hold portfolios composed of the S&P 500 have additional annualized returns of 1.5% than portfolios which reallocate funds in alternative securities based on CAPE and q thresholds. I conclude that for long-term investment horizons, an investor is unlikely to increase portfolio returns by reallocating funds to an alternative asset class when stocks are overvalued. However, I do not find that stocks are better investment vehicles compared to bonds as portfolio with bonds have a lower portfolio risk in my sample. I believe that the effectiveness q ratios for market timing is likely to be independent of how the q ratio is calculated. As suggested by Asness (2015), I find that portfolios that utilize both value and trend investing principles with CAPE and q may outperform portfolios that utilize only value-based market timing strategies. I conclude that CAPE and q based timing strategies are difficult to implement without detailed knowledge of future stock valuations.

Keywords: Portfolio Choice, Investment Decisions, Information on Market Efficiency

***JEL classification**:* G11; G14

1. **INTRODUCTION**

For many decades, both academics and practitioners have debated whether contrarian investing (also known as value investing) can be used to “beat the market.” Specifically, contrarian investors seek to take advantage of security mispricing by buying securities when they are undervalued and selling them when they are overvalued. Securities will frequently deviate from their book value because investors make buy or sell decisions based on subjective factors, such as the securities’ popularity or uniqueness, rather than the fundamental factors. A contrarian investor’s success is largely based upon their ability to “time the market,” by recognizing when the security in mispriced.

However, passive investors, also known as index investors, believe that investors utilizing contrarian strategies underperform in the long run, and suggest buying and holding high performing securities to maximize returns. Essentially, passive investors believe that estimating the underlying value of a security is too difficult. They believe that market returns are relatively random leading to inconsistent returns.

In my study, I compare a contrarian investment strategy advocated by Smithers and Wright (2000) to a passive investment strategy promoted by Siegel (2014). Siegel (2014) argues that buy-and-hold equity portfolios outperform portfolios that invest in varying levels of equity and fixed income over long investment horizons, typically 20 years or longer. However, Smithers and Wright (2000) argue that the Tobin’s q ratio, a measure of price over fundamental value, can be used to time the market by identifying the stocks that are overvalued. I test Smithers and Wright’s strategy by using cyclically adjusted price-earnings (CAPE), a measure of value developed by Shiller (2000). Shiller (2000) argues that CAPE can be used as a metric for contrarian investment strategies.

Siegel's arguments supporting the buy-and-hold equity portfolio are based on an analysis of historical data. His analysis shows that from 1871 to 2012, stocks outperformed bonds 95% of the time, by giving both higher returns and lower standard deviations (Siegel, 2014, Chapter 5). Shiller's arguments in favor of CAPE are based on work by Campbell and Shiller (1998) in which CAPE was proposed as a more accurate measure of valuation than Price-over-Earnings (P/E). Smithers and Wright (2000) regard Tobin's q, proposed by Tobin (1969) as market capitalization over value of capital, as the best measure for market timing as it divides price by replacement value instead of earnings. Using q based timing strategies, Smithers and Wright (2000) constructed portfolios that returned 5-8% more annualized than the S&P 500, over the 1900-2000 period (Chapter 14).

However, there are drawbacks to each approach. Siegel has been openly critical of market timing based on CAPE and Tobin's q. Siegel (2013) has argued that distorted earning reports and an increase in the growth rate of earnings have biased the CAPE upwards. Regarding the Tobin's q approach, Siegel (2014, Chapter 11) writes that there is no accurate way to estimate capital value independent of stock market value because capital equipment and structure lack a secondary market. Similarly, Shiller and Smithers & Wright have criticized Siegel's approach. Shiller (2000, Chapter 10) argues that there are not enough independent 20 to 30 year time periods to conclusively prove that stocks are superior to bonds. Further, in countries other than US, bonds have outperformed stocks over long periods. Smithers and Wright (2000) have written that regardless of the superiority of one security over another, market timing has a significant effect on the long-term return of a portfolio. For example, an investor in the S&P from January 1985- January 2000 would have obtained returns of 14.89% on an annual basis and would have outperformed Vanguard's Ginnie Mae Bond Fund (VFIIX), with 9.44% annualized return.

However, an investor in the S&P from 1998-2013 would have obtained a 3.97% annualized return and underperformed VFIIX, returning 5.69% annualized.

To test whether the timing strategies based on CAPE and Tobin's q are superior to buy-and-hold equity strategies, I checked if the portfolios that utilized the timing strategies over a certain time period consistently delivered higher risk-adjusted returns than those which invested in equity only over the same period. I used S&P 500 as a proxy for equity as S&P is one of the few securities with a publically available series of q and CAPE values. To test the timing strategies, I constructed portfolios that consisted of S&P 500 and various other securities, which I call "alternative" securities. Specifically, these alternative securities are the seven different Vanguard bond indices, an MSCI developed market (EFA) and emerging market index (EEM), gold, and cash for two different time periods.

For each portfolio combination, I tested ten different timing strategies. Six of these are based on the three trading rules suggested by Smithers and Wright (2000, Chapter 14). Although these strategies are for Tobin's q, I apply these to CAPE, as CAPE is highly correlated with q as a measure of underlying equity value. These strategies are: (1) When q goes above average for equity, switch to an alternative security, (2) When q goes 50% above average for equity, switch to an alternative security, and (3) When q goes 50% above average for equity, hold the alternative security until it goes below the average. Two other timing strategies are based on return maximizing strategies that I calculated for CAPE and Tobin's q over the 1975 to 2015 time period. For CAPE, this is to invest in the alternative security when CAPE goes above 30, and switch back into equity when CAPE goes below 15. For q, this is to invest in the alternative security when q goes above 2.4, and switch back into equity when q goes below 1. For the 1935-1975 cash portfolio, I calculated the return maximizing strategy using 22.89 and 11.46 as the

CAPE thresholds and 1.89 and 0.79 as q threshold to account for price level differences. The last two strategies are buy-and-hold for equity and buy-and-hold for the alternative security. Equity-only is the Siegel recommended strategy and alternative security-only is used for comparison purposes.

2. **DATA SOURCE AND FUND SELECTION**

I use Yahoo Finance as my source for historically adjusted price data for each security, Shiller's online website (2011) as my source for historical S&P CAPE values and data sets provided directly by Smithers (2011) for my Tobin's q values. Historically adjusted prices account for inflation and splits, and assume dividends and interest rates to be reinvested in the underlying security.

I use the S&P 500 as my proxy for equity. Regarding proxies for bonds, I use Vanguard investor fund selections, specifically the Ginnie Mae Fund (VFIIX), Short Term Federal Fund (VSGBX), Total Bond Market Fund (VBMFX), Short Term Investment Grade Fund (VFSTX), the Long Term Treasury Fund (VUSTX), the High-Yield Corporate Fund (VWEHX), and Long-Term Investment Grade Fund (VWESX). I picked bond funds that have inception dates around 1980 as it is easy to obtain historically adjusted price data for these funds. This also allows me to test timing strategies over relatively long periods.

I use the timing strategies with developed market and emerging market funds to test Siegel's hypothesis that international equities provide better diversification than fixed income and Smithers and Wright's hypothesis that international stocks pose too much risk to be a good alternative to fixed income. I use iShares MSCI EAFE (EFA) as my proxy for developed market return and iShares MSCI Emerging Markets (EEM) as my proxy for emerging market return. For both these indexes, I use net total returns, which assumes that dividends are reinvested after deducting withholding taxes using a tax rate applicable to non-resident investors who do not benefit from double taxation treaties (MSCI, 2012).

I test equity against gold to evaluate whether inflation expectations play a role in the effectiveness of the timing strategies and equity against cash. These follow Smithers & Wright's original trading rules for portfolios investing in stocks and cash. I use historically adjusted prices of the one-month forward gold contract as a proxy to calculate gold returns and the proportional changes in the Consumer Price Index as the proxy for cash returns. I test over two different time periods with cash (1935-1975 and 1975-2015) to see whether the thresholds used for the timing strategies provide consistent returns over different time periods.

3. CALCULATING TOBIN'S Q AND CAPER

Campbell and Shiller (1998) calculate CAPE by dividing real price by a ten-year average of real earnings. This metric is based on Graham and Dodd (2006) who suggest that averaging a firm's earnings over 7-10 years provides a more accurate estimation of value than one year earnings. Tower (2011) constructed a version of CAPE called CAPER, which may serve as a better predictor for equity prices. To obtain CAPER, trend real earnings calculated by regressing the natural log of real earnings on time and taking antilog of the calculated values are used for the price earnings ratio. However, I use the Shiller CAPE in this study instead of CAPER because CAPER is harder to estimate when earnings are zero or unavailable. My measure is slightly different from Shiller CAPE in that I use the end of month S&P prices instead of the average of monthly S&P prices.

Tobin's q, as first proposed by James Tobin (1969), is the ratio of market capitalization divided by the value of capital, which reflects how highly the stock is valued relative to the replacement cost. Smithers and Wright (2000) calculate the q ratio for the S&P index by dividing the market value of outstanding equities over the sum of book values (physical capital) of all stocks contained in the index. One difference is I use log-adjusted q values for this study.

4. OPTIMAL MARKET TIMING STRATEGIES

Before constructing an optimal timing strategy using CAPE and q thresholds, I considered constructing an optimal timing strategy using the functional form equation to estimate the optimal stock portfolio share as a function of CAPE or q. I believed that the logit function would be superior to a linear function, as a linear function would imply that low values of CAPE or q would require more than 100% investment in stocks, and high values of CAPE or q would require less than 0% invested in stocks. I constructed the following equation as a possible optimal function:

$$F(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$

Equation 1. Function Logit form with x as the CAPE or q value β_0 is the equity beta, and β_1 is the alternative security beta. In this equation, equity beta is always equal to 1 if the equity in question is the whole equity market

In this equation, x is the CAPE or q value, β_0 is the equity beta, and β_1 is the alternative security beta. However, I ran into issues with this method because there was no significant correlation between CAPE and return of the alternative securities.

Therefore, to determine the optimal thresholds for my CAPE and Tobin's q timing strategies, I calculated the return for all portfolios using a variant of Smithers and Wright's third timing strategy. This strategy requires investment in the alternative security when CAPE or q for equity reaches a certain high threshold until CAPE or q for the equity reaches a certain lower threshold. I found these by testing the Ginnie Mae Fund (VFIIX) against the Vanguard 500 Index Fund (VFINX) instead of the S&P 500 to avoid any consistency issues caused by the portfolio construction. The returns all two-tiered threshold CAPE combinations from the 1980-2015 historical period are shown in Table 1.

Table 1: Portfolio Returns for Different CAPE Threshold Combinations – Two Tiered

Portfolio returns are calculated on an annualized basis. CAPE Upper limit refers to the level at which to switch from VFINX (equity) to VFIIX (alternative security, in this case, a fixed income fund). CAPE Lower level refers to the threshold at which to reinvest in equity. Cells highlighted in green perform better the buy-and-hold VFINX during the entire period, represented by the top left hand cell in orange, and cells highlighted in yellow are optimal for the particular upper limit. Note that cells that are both optimal and outperform VFINX have a green shading.

		CAPE UPPER LIMIT									
		45	40	35	30	25	20	15	10	5	0
CAPE LOWER LIMIT	45	6.84%	-	-	-	-	-	-	-	-	-
	40	6.12%	6.11%	-	-	-	-	-	-	-	-
	35	6.12%	6.23%	6.27%	-	-	-	-	-	-	-
	30	6.12%	6.32%	6.26%	6.48%	-	-	-	-	-	-
	25	6.12%	6.46%	6.40%	6.57%	6.11%	-	-	-	-	-
	20	6.12%	6.60%	6.54%	6.89%	6.37%	5.91%	-	-	-	-
	15	7.66%	6.71%	6.65%	9.62%	8.72%	6.13%	5.70%	-	-	-
	10	6.12%	6.04%	5.98%	6.81%	6.13%	6.15%	5.24%	3.44%	-	-
	5	6.12%	6.04%	5.98%	3.85%	3.52%	3.09%	2.82%	2.61%	2.19%	-
	0	4.38%	6.04%	5.98%	3.85%	2.55%	2.23%	2.19%	2.19%	2.19%	2.19%

Smithers and Wright's thresholds for this period would be 26.15 for the CAPE upper limit and 21.55 for the CAPE lower limit. However, those strategies are not optimal for this time period, as Smithers and Wright (2000, Chapter 14) made their recommendations based on optimal values calculated with portfolios invested during 1900-2000. In fact, Smithers and Wright's thresholds underperform buy-and-hold equity for this time period. The results for Tobin's q are similar and are displayed in table 2.

Table 2: Portfolio Returns for Different Tobin's q Threshold Combinations – Two Tiered

Portfolio returns are calculated on an annualized basis. Tobin's q Upper limit refers to the level at which to switch from VFINX (equity) to VFIIX (alternative security, in this case, a fixed income fund). Tobin's q Lower level refers to the threshold at which to reinvest in equity. Cells highlighted in green perform better the buy-and-hold VFINX during the entire period, represented by the top left hand cell in orange, and cells highlighted in yellow are optimal for the particular upper limit. Note that cells that are both optimal and outperform VFINX have a green shading. The most optimal cell overall is depicted with a red font.

	TOBIN'S Q UPPER LIMIT											
TOBIN'S Q LOWER LIMIT	2.6	2.4	2.2	2	1.8	1.6	1.4	1.2	1	0.8	0.6	0.4
2.6	7.84%	-	-	-	-	-	-	-	-	-	-	-
2.4	7.84%	8.20%	-	-	-	-	-	-	-	-	-	-
2.2	7.84%	8.37%	8.12%	-	-	-	-	-	-	-	-	-
2	7.84%	8.37%	8.12%	8.11%	-	-	-	-	-	-	-	-
1.8	7.84%	8.72%	8.47%	7.70%	7.48%	-	-	-	-	-	-	-
1.6	7.84%	9.16%	8.91%	8.14%	7.30%	6.28%	-	-	-	-	-	-
1.4	7.84%	9.75%	9.50%	8.73%	7.89%	6.81%	6.48%	-	-	-	-	-
1.2	7.84%	9.77%	9.53%	8.76%	7.92%	6.84%	5.68%	5.56%	-	-	-	-
1	7.84%	10.33%	10.08%	9.31%	8.47%	7.39%	6.24%	6.28%	5.85%	-	-	-
0.8	7.84%	8.30%	8.05%	7.29%	6.73%	6.17%	5.70%	5.74%	5.61%	5.67%	-	-
0.6	7.84%	8.30%	8.05%	7.29%	6.73%	6.17%	5.70%	5.74%	5.61%	5.24%	4.92%	-
0.4	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%	4.39%

I find my optimal threshold (in red) to be 2.4 for the upper limit and 1 for the lower limit, which is different from Smithers and Wright's thresholds as 1.58 for the upper limit on q and 1.3 for the lower limit on q.

Even though the Smithers and Wright strategies are not optimal, I still test their strategies because they are quite intuitive. Investors would not be able to apply the optimal strategies because it would require them to predict all CAPE and Tobin's q values for the future duration of investment. I only test the optimal strategies to see how they perform relative to buy-and-hold equity and the Smithers and Wright strategies.

5. NOTE ON TIME HORIZONS

For funds initiated after 1975, the time horizon for the implementing the timing strategies are from fund inception until December 2014. For funds and securities with prices that date before 1975, my time horizon is January 1975 to December 2014. The exception to these rules are the S&P 500 and CPI combination from 1935 to 1975.

In contrast to the 100 year time horizon Smithers and Wright use, I do not test the strategies for periods beyond 40 years because I want to evaluate the strategies for time periods that are realistic for an investor. However, I still keep my time horizons quite long, as the shortest time horizon is 27 years, to make sure that I accurately assess whether buy-and-hold equity provides higher returns that timing based portfolio in periods over 20 years, as Siegel (2014) argues.

6. **RESULTS: APPENDICES**

Appendix 1 shows the results of the comparison of all portfolios for CAPE based timing strategies. Appendix 2 shows the results of the comparison of all portfolios for Tobin's q based strategies. Appendix 3 includes the yearly figures for S&P CAPE and q since 1935. Appendix 4 shows the averages for the results in appendices 1 and 2.

For each portfolio and strategy combination in Appendices 1 and 2, I calculate the annualized return, standard deviation (risk), Sharpe Ratio, proportion of equity investment, correlation, beta, Jensen alpha (annualized) and r-squared. S&P 500 return is used as the market return and the return on the Consumer Price Index is used as the risk-free-rate. The correlation value represents that correlation between the portfolio and the market, specifically the S&P 500.

Strategy #1 – Strategy #3 refer to the strategies described by Smithers and Wright for Tobin's q, which I also apply to CAPE. My optimal strategies are labeled as Strategy #4 for both Tobin's q and CAPE. Buy-and-hold equity is listed as "Equity Only" and buy-and-hold alternative security is listed as "Alternative Security Only."

7. **IMPLICATIONS FOR SMITHERS & WRIGHT**

My results do not support Smithers and Wright's trading rules as strategies that can be applied to increase portfolio return. The portfolios that utilize Smithers and Wright's strategies exhibit lower annual returns, returning 6.56% annualized on average for Strategy #1-Strategy #3, than equity-only portfolios, retuning 8.05% annualized on average, and provide an average Jensen Alpha of 0.43% annually (see Appendix 1.4). Portfolios that use Smithers and Wright's strategies for q, returning 6.16% annualized on average for Strategy #1-Strategy #3, perform worse than those that that utilize CAPE.

The portfolios that utilize my optimal strategies consistently perform better than equity-only strategies and provide an average Jensen Alpha of 3.35% annually. However, this does not necessarily support the hypothesis that q based timing strategies can be utilized to increase portfolio return.

In the graphs section, I display the returns and standard deviations for the combinations of CAPE (Graph 1 in Graph Section) and Tobin's q (Graph 2 in Graph Section) timing strategies that one can use to determine equity investment for the Ginnie Mae (VFIIX) – Vanguard 500 (VFINX) combination. As implied by the rightmost point, the VFINX only portfolio had a return 6.74% and a risk of 4.46% for this period. The optimal portfolio had a return of 7.41% and a risk of 4.20%. The optimal portfolio does not perform much better than the VFINX-only portfolio and 56% of timing based portfolios performed worse than the equity-only portfolio. For q, the potential of these strategies is even worse than for CAPE. The optimal portfolio has a return 8.32% and risk of 4.29%. However, 79% of timing based portfolios performed worse than the equity-only portfolio.

Portfolios that utilize the two thresholds have greater return potential from the optimal portfolio, but also result in greater risk of loss. For example, the optimal portfolio using this timing strategy for CAPE returns 9.62% but 95% of two threshold CAPE strategies underperform buy-and-hold equity. For q, the optimal portfolio returns 10.55% but 65% of two threshold q strategies underperform buy-and-hold equity.

Additionally, by performing regression for all portfolios combinations I determined that the equity return has a strong effect on portfolio return. The regression of all portfolio returns on proportion of equity investment, equity return and alternative security return is depicted below.

Regression 1: Portfolio Return on Proportion of Time Invested in S&P, S&P Return, and Alternative Security Return

In this regression, portfolio return is the dependent variable and Proportion of Time Invested in S&P, S&P Return, and Alternative Security Return are the independent variables. Pr (>|t|) is also known as the p-value. The 108 observations for this regression are all portfolios combinations except those that did not invest in equity, specifically, any of the alternative security proxies. All returns are annualized. Proportion of time invested in equity refers to the percentage of monthly periods in which the strategy requires the investor to be long in the equity security.

Model Summary

Observations	R	R Square	Adjusted R Square	Std. Error of the Estimate
108	0.6201	0.3845	0.3667	0.0174

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.0197	3	0.0066	21.6558	0.000
Residual	0.0315	104	0.0003		
Total	0.0512	107			

Coefficients

Model	Unstandardized Coefficients		t-Value	Pr(>|t|)
	B	Std. Error		
(Intercept)	-0.0265	0.0132	-2.0135	0.0466
Proportion of Time Invested in S&P	0.0370	0.0114	3.2530	0.0015
S&P Return	0.8816	0.1252	7.0441	0.0000
Alternative Security Return	0.0572	0.0525	1.0893	0.2785

From the results above, I can conclude that equity return explains most of the variation in portfolio returns. Proportion of S&P investment is also significant and is a factor that could affect portfolio return in larger sample sizes. Alternative security return has no effect on portfolio return. If Smithers and Wright's strategies were correct, then I would not expect to see a significant relationship between proportion of time invested in S&P and portfolio return, as timing strategies would work regardless of how often one invests in stocks. However, my results suggest the opposite which implies that equity, not strategy, is driving the portfolio return.

8. RESULTS: IMPLICATIONS FOR SIEGEL

My results support Siegel's hypothesis, specifically for CAPE and Tobin's q, that market timing based portfolios will not usually outperform buy-and-hold index based equity portfolios. Siegel (2014) does believe that value investing can be used to outperform the market, but also argues, that CAPE and Tobin's q do not provide accurate estimates of underlying value, and therefore cannot be used to outperform buy-and-hold equity strategies.

However, in my sample, I do not find support for Siegel's theory that stocks are superior investment vehicles than bonds for periods greater than 20 years. The bond funds I examined returned an annualized average return of 7.6% which is much greater than the 5.1% value that Siegel believes one should expect from bonds. Siegel (2014) obtained his estimate from observing historical returns from 1871-2012, but most of the historical periods examined in my study are from 1975-2014. Since 1985, there has been the advent of a much wider variety of fixed income securities for investors that desire high-yield, such asset-backed debt obligations. Because we will continue to see the development of debt-based securities that fit the high-risk high-return profile of stocks, it is likely that portfolios containing fixed income investment can outperform equity-only portfolios over the long term.

Siegel (2014) argues that stocks are less risky than bonds for investment horizons greater than 20 years. However, I do not observe this is my study. The average standard deviation for portfolios investing in equity-only (or equity and gold) is 4.33% while the standard deviation for portfolios that invest in equity with fixed income or cash is 3.66%. The results of the regression for portfolio risk on proportion of alternative security investment, for only the portfolios invested in the S&P with the Vanguard bond funds or cash, is shown below.

Regression 2: Portfolio Risk on Proportion of Time Invested in Fixed Income Fund

In this regression, portfolio return is the dependent variable and Proportion of Time Invested in Fixed Income is the independent variables. PR (>|t|) is also known as the p-value. The 84 observations for this regression are portfolios combinations that required investing in Vanguard Bond Funds. Proportion of time invested in fixed income refers to the percentage of monthly periods in which the strategy requires the investor to be long in the fixed income security – in this case, the Vanguard Bond Fund.

Model Summary

Observations	R	R Square	Adjusted R Square	Std. Error of the Estimate
84	0.8028	0.6444	0.6401	0.0947

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.3320	1	1.3320	148.6207	0.000
Residual	0.7349	82	0.0090		
Total	2.0670	83			

Coefficients

Model	Unstandardized Coefficients		t-Value	Pr(>|t|)
	B	Std. Error		
(Intercept)	1.7936	0.1234	14.5292	0.0000
Proportion of Time Invested in Fixed Income	-39.8244	3.2667	-12.1910	0.0000

It is clear from these results that time invested in the Vanguard bond fund is the most significant determinant of portfolio risk. In my sample, portfolios that invest in Vanguard bond funds for longer periods observe much lower levels of risk, even though the time horizon for all of my observations is more than 20 years. Siegel (2014, Chapter 5) argues that bonds observe mean aversion in the long run because fears of high inflation lead to higher fixed income risk. However, since the mid-1980s, the U.S. has seen relatively low levels of inflation. This means that there can be long periods in which bonds are less risky than stocks.

9. **RESULTS: IMPLICATIONS FOR SHILLER CAPE**

My results neither support nor refute theories regarding CAPE proposed by Shiller (2000). It is important to note that Shiller does not advocate the use of CAPE for market timing strategies. However, in my study, CAPE based timing methods do perform better than q based timing methods on average. Nevertheless, I believe there are ways in which CAPE can be improved if it is to be used to predict the market.

One issue with CAPE is that it assumes that an economic cycle lasts for an average of ten years. Campbell and Shiller (1998) and Shiller (1999) justified this assumption by showing that, for the S&P 500, a division by the ten year average of earnings is most highly correlated with stock market value. However, CAPE can be biased upward or downward for economic cycles that are much shorter than 10 years. For example, CAPE has only been below average for one month since 1992 at the trough of the great recession in 2009. In this case, earnings for the tech bubble were included in the measure from 1998-2010. Because the CAPE did not increase during the economic expansion in the mid-2000s, an investor would have not be able to forecast the subprime mortgage crisis using CAPE. For this reason, Bunn (2014) suggests that I should adjust CAPE based on relative value to reflect changes in the duration of economic cycles.

The other issue with CAPE is that it relies on reported earnings rather than actual earnings. Before the last recession, many companies bought-back stock instead of distributing dividends, which gives an inflated value of a company's earnings. Inflated values of corporate earnings bias CAPE upwards. Siegel (2014, Chapter 11) has suggested that I substitute S&P reported earnings with National Income Product Account (NIPA) earnings to fix this issue.

10. **TIMING STRATEGIES USING ALTERNATIVE Q RATIOS**

I examined whether alternative q calculation methods can be used for market timing strategies, but found that methods proposed by Chung and Pruitt (1994) and Phillipon (2011) are not ideal for market timing, meaning that that q ratios effectiveness for market timing is likely independent of how the q ratio is calculated.

One issue with q is that it is difficult to calculate and therefore not readily available for most stocks. Chung and Pruitt (1994) proposed a method to simplify the calculation of the q ratio with the equation (MVE + PS + DEBT) / TA. In this formula, MVE is the share price, PS is the liquidating value of outstanding stock, DEBT is the value of long-term liabilities net its short term assets plus the book value of the firm's long term debt, and TA is the book value of total assets. However, one issue I see with this method is that the low interest rates cause the long term debt value to increase. Low interest rates can inflate q if rates decline over long periods of time. This has been an issue in the United States, which Swedroe (2015) believes is caused by aging demographics and the need for higher amount of fixed income investment in retirement portfolios. Even though interest rates have an effect on Smithers and Wright's q (see graph 3), they leave the book value calculation (in the q denominator) open to different methods, including those that can neutralize that effect of artificially low interest rates.

It is also important to consider whether market timing can be implemented with q calculated for bonds. Phillipon (2011) recently developed a method to calculate q for corporate bonds using the traditional definition of market value over replacement cost. His method is similar to Hayashi (1982) but accounts for total firm value including the value of growth options. Phillipon measures fixed income risks (idiosyncratic risk, credit risk etc.) by modelling payment equations through a Markov Process that contains variables that account for different probabilities of risk. Phillipon's bond q is specifically for corporate bonds but the q for corporate bonds does not necessarily tell us about the underlying value for other types of fixed income funds or even other corporate bond funds. For example, below is a regression of Phillipon's bond q values, calculated quarterly, on returns for the Vanguard High-Yield Corporate Bond Fund (VWEHX).

Regression 3: Bond q values on Vanguard High-Yield Corporate Bond Fund Return

In this regression, bond q values is the dependent variable and Vanguard High-Yield Corporate Bond Fund (VWEHX) Return is the independent variable. PR (>|t|) is also known as the p-value. The 115 observations for this regression refer to quarterly periods from VWEHX initiation inQ4 1978 to Q4 2007.

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Model Summary

Observations	R	R Square	Adjusted R Square	Std. Error of the Estimate
115	0.1304	0.0170	0.088	0.0962

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.0181	1	0.0181	1.9554	0.1647
Residual	1.0450	113	0.0092		
Total	1.063	114			

Coefficients

Model	Unstandardized Coefficients		t-Value	Pr(>|t|)
	B	Std. Error		
(Intercept)	2.5204	0.7047	3.5765	0.0005
VWEHX Return	-0.9780	0.6994	-1.3983	0.1647

These results indicate that there is not a significant relationship between the two measures. I expect this because the probabilistic values of fixed income risk are different for every fixed income security and fund and therefore, it is not reasonable to use a bond q to implement timing strategies for the whole market.

11. **IMPLICATIONS OF TREND INVESTING**

One way to improve investing strategies involving CAPE and q would be to utilize trend investing, also known as momentum investing, along with market timing. Trend investors argue that when assets are rising in recent periods, they are more likely to rise in the future, and when they have been falling in recent periods, they are more likely to fall in the future. Asness (2015) compared the performance of an optimal trend-following strategy that utilizes CAPE to that of one that utilizes the optimal contrarian strategy using a U.S. Equity-10 Year Treasury portfolio from 1900-2014. The trend strategy is to own 150% equities when the prior year trend is at the 60 year maximum and 50% equities when prior year trend is at a 60 year minimum. In his study, the optimal trend strategy outperforms the optimal contrarian strategy by 0.7% per annum.

Trend investing can be better on two specific aspects of Smithers and Wright's strategy. First, a trend investing strategy would not be binary, that is investing either fully in equity or fully in the alternative security. In my study, I find that there are many periods in which getting out of equity results in the investor missing out on positive returns. The table below depicts, specifically from strategy #3 from Smithers and Wright, and my optimal strategy #4, periods where equity return is greater than alternative security for periods where the strategy required the investor to invest in the alternative security,.

Table 4: Percentage of Periods Where Equity Return Is Greater Than Alterative Security Return in Periods of Alternative Security Investment

For specifically strategies #3, when q or CAPE goes 50% above average for equity, hold alternative security until it goes below the average, from Smithers and Wright, and strategy #4, My optimal strategies, with thresholds at 30 CAPE upper limit, 15 CAPE limit, 2.4 q upper limit, and 1 q lower limit, this table depicts, for periods where the strategy required the investor invest in the alternative security, monthly periods where equity return is greater than alternative security. *Strategy contains no signal for alternative security investment.

Percentage of Periods Where Equity Return Is Greater Than Alterative Security Return in Periods of Alternative Security Investment

Portfolio Composition	Strategy #3 – CAPE	Strategy #4 – CAPE	Strategy #3 – Q	Strategy #4 – Q
S&P 500 -VFIIX	56.15%	52.86%	60.38%	50.94%
S&P 500 -VSGBX	56.15%	52.86%	61.01%	50.94%
S&P 500 - VBMFX	47.73%	51.43%	59.78%	49.06%
S&P 500 - VFSTX	53.54%	52.14%	57.69%	49.06%
S&P 500 - VUSTX	60.00%	45.71%	56.52%	40.57%
S&P 500 - VWEHX	54.69%	54.29%	57.93%	50.00%
S&P 500 -VWESX ('75-'15)	48.72%	45.00%	48.68%	39.62%
S&P 500 - EAFE ('75-'15)	48.72%	45.71%	42.86%	45.28%
S&P 500 - EEM	47.06%	44.29%	62.22%	39.62%
S&P 500 - GLD ('75-'15)	51.28%	45.71%	49.21%	40.57%
S&P 500 - CPI ('35-'75)	56.35%	50.00%	55.36%	--*
S&P 500 - CPI ('75-'15)	59.62%	56.43%	54.50%	52.83%

In many cases, in the majority of monthly periods where the trading strategies require us to invest in the alternative security, equity has a higher return than the alternative security. Trend investing implies that the underlying value is not the only determinant of price. Investors will buy securities that are overvalued because they have exhibited positive returns in the past and vice versa. Therefore, it is better is to gradually reduce stock share until a drop in stock prices becomes more apparent, as is implied by Asness's study.

Second, a trend investing strategy would use dynamic thresholds. As I have stated previously, it is hard to determine optimal threshold for investment because it requires investors to predict future stock valuations. However, a trend strategy allows an investor to make changes to thresholds as trends materialize. This means that investors have to predict short-term stock prices rather than long-term trends.

12. **CONCLUSIONS**

In my sample, the buy-and-hold S&P portfolios deliver higher annualized returns than portfolios utilizing market timing with CAPE or Tobin's q. My study demonstrates that an investor cannot increase portfolio returns using Smithers and Wright's trading rules without prior knowledge of future stock valuations.

I do not believe that this is caused by stocks being superior investment vehicles to bonds, as implied by Siegel. However, I believe that there are certain economic factors (e.g. stock buybacks, interest rates) that can distort CAPE and q values which reduce the effectiveness of timing strategies. Alternative calculation methods that don't take the effect of these factors, or are not good proxies for an asset class, are not ideal for market timing.

I believe that trend-based investing strategies can be utilized to improve on some aspects of the timing strategies proposed by Smithers and Wright. Because there are many factors that affect security prices besides overvaluation, investors may have to apply dynamic quantitative methods to take these factors into account when using market timing with CAPE or q.

13. **GRAPHS**

GRAPH 1. Depicts the average annualized returns and standard deviations (risks) for a variety of two-tiered (strategy #3 based) portfolio strategies, with CAPE upper bound as the threshold for which to switch into investing in the alternative security. The rightmost point is buy-and-hold equity (VFINX).

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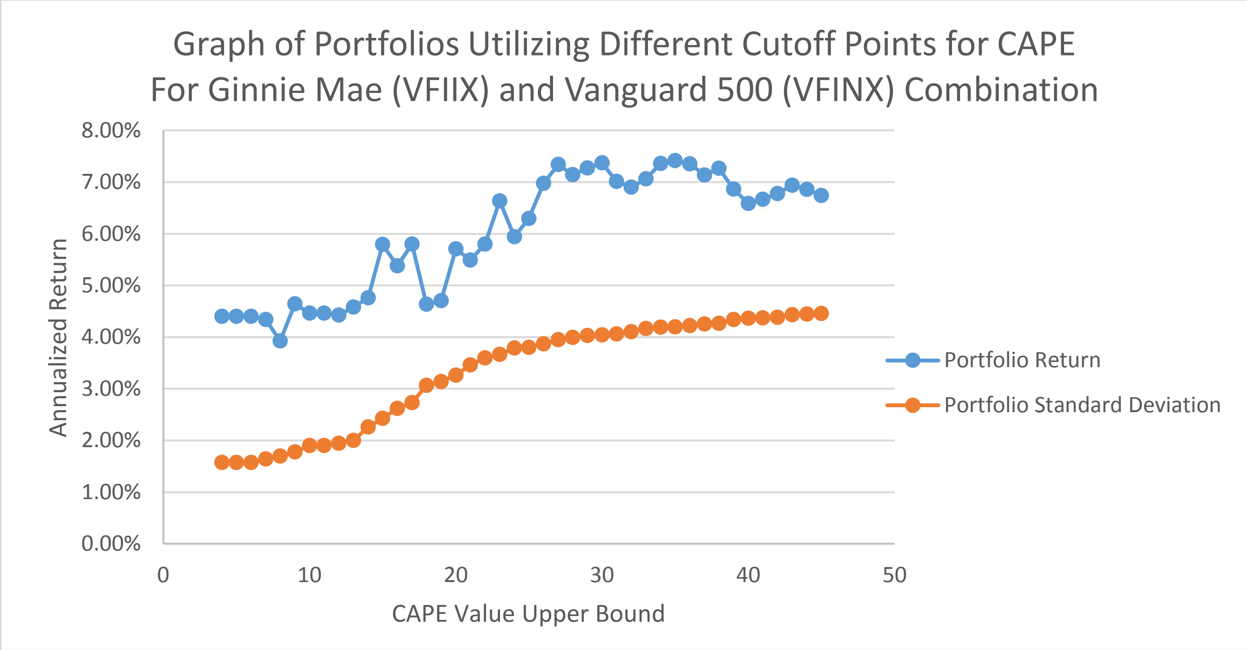
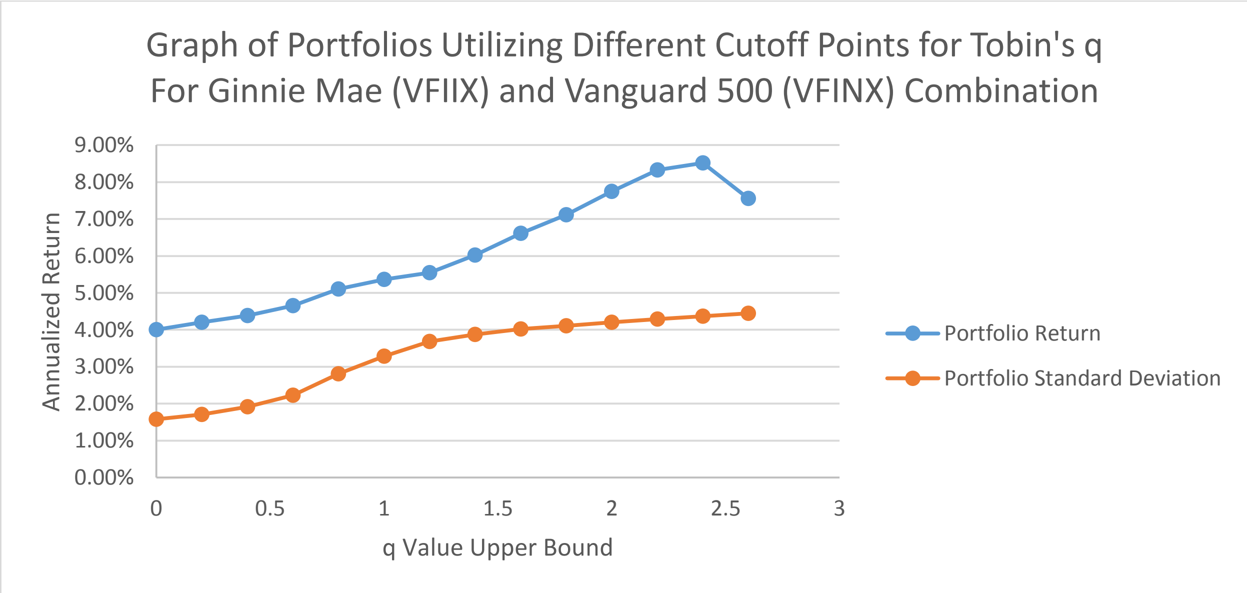
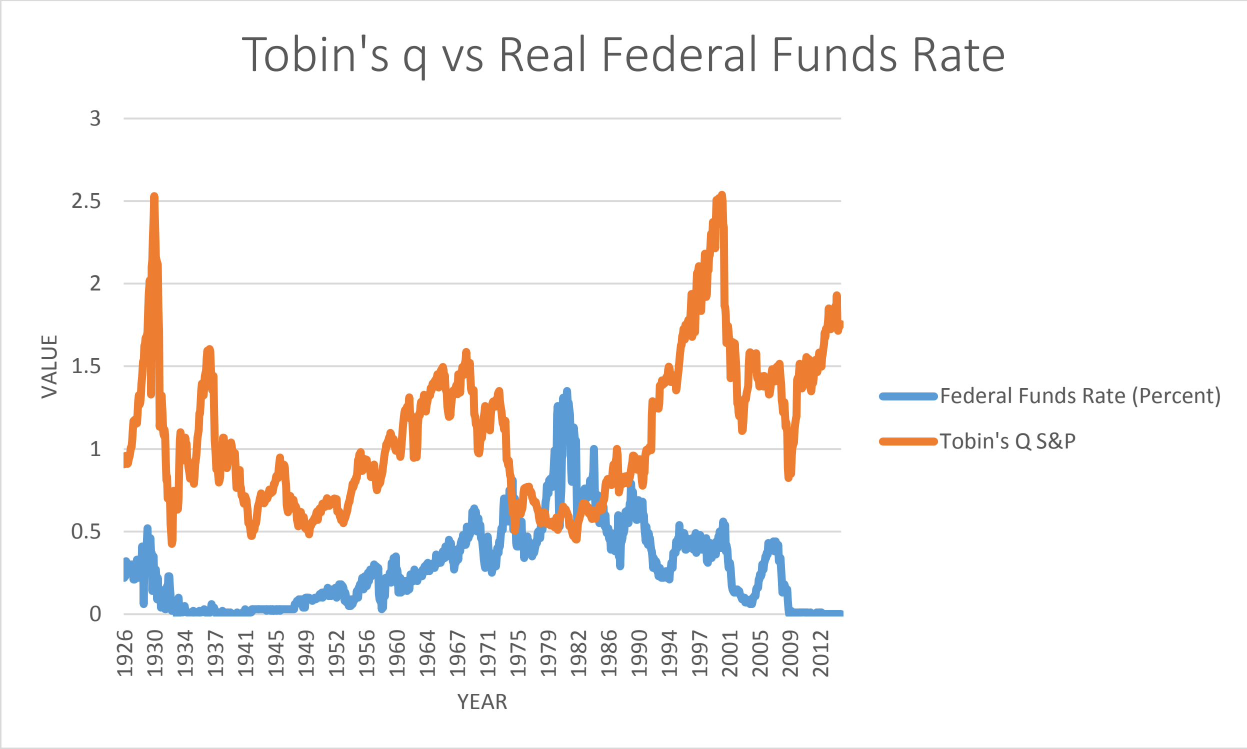


GRAPH 1. Depicts the average annualized returns and standard deviations (risks) for a variety of two-tiered (strategy #3 based) portfolio strategies, with Tobin's q upper bound as the threshold for which to switch into investing in the alternative security. The rightmost point is buy-and-hold equity (VFINX).



GRAPH 3. Depicts the relationship between Tobin's q (Smithers & Co, 2011) for the S&P and the real federal funds rate. Federal funds rates are percentages, but Tobin's q values are numbers.



Appendix 1.1: Market Timing CAPE Strategy Results

Return, risk, and annual alpha, are on an annualized basis. All other measures are for the entire time horizon.

PORTFOLIO STRATEGY - CAPE	PORTFOLIO COMBINATION	RETURN	RISK	SHARPE RATIO	PROPORTION OF TIME INVESTED IN EQUITY	CORRELATION	BETA	ANNUAL ALPHA	R-SQUARED
STRATEGY # 1 - 50% RULE	S&P 500 -VFIIX	6.23%	3.54%	0.892	0.534	0.599	0.488	0.39%	0.359
	S&P 500 -VSGBX	5.66%	3.51%	0.737	0.534	0.578	0.468	-0.06%	0.335
	S&P 500 - VBMFX	5.88%	3.61%	0.874	0.551	0.598	0.493	0.59%	0.512
	S&P 500 - VFSTX	6.32%	3.46%	1.032	0.528	0.636	0.508	0.46%	0.404
	S&P 500 - VUSTX	6.66%	3.91%	1.006	0.557	0.531	0.479	1.55%	0.290
	S&P 500 - VWEHX	6.72%	3.62%	0.884	0.512	0.581	0.485	0.60%	0.338
	S&P 500 -VWESX ('75-'15)	6.63%	3.71%	0.747	0.523	0.627	0.539	0.25%	0.393
	S&P 500 - EAFE ('75-'15)	7.92%	4.45%	0.915	0.523	0.651	0.668	0.93%	0.418
	S&P 500 - EEM	8.90%	4.63%	1.373	0.546	0.696	0.775	2.31%	0.485
	S&P 500 - GLD ('75-'15)	4.39%	4.26%	0.127	0.523	0.487	0.482	-1.72%	0.237
	S&P 500 - CPI ('35-'75)	1.99%	3.28%	-0.564	0.492	0.409	0.322	-1.50%	0.167
	S&P 500 - CPI ('75-'15)	4.44%	3.42%	0.169	0.523	0.497	0.394	-1.26%	0.247
STRATEGY # 2- 75% RULE	S&P 500 -VFIIX	7.48%	3.81%	1.159	0.746	0.782	0.685	0.53%	0.612
	S&P 500 -VSGBX	7.17%	3.80%	1.080	0.746	0.770	0.674	0.28%	0.594
	S&P 500 - VBMFX	6.81%	3.75%	1.086	0.750	0.776	0.665	0.61%	0.783
	S&P 500 - VFSTX	7.73%	3.77%	1.322	0.749	0.806	0.700	0.70%	0.649
	S&P 500 - VUSTX	7.23%	3.91%	1.155	0.752	0.738	0.664	1.20%	0.560
	S&P 500 - VWEHX	7.80%	3.90%	1.099	0.775	0.807	0.725	0.39%	0.652
	S&P 500 -VWESX ('75-'15)	7.53%	3.90%	0.941	0.750	0.805	0.729	0.26%	0.647
	S&P 500 - EAFE ('75-'15)	8.33%	4.27%	1.052	0.750	0.579	0.570	1.81%	0.331
	S&P 500 - EEM	7.00%	4.25%	1.049	0.750	0.833	0.851	0.01%	0.693
	S&P 500 - GLD ('75-'15)	6.30%	4.16%	0.590	0.750	0.731	0.705	-0.87%	0.535
	S&P 500 - CPI ('35-'75)	2.72%	3.83%	-0.292	0.750	0.710	0.651	-0.86%	0.503
	S&P 500 - CPI ('75-'15)	6.47%	3.80%	0.687	0.750	0.736	0.649	-0.43%	0.542
STRATEGY # 3 - 50%/75% RULE	S&P 500 -VFIIX	8.87%	3.71%	1.564	0.681	0.726	0.620	2.28%	0.527
	S&P 500 -VSGBX	8.49%	3.70%	1.468	0.681	0.711	0.606	1.99%	0.507
	S&P 500 - VBMFX	7.44%	3.68%	1.282	0.646	0.683	0.573	1.72%	0.763
	S&P 500 - VFSTX	9.05%	3.65%	1.727	0.671	0.746	0.627	2.46%	0.556
	S&P 500 - VUSTX	8.15%	3.88%	1.399	0.650	0.630	0.564	2.62%	0.408
	S&P 500 - VWEHX	8.94%	3.79%	1.427	0.704	0.746	0.652	1.91%	0.557
	S&P 500 -VWESX ('75-'15)	8.81%	3.78%	1.308	0.675	0.746	0.655	1.88%	0.556
	S&P 500 - EAFE ('75-'15)	8.15%	4.30%	1.002	0.675	0.603	0.597	1.49%	0.358
	S&P 500 - EEM	9.20%	4.60%	1.449	0.633	0.754	0.833	2.30%	0.569
	S&P 500 - GLD ('75-'15)	7.48%	4.20%	0.865	0.675	0.650	0.634	0.65%	0.424
	S&P 500 - CPI ('35-'75)	4.29%	3.47%	0.127	0.623	0.562	0.467	0.75%	0.315
	S&P 500 - CPI ('75-'15)	7.41%	3.61%	0.984	0.675	0.657	0.550	0.98%	0.432
STRATEGY # 4 - 30/15 RULE	S&P 500 -VFIIX	10.70%	3.45%	2.212	0.662	0.709	0.564	4.44%	0.503
	S&P 500 -VSGBX	10.43%	3.43%	2.144	0.662	0.694	0.549	4.25%	0.482
	S&P 500 - VBMFX	10.05%	3.28%	2.231	0.583	0.627	0.470	4.87%	0.703
	S&P 500 - VFSTX	11.09%	3.44%	2.423	0.637	0.720	0.571	4.84%	0.518
	S&P 500 - VUSTX	11.33%	3.66%	2.355	0.592	0.568	0.479	6.22%	0.332
	S&P 500 - VWEHX	9.36%	3.69%	1.584	0.676	0.722	0.614	2.55%	0.522
	S&P 500 -VWESX ('75-'15)	10.35%	3.79%	1.712	0.708	0.772	0.678	3.31%	0.596
	S&P 500 - EAFE ('75-'15)	9.03%	4.38%	1.183	0.708	0.592	0.598	2.36%	0.346
	S&P 500 - EEM	10.61%	4.95%	1.631	0.568	0.710	0.845	3.65%	0.505
	S&P 500 - GLD ('75-'15)	8.98%	4.12%	1.458	0.708	0.686	0.656	2.92%	0.472
	S&P 500 - CPI ('35-'75)	4.70%	3.75%	0.229	0.748	0.707	0.636	1.12%	0.499
	S&P 500 - CPI ('75-'15)	8.98%	3.61%	1.447	0.708	0.692	0.567	2.46%	0.479
EQUITY	S&P 500	8.05%	4.31%	1.090	1.000	1.000	1.000	--	1.000
ALTERNATIVE SECURITIES	VFIIX	7.83%	1.53%	3.100	--	0.140	0.049	4.48%	0.019
	VGBX	6.62%	1.35%	2.632	--	0.096	0.030	3.38%	0.005
	VBMFX	6.44%	1.12%	3.307	--	0.105	0.027	3.57%	0.011
	VFSTX	6.40%	0.74%	4.948	--	0.229	0.039	3.42%	0.052
	VUSTX	8.25%	2.73%	2.025	--	-0.059	-0.037	5.70%	0.003
	VWEHX	8.69%	2.30%	2.252	--	0.142	0.075	4.50%	0.020
	VWESX ('75-'15)	8.90%	2.34%	2.164	--	0.219	0.119	4.50%	0.048
	EAFE ('75-'15)	9.70%	4.92%	1.192	--	0.633	0.722	1.31%	0.401
	EEM	14.26%	5.44%	2.156	--	0.330	0.431	9.47%	0.109
	GLD ('75-'15)	0.98%	4.96%	-0.576	--	-0.077	-0.088	-2.44%	0.006
	CPI ('35-'75)	3.40%	0.56%	0.000	--	-0.163	-0.022	0.01%	0.027
	CPI ('75-'15)	3.84%	0.37%	0.000	--	-0.055	-0.005	0.02%	0.003

Appendix 1.2: Market Timing Tobin's q Strategy Results

Return, risk, and annual alpha, are on an annualized basis. All other measures are for the entire time horizon.

PORTFOLIO STRATEGY - Tobin's q	PORTFOLIO COMBINATION	RETURN	RISK	SHARPE RATIO	PROPORTION IN EQUITY INVESTMENT	CORRELATION	BETA	ANNUAL ALPHA	R-SQUARED
STRATEGY # 1 - 50% RULE	S&P 500 -VFIIX	6.26%	3.42%	0.931	0.444	0.522	0.412	0.85%	0.136
	S&P 500 -VSGBX	5.55%	3.39%	0.731	0.444	0.497	0.388	0.28%	0.124
	S&P 500 - VBMFX	4.35%	3.61%	0.448	0.542	0.590	0.485	-0.91%	0.347
	S&P 500 - VFSTX	5.71%	3.32%	0.891	0.420	0.553	0.423	0.37%	0.305
	S&P 500 - VUSTX	4.15%	3.94%	0.362	0.525	0.497	0.452	-0.83%	0.254
	S&P 500 - VWEHX	7.84%	3.54%	1.218	0.442	0.521	0.426	2.03%	0.272
	S&P 500 -VWESX ('75-'15)	8.46%	3.63%	1.264	0.471	0.586	0.494	2.28%	0.272
	S&P 500 - EAFE ('75-'15)	7.61%	4.55%	0.829	0.471	0.667	0.699	0.47%	0.439
	S&P 500 - EEM	3.65%	4.37%	0.254	0.534	0.688	0.723	-2.67%	0.473
	S&P 500 - GLD ('75-'15)	5.65%	4.16%	0.434	0.471	0.431	0.416	-0.15%	0.186
	S&P 500 - CPI ('35-'75)	2.77%	2.73%	-0.393	0.510	0.431	0.282	-0.71%	0.186
	S&P 500 - CPI ('75-'15)	5.86%	3.32%	0.601	0.471	0.442	0.340	0.41%	0.195
STRATEGY # 2- 75% RULE	S&P 500 -VFIIX	7.10%	3.83%	1.051	0.739	0.776	0.684	0.15%	0.301
	S&P 500 -VSGBX	6.78%	3.81%	0.973	0.739	0.764	0.671	-0.09%	0.292
	S&P 500 - VBMFX	5.67%	3.84%	0.767	0.750	0.776	0.680	-0.60%	0.602
	S&P 500 - VFSTX	7.02%	3.81%	1.119	0.751	0.808	0.710	-0.08%	0.652
	S&P 500 - VUSTX	6.11%	4.02%	0.843	0.749	0.735	0.680	0.00%	0.556
	S&P 500 - VWEHX	7.49%	3.89%	1.019	0.750	0.786	0.705	0.18%	0.618
	S&P 500 -VWESX ('75-'15)	8.18%	3.92%	1.102	0.750	0.805	0.731	0.89%	0.513
	S&P 500 - EAFE ('75-'15)	6.73%	4.31%	0.671	0.750	0.579	0.575	0.18%	0.331
	S&P 500 - EEM	4.07%	4.03%	0.379	0.750	0.833	0.806	-2.69%	0.693
	S&P 500 - GLD ('75-'15)	4.45%	4.15%	0.147	0.750	0.731	0.704	-2.71%	0.535
	S&P 500 - CPI ('35-'75)	3.50%	3.61%	-0.095	0.746	0.705	0.610	-0.07%	0.496
	S&P 500 - CPI ('75-'15)	6.95%	2.85%	1.085	0.750	0.736	0.486	0.82%	0.542
STRATEGY # 3 - 50%/75% RULE	S&P 500 -VFIIX	7.12%	3.71%	1.090	0.616	0.670	0.573	0.80%	0.224
	S&P 500 -VSGBX	6.75%	3.69%	0.995	0.616	0.652	0.555	0.53%	0.213
	S&P 500 - VBMFX	5.95%	3.78%	0.850	0.726	0.755	0.652	-0.18%	0.569
	S&P 500 - VFSTX	7.92%	3.71%	1.391	0.731	0.792	0.678	1.02%	0.626
	S&P 500 - VUSTX	6.37%	3.97%	0.919	0.732	0.716	0.655	0.38%	0.528
	S&P 500 - VWEHX	7.74%	3.77%	1.120	0.620	0.674	0.586	1.08%	0.455
	S&P 500 -VWESX ('75-'15)	8.57%	3.73%	1.262	0.606	0.543	0.470	2.52%	0.233
	S&P 500 - EAFE ('75-'15)	7.32%	4.38%	0.795	0.606	0.625	0.630	0.51%	0.385
	S&P 500 - EEM	4.69%	4.03%	0.533	0.722	0.814	0.789	-1.98%	0.663
	S&P 500 - GLD ('75-'15)	5.93%	4.21%	0.496	0.606	0.440	0.430	0.07%	0.194
	S&P 500 - CPI ('35-'75)	4.67%	3.39%	0.243	0.650	0.593	0.482	1.13%	0.351
	S&P 500 - CPI ('75-'15)	6.80%	3.52%	0.834	0.606	0.569	0.465	0.77%	0.324
STRATEGY # 4 - 2.4/1 RULE	S&P 500 -VFIIX	11.02%	3.82%	2.080	0.744	0.780	0.686	4.05%	0.304
	S&P 500 -VSGBX	10.80%	3.81%	2.029	0.744	0.768	0.674	3.91%	0.296
	S&P 500 - VBMFX	10.41%	3.75%	2.049	0.685	0.718	0.614	4.48%	0.514
	S&P 500 - VFSTX	11.87%	3.82%	2.387	0.728	0.790	0.696	4.86%	0.623
	S&P 500 - VUSTX	11.40%	3.97%	2.185	0.694	0.676	0.619	5.59%	0.470
	S&P 500 - VWEHX	10.77%	3.92%	1.852	0.757	0.791	0.714	3.42%	0.627
	S&P 500 -VWESX ('75-'15)	10.84%	3.93%	1.773	0.779	0.827	0.755	3.43%	0.542
	S&P 500 - EAFE ('75-'15)	9.26%	4.39%	1.232	0.779	0.570	0.577	2.69%	0.320
	S&P 500 - EEM	4.62%	4.88%	0.427	0.673	0.781	0.916	-2.71%	0.610
	S&P 500 - GLD ('75-'15)	11.90%	4.16%	1.934	0.779	0.762	0.737	4.58%	0.582
	S&P 500 - CPI ('35-'75)	3.68%	4.17%	-0.039	1.000	1.000	1.000	0.00%	0.998
	S&P 500 - CPI ('75-'15)	10.39%	3.77%	1.732	0.779	0.767	0.671	3.39%	0.588
EQUITY	S&P 500	8.05%	4.31%	1.090	1.000	1.000	1.000	--	1.000
ALTERNATIVE SECURITIES	VFIIX	7.83%	1.53%	3.100	--	0.140	0.049	4.48%	0.019
	VGBX	6.62%	1.35%	2.632	--	0.096	0.030	3.38%	0.005
	VBMFX	6.44%	1.12%	3.307	--	0.105	0.027	3.57%	0.011
	VFSTX	6.40%	0.74%	4.948	--	0.229	0.039	3.42%	0.052
	VUSTX	8.25%	2.73%	2.025	--	-0.059	-0.037	5.70%	0.003
	VWEHX	8.69%	2.30%	2.252	--	0.142	0.075	4.50%	0.020
	VWESX ('75-'15)	8.90%	2.34%	2.164	--	0.219	0.119	4.50%	0.048
	EAFE ('75-'15)	9.70%	4.92%	1.192	--	0.633	0.722	1.31%	0.401
	EEM	14.26%	5.44%	2.156	--	0.330	0.431	9.47%	0.109
	GLD ('75-'15)	0.98%	4.96%	-0.576	--	-0.077	-0.088	-2.44%	0.006
	CPI ('35-'75)	3.40%	0.56%	0.000	--	-0.163	-0.022	0.01%	0.027
	CPI ('75-'15)	3.84%	0.37%	0.000	--	-0.055	-0.005	0.02%	0.003

APPENDIX 1.3: S&P Price, Q, and CAPE Since 1935

Data obtained from Smithers & Co (2011) but log-modified and adjusted to 2014 price levels

Year	Historically Adjusted Price	Historically Adjusted Return	Smithers & Wright q (* 100)	Linked	Logs	Logs to average q	q value	Logs to average CAPE	CAPE value
1935	161.94	N/A	78.17	75.063	4.318	0.200	1.221	0.082941582	1.086
1936	237.15	46.44%	97.91	94.024	4.544	0.425	1.529	0.347288156	1.415
1937	296.71	25.11%	56.35	54.117	3.991	-0.128	0.880	-0.134831718	0.874
1938	189.43	-36.16%	65.73	63.118	4.145	0.026	1.027	0.062802351	1.065
1939	212.36	12.10%	63.22	60.713	4.106	-0.013	0.988	0.083127596	1.087
1940	210.46	-0.89%	49.06	47.110	3.852	-0.266	0.766	-0.082918777	0.920
1941	177.96	-15.44%	35.39	33.983	3.526	-0.593	0.553	-0.402123861	0.669
1942	135.28	-23.98%	37.33	35.846	3.579	-0.539	0.583	-0.45773408	0.633
1943	142.00	4.97%	43.55	41.818	3.733	-0.385	0.680	-0.361074177	0.697
1944	161.98	14.07%	47.65	45.754	3.823	-0.295	0.744	-0.292372535	0.746
1945	180.25	11.28%	54.70	52.531	3.961	-0.157	0.854	-0.035347039	0.965
1946	235.49	30.65%	44.07	42.317	3.745	-0.374	0.688	-0.307105574	0.736
1947	168.26	-28.55%	36.63	35.174	3.560	-0.558	0.572	-0.375321963	0.687
1948	148.82	-11.55%	33.52	32.191	3.472	-0.647	0.524	-0.431187669	0.650
1949	152.22	2.28%	35.67	34.251	3.534	-0.585	0.557	-0.383713108	0.681
1950	170.84	12.23%	39.66	38.087	3.640	-0.479	0.619	-0.301583704	0.740
1951	198.6	16.25%	42.16	40.489	3.701	-0.418	0.659	-0.219852697	0.803
1952	217.11	9.32%	38.29	38.290	3.645	-0.474	0.623	-0.158224281	0.854
1953	234.08	7.82%	36.09	36.090	3.586	-0.533	0.587	-0.255656138	0.774
1954	225.11	-3.83%	47.46	47.460	3.860	-0.259	0.772	0.031963811	1.032
1955	317.12	40.87%	55.01	55.010	4.008	-0.111	0.895	0.20857812	1.232
1956	391.81	23.55%	54.93	54.930	4.006	-0.113	0.893	0.099737094	1.105
1957	391.48	-0.08%	47.64	47.640	3.864	-0.255	0.775	-0.135230098	0.874
1958	341.95	-12.65%	61.25	61.250	4.115	-0.004	0.996	0.103185487	1.109
1959	456.16	33.40%	65.48	65.480	4.182	0.063	1.065	0.172624252	1.188
1960	471.05	3.26%	65.21	65.210	4.178	0.059	1.061	0.115440411	1.122
1961	476.63	1.18%	75.87	75.870	4.329	0.210	1.234	0.340974877	1.406
1962	547.58	14.89%	71.16	71.160	4.265	0.146	1.157	0.167410256	1.182
1963	509	-7.05%	75.80	75.800	4.328	0.209	1.233	0.289915846	1.336
1964	588.44	15.61%	84.82	84.820	4.441	0.322	1.380	0.368287705	1.445
1965	656.49	11.56%	90.79	90.790	4.509	0.390	1.477	0.413021371	1.511
1966	697.96	6.32%	74.16	74.160	4.306	0.188	1.206	0.234012518	1.264
1967	610.5	-12.53%	89.68	89.680	4.496	0.378	1.459	0.334591359	1.397
1968	662.88	8.58%	98.05	98.050	4.585	0.467	1.595	0.356266097	1.428
1969	681.45	2.80%	74.76	74.760	4.314	0.196	1.216	0.105710481	1.112
1970	568.23	-16.61%	68.56	68.560	4.228	0.109	1.115	0.016845399	1.017
1971	558.68	-1.68%	73.19	73.190	4.293	0.174	1.190	0.056497708	1.058
1972	597.78	7.00%	83.00	83.000	4.419	0.300	1.350	0.169806113	1.185
1973	661.03	10.58%	57.67	57.670	4.055	-0.064	0.938	-0.155479092	0.856
1974	490.53	-25.79%	31.15	31.150	3.439	-0.680	0.507	-0.641090473	0.527
1975	331.24	-32.47%	41.62	41.620	3.729	-0.390	0.677	-0.426131224	0.653
1976	414.33	25.08%	45.85	45.850	3.825	-0.293	0.746	-0.303917426	0.738
1977	422.01	1.85%	36.56	36.560	3.599	-0.520	0.595	-0.485260007	0.616
1978	343.44	-18.62%	33.74	33.740	3.519	-0.600	0.549	-0.55609924	0.573
1979	347.22	1.10%	34.77	34.770	3.549	-0.570	0.566	-0.585280415	0.557
1980	339.03	-2.36%	40.22	40.220	3.694	-0.424	0.654	-0.514691758	0.598
1981	363.59	7.24%	32.80	32.800	3.490	-0.628	0.534	-0.697542187	0.498
1982	295.85	-18.63%	35.36	35.360	3.566	-0.553	0.575	-0.617199739	0.539
1983	350.92	18.61%	39.79	39.790	3.684	-0.435	0.647	-0.465921724	0.628
1984	388.38	10.67%	35.67	35.670	3.574	-0.544	0.580	-0.489860706	0.613
1985	386.85	-0.39%	42.77	42.770	3.756	-0.363	0.696	-0.292216925	0.747
1986	451.81	16.79%	48.25	48.250	3.876	-0.242	0.785	-0.102811749	0.902
1987	565.72	25.21%	46.75	46.750	3.845	-0.274	0.760	-0.153538245	0.858
1988	514.94	-8.98%	48.90	48.900	3.890	-0.229	0.795	-0.061404006	0.940
1989	560.52	8.85%	57.77	57.770	4.056	-0.062	0.940	0.123276342	1.131
1990	634.68	13.23%	53.76	53.760	3.985	-0.134	0.874	0.014391776	1.014
1991	575.14	-9.38%	74.48	74.480	4.311	0.192	1.211	0.168755352	1.184
1992	716.58	24.59%	85.52	85.520	4.449	0.330	1.391	0.270903246	1.311
1993	725.91	1.30%	91.36	91.360	4.515	0.396	1.486	0.304256786	1.356
1994	769.46	6.00%	83.69	83.690	4.427	0.308	1.361	0.242641277	1.275
1995	736.22	-4.32%	103.28	103.280	4.637	0.519	1.680	0.475614281	1.609
1996	946.45	28.56%	103.63	103.630	4.641	0.522	1.686	0.580392984	1.787
1997	1,145.42	21.02%	113.48	113.480	4.732	0.613	1.846	0.76073778	2.140
1998	1,417.84	23.78%	128.55	128.550	4.856	0.738	2.091	0.928282368	2.530
1999	1,807.70	27.50%	154.88	154.880	5.043	0.924	2.519	1.059459859	2.885
2000	2,008.65	11.12%	115.21	115.210	4.747	0.628	1.874	0.896202977	2.450
2001	1,814.18	-9.68%	101.70	101.700	4.622	0.503	1.654	0.694859795	2.003
2002	1,531.26	-15.59%	74.44	74.440	4.310	0.191	1.211	0.409988979	1.507
2003	1,172.62	-23.42%	93.50	93.500	4.538	0.419	1.521	0.541756831	1.719
2004	1,454.41	24.03%	89.64	89.640	4.496	0.377	1.458	0.561164365	1.753
2005	1,473.44	1.31%	85.22	85.220	4.445	0.327	1.386	0.53941287	1.715
2006	1,533.69	4.09%	89.17	89.170	4.491	0.372	1.450	0.578959581	1.784
2007	1,673.38	9.11%	86.16	86.160	4.456	0.337	1.401	0.540044558	1.716
2008	1,553.54	-7.16%	61.49	61.490	4.119	0.000	1.000	0.031519827	1.032
2009	975.02	-37.24%	87.62	87.620	4.473	0.354	1.425	0.383933344	1.468
2010	1,233.25	26.48%	91.36	91.360	4.515	0.396	1.486	0.478351126	1.613
2011	1,385.21	12.32%	86.33	86.330	4.458	0.339	1.404	0.386949792	1.472
2012	1,364.69	-1.48%	92.53	92.530	4.528	0.409	1.505	0.41123237	1.509
2013	1,528.99	12.04%	108.61	108.610	4.688	0.569	1.767	0.565285279	1.760
2014	1,852.91	21.19%	108.60	108.600	4.688	0.569	1.766	0.600618731	1.823

Appendix 1.4: Market Timing Strategy Result Averages

All averages are arithmetic calculations derived from results in appendices 1.1. and 1.2

	RETURN	RISK	SHARPE RATIO	PROPORTION OF TIME INVESTED IN EQUITY	CORRELATION	BETA	ANNUAL ALPHA	R-SQUARED
CAPE Strategy #1 - 50% Rule	5.98%	3.81%	0.664	0.528	0.574	0.508	0.21%	0.349
CAPE Strategy #2 - 75% Rule	6.88%	3.94%	0.888	0.752	0.756	0.689	0.30%	0.592
CAPE Strategy #3 - 50%/75% Rule	8.02%	3.88%	1.185	0.664	0.684	0.615	1.75%	0.498
CAPE Strategy #3 - 30/15 Rule	9.63%	3.83%	1.673	0.664	0.683	0.602	3.58%	0.496
Tobin's q Strategy #1 - 50% Rule	5.65%	3.69%	0.604	0.482	0.535	0.462	0.12%	0.266
Tobin's q Strategy #2 - 75% Rule	6.17%	3.84%	0.728	0.749	0.753	0.670	-0.34%	0.511
Tobin's q Strategy #3 - 50%/75% Rule	6.65%	3.84%	0.858	0.657	0.654	0.580	0.55%	0.397
Tobin's q Strategy #4 - 2.4/1 Rule	9.75%	4.05%	1.596	0.763	0.769	0.722	3.14%	0.540
Equity	8.05%	4.31%	1.090	1.000	1.000	1.000	0.00%	1.000
Alternative Security	7.11%	2.44%	1.827	0.000	0.128	0.112	3.16%	0.059

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