The Buy-and-Hold Market Timer

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Peer Reviewed

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ABSTRACT

This study examines whether the S&P 500 earnings yield minus the 10-year T-bond yield (often referred to as the Fed model) can signal an overvalued market and be used to occasionally exit the market and outperform a simple buy-and-hold strategy both in return and risk metrics. Results show that when the S&P 500 earnings yield minus the 10-year T-bond yield is in the bottom decile relative to a 10-year moving average, the probability of a market decline over the next year increases from 28% at any time to more than 65%. Relying on this signal to exit the market and returning when the spread moves to normal levels, or after a set decline barrier is reached, results in a positive expected excess return of 5% or more with a lower risk profile stemming from being temporarily out of the market.

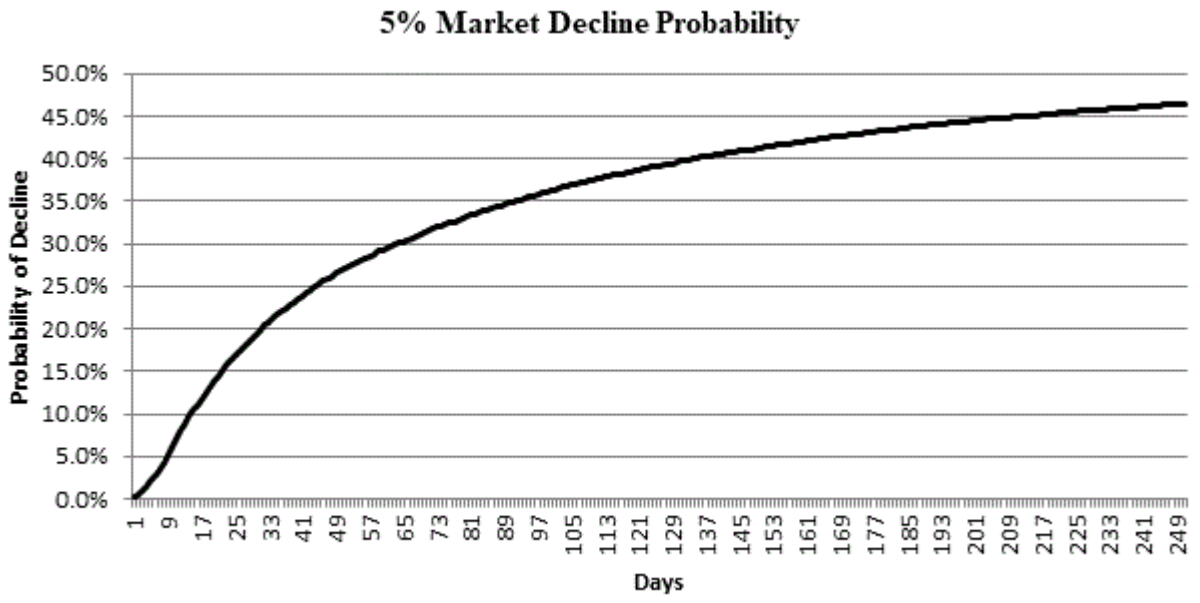
INTRODUCTION

Based on the last 70 years of daily stock returns, no matter what day an investor buys into the market, there is a 91% probability it is "overvalued." In other words, from any given day, there is a 91% chance that the market will be lower (including reinvested dividends) sometime in the future. Seemingly, an investor who exits the market, especially one who considers it overvalued, will almost always have a chance to renter at a lower value.

However, applying a time constraint and a minimum magnitude of decline changes the picture dramatically. Figure 1 below shows that there is only a 46.5% probability the market will fall at least 5% sometime over the following year. What makes this even more problematic for the market timer is the cost of being wrong. If the market doesn't fall 5% sometime during the year, the average return is more than 17%. These statistics give credence to the idea that a buy-and-hold strategy may be difficult to outperform.

In fact, Bauer & Dahlquist (2001, 2012) show that a simple buy-and-hold strategy outperforms 99.8% of any possible asset allocation switching strategies between the market and treasuries. They go on to show that an investor would need to be able switch correctly 66% of the time on a monthly basis to outperform a buy-and-hold strategy, although in 2000-2011 this hurdle falls to 57%. Drew (2006) finds a similar high hurdle rate of 70% using Australian data. Reaffirming this idea, Hulbert (2013) examines more than 100 market timing newsletters and finds only six that appear to be remotely successful during the financial crisis.

FIGURE 1
Probability of a 5% decline over the following 252 trading days from any day using returns from the S&P 500, including reinvested dividends 1946 to 2016.



This study differs from the typical market timing study by determining if an investor can circumvent the odds needed to be correct by only reducing exposure or exiting the market when it appears to be highly overvalued. In essence, this study examines whether the typical buy-and-hold investor has any incentive to occasionally market time to avoid periods where significant losses may be more probable. Tversky & Kahneman's (1979) Prospect Theory suggests this strategy should be attractive as investors give more weight to losses than gains.

Perhaps the most common measure of value for the stock market is the PE ratio and by extension, the market yield minus the 10-year treasury yield, which is often referred to as the Fed model. The idea behind the Fed model is high PE ratios can be justified if the treasury yield is sufficiently low, and thus, high PE ratios in and of themselves do not necessarily suggest an overheated market. The market run up and high PEs of 2016/17 is often explained by this logic and even comes with its own acronym, TINA which stands for "there is no alternative".

The Fed model is not without its detractors. Asness (2003) suggests the Fed model only has descriptive power when conditioned on perceived volatility and does poorly as a predictive model. Estrada (2006, 2009) discusses theoretical issues with the model and how the PE by itself does better for 5-year forecasts. However, Shen (2002) shows that the spread between the E/P ratio and interest rates appear to be successful in outperforming buy-and-hold from 1970 to 2000. Thomas & Zhang (2008) explain why

the Fed model works, while Maio (2013) shows the yield gap forecasts positive excess market returns for both short and long forecasting horizons.

This study examines whether the Fed model can reliably indicate an overvalued market and whether a temporary exit can be justified relative to a buy-and-hold strategy. Unlike Shen (2002), who has investors exiting only while the earnings yield is low, this study estimates how long one should wait before re-entering and what the cost is if the decision turns out to be erroneous. This study finds a low earnings yield T-bond spread relative to the previous 10-year moving average is associated with a market decline over the following year 66% of the time. This percentage is approximately what is needed for successful market timing as suggested by Bauer & Dahlquist (2001, 2012) and is significantly greater than the probability of an annual decline at any time which is only 28%.

Results reconfirm Shen (2002) that exiting the market when the yield spread falls into the bottom decile relative to the previous 10-years results in higher returns with lower risk. In addition, after exiting the market, waiting for the yield spread to return to more normal levels results in even better performance. Finally, it is found that using loss thresholds from 5% to 15% result in still higher excess expected returns ranging from 5% to 8%. Thus, this study concludes that exiting, or at the very least, reducing market exposure when the yield spread suggests a possible overvaluation should be considered by even stalwart buy-and-hold investors.

DATA AND METHODOLOGY

Return data is taken from CRSP's Value-Weighted S&P 500 Composite Index to proxy for the S&P 500 from January, 1936 to June, 2016 along with 30-day T-bill returns. Returns for the index include dividends so the computed index value includes reinvested dividends to account for the full opportunity cost of exiting the market. Monthly PE ratios and 10-year T-bond yields are taken form www.multpl.com. The post WWII January, 1946 to December, 2015 period is examined so a moving 10-year historical average of the underlying variables can be calculated.

The trading strategy is directed towards the long-term buy-and-hold investor who generally believes the market is fairly valued, but who also believes that at times the market can deviate significantly from this value. When the market appears excessively overvalued, it is assumed even the typical buy-and-hold investor may want to reduce or eliminate market exposure. At the very least, it certainly would be a time to consider re-balancing a portfolio if equity positions have drifted upwards over time. With the PE ratio being the most common metric of value and by extension the Fed model, only these two variables are examined. The PE value is based on the past four quarters of earnings to allow both a longer time frame of data and to avoid issues of analysts' forecast errors. Trading costs are ignored or assumed to be minimal, which may bias the results, but with the advent of mutual funds and ETFs, entering and exiting the market, at least going forward in time, is associated with minimal costs. The specific trading rules are as follows:

PE: If the PE ratio is in the top decile relative to the previous 10 years, a sell signal is generated.
E/P T-bond yield spread: If the spread is in the lowest decile relative to the previous 10 years, a sell signal is generated.

Once a sell signal is generated, an investor faces up to three additional decisions. The first is at what point the investor re-enters the market. If the investor exits the market expecting some decline, the second issue is how long will the investor wait for the decline to occur, while the third is to what magnitude the investor is willing to let the market rise before the decision is reversed. This last one is inevitably the most difficult to deal with since if the investor exits and the market rises, the additional increase in value likely increases the investor's interpretation that the market is even more overvalued. This paper does not deal with this behavioral finance issue directly, but assumes the investor re-enters the market when one of the following occurs: 1) the sell signal is no longer in effect, 2) the signal recovers to some normal level, 3) a decline barrier has been met, or 4) the investor reenters after a specified time duration regardless of the result.

This study replicates Shen's (2002) methodology where the investor exits the market and does not return until the earnings yield variable is no longer in the bottom decile. In addition, longer exit periods and magnitudes are also investigated. Specifically, the investor does not return until the underlying variable returns to a more "normal range" as identified to be in the third decile or higher relative to the preceding 10 years. Finally, a magnitude of decline is investigated to determine whether the risk of exit is worth the reward. This study focuses on 5% to 15% decline barriers using a one-year wait duration. Both the decline and duration magnitude have their own unique costs. Specifically, waiting for a larger decline is associated with a lower probability of success, while using a longer wait duration is associated with higher opportunity costs.

In order to determine if market timing is viable in the context of this study, an expected value of exiting the market for a period of time is calculated. This value is based on the probability of a market decline for a particular amount over a particular period multiplied by the return generated based on this amount, plus the return from 30-day T-bills. If the decline occurs before the end of time T defined as the duration the investor is willing to wait for a particular decline to occur, the investor re-enters the market and earns the market return until the end of time T. The cost of this timing is the probability the market doesn't decline by a particular amount multiplied by the excess market return over the period, as it is assumed the investor is otherwise invested in 30-day T-bills.

Mathematically, the expected value is calculated as:

$$EV = P_t(M_t + r_{ft} + M_{T-t}) - (1 - P_t)(M_T - r_{ft}) \quad (1)$$

where P_t is the probability of a market decline of a particular amount D, D is the market decline barrier at which the investors re-enters the market set from 5% to 15% in this study, r_{ft} is the risk-free rate earned while not in the market waiting for the decline D,

and M is the market return. M_t is the market decline from exit to time t when D is met, and M_{T-t} is the market return after the decline is realized until the end of the duration that the investor is willing to wait, set at one year in this study.

To evaluate the risk of these portfolios, both the Sharpe and Sortino (Sortino & Price, 1994) ratios are calculated. The Sharpe Ratio is the amount of excess return above the risk-free rate per unit of risk as measured by the standard deviation of returns. [1] Opdyke's (2007) testing procedure is applied to determine if the Sharpe ratio from timing is significantly better than buy-and-hold.

Since this study is focused on avoiding losses, the Sortino ratio is also calculated. The Sortino ratio is a modification of the Sharpe ratio where the denominator is a measure of the downside deviation. The larger the ratio, the greater the return per unit of downside risk. [2]

Along with the Sharpe and Sortino ratios, Value-at-Risk (VaR) is calculated which gives the percentage loss at some confidence level. The 5% level is used so that VaR represents the percentage loss that will be realized less than 5% of the time. To test for differences in VaR, an unconditional coverage test is used following Annaert, Ossealaer, & Verstraete (2009). VaR values are compared to the buy-and-hold VaR to determine if occasionally exiting the market can significantly reduce the VaR. A 95% confidence level is used and under the null hypothesis the buy-and-hold VaR equals the timing VaR. [3]

RESULTS

Table 1 below shows subsequent excess returns (market minus 30-day T-bill) following a yield spread in the lowest decile relative to the rolling previous 10 years from 1946 to 2016. It is apparent whether one looks at the subsequent month, quarter, or annual excess return after which an extremely low yield spread is observed that the return is significantly less than average. In fact, it is the only time in which excess returns are negative ranging from -0.03% monthly, -1.04% quarterly, to -4.52% for the following year relative to the overall averages of the S&P 500, (returns of 0.62%, 1.89%, and 8.15% respectively). The returns are significantly different along with having lower Sharpe, Sortino, and VaR values. It is also of interest to note that the returns to the market are well above average when the yield spread is in the upper deciles.

TABLE 1
Average subsequent excess returns and risk metrics based on yield spread
1946 to 2016

Percent Rank	All Returns	0 to .1	.1 to .2	.2 to .8	.8 to .9	.9 to 1.0
Subsequent Monthly Excess Returns Following Yield Spread in Bottom Decile						
Mean	0.62%	-0.03%**	1.21%	0.57%	1.53%**	0.64%
St. Dev	4.20%	3.71%	4.16%	4.46%	3.41%	4.26%
Sharpe	0.15	-0.01	0.29	0.13	0.45	0.15
Sortino	0.37	0.16	0.59	0.33	1.03	0.35
VaR	-6.50%	-6.28%	-5.41%*	-7.55%**	-3.79%	-6.39%
Subsequent Quarterly Excess Returns Following Yield Spread in Bottom Decile						
Mean	1.89%	-1.04%***	2.53%	2.18%	4.38%***	2.77%
St. Dev	7.50%	7.52%	6.79%	7.72%	5.70%	7.29%
Sharpe	0.25	-0.14	0.37	0.28	0.77	0.38
Sortino	0.40	-0.17	0.62	0.46	2.36	0.67
VaR	-11.02%	-14.23%**	-6.08%	-11.35%	-3.35%*	-8.67%
Subsequent Annual Excess Returns Following Yield Spread in Bottom Decile						
Mean	8.15%	-4.52%***	11.73%***	10.36%*	13.62%***	11.27%***
St. Dev	17.05%	14.07%	13.86%	18.18%	15.02%	13.51%
Sharpe	0.48	-0.32	0.85	0.57	0.91	0.83
Sortino	1.21	0.09	4.27	1.04	3.31	4.03
VaR	-21.51%	-24.88%***	-14.30%*	-21.88%	-8.59%	-11.47%*
Subsequent Monthly Excess Returns Following PE Ratio in Highest Decile						
Mean	0.62%	0.09%	0.50%	0.88%	0.14%	0.86%
St. Dev	4.20%	4.79%	3.67%	3.89%	4.08%	4.55%
Sharpe	0.15	0.02	0.14	0.23	0.03	0.19
Sortino	0.37	0.15	0.43	0.54	0.17	0.39
VaR	-6.50%	-8.44%***	-6.11%	-5.14%*	-7.35%	-6.79%

Notes. Monthly, quarterly, and annual returns following percent ranking of yield spread based on preceding 10 years for 1946 to 2016. The bottom of the table is the monthly results using only the PE ratio. Statistical differences in Sharpe ratios is unavailable due to difference in time periods. ***, **, and * denote significant difference at the 1%, 5%, and 10% level from the overall averages. VaR significance is based on being worse than results using all the returns.

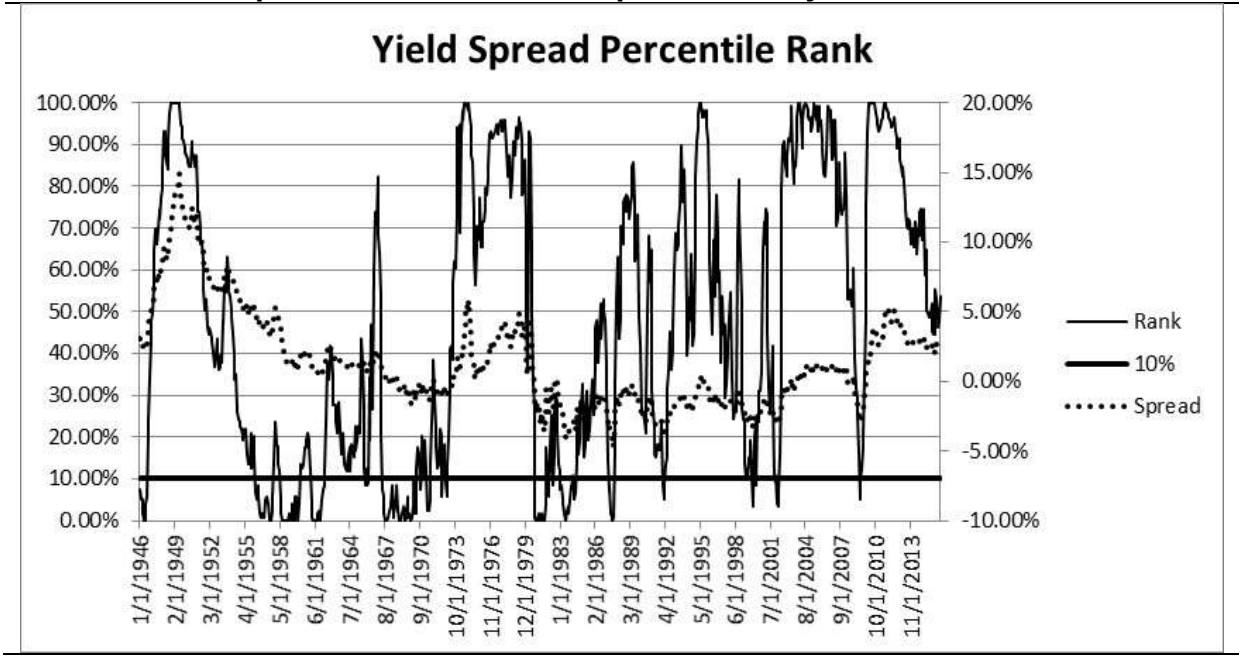
When examining the second lowest decile, one could come to the erroneous conclusion that although the lowest decile has the worst return, the second lowest decile appears to be a positive signal. For example, the 1.21% mean monthly return for the 0.1 to 0.2 decile. However, this is only on the way up so to speak, meaning that the positive average return is generally associated with the spread moving to the lowest decile, not after having reached the lowest decile. For example, the excess market return in the second decile if the following month is in the lowest decile is 3.47%, while the excess return is -2.03% if the preceding month is in the lowest decile. Another way

of thinking about this is the overall average is positive in this decile, but only from the return when a slightly overvalued market becomes even more overvalued. Thus, if the spread has increased into the second decile due to a recent market decline, this is not a signal to re-enter at this point.

Monthly excess returns following PE ratios in the top decile are also shown at the bottom of Table 1. Results suggest that high values of the PE ratio are not useful for predicting future negative returns, neither in value or probability. In fact, the monthly excess return following PE ratios in the highest decile are greater than average, 0.86% compared to 0.62%. Although not shown, quarterly excess returns had similar results, although the annual excess return of 5.01% in the highest decile is significantly lower compared to the average market excess return but does not come close to the -4.52% from using the yield spread. Further results using the PE ratio did not demonstrate any usefulness within the context of this study. Because of this, only results from using the yield spread are reported further.

Figure 2 below graphs the percent rank and value of the yield spread from 1946 to 2015 to show how often extreme values occur. Percent rank values below the solid horizontal line show when the yield spread is in the bottom decile. The longest period the yield spread stays in the bottom decile is 33 months from May 1967 to Jan. 1970, with an average duration of 6.46 months. Thus, using the spread as an indicator to exit the market does not lead to excessive trading, and may be attractive to an investor who generally follows a buy-and-hold strategy.

FIGURE 2
Yield curve percent rank relative to previous 10-years from 1946 to 2016.



Notes. The solid line shows the 10% barrier for when the market may be overvalued.

To attain an idea of how well the yield spread correctly signals a decline, Table 2 below compares the probability of decline at any time relative to periods following a yield spread in the bottom decile. Overall, the probability of a monthly, quarterly, or annual decline on a rolling monthly basis for the subsequent month, quarter, or year is 41%, 37%, and 28% respectively. Following a yield curve in the bottom decile, the probabilities are 46%, 56%, and 66% respectively, which are all statistically greater. Although not shown, these increases are even more significant over the last two 20-year sub-periods. However, the probability a signal occurs is only 19% for the overall time period, with a low of 3% (8 months) over the last 20 years.

TABLE 2
Probability of market decline and opportunity cost when market doesn't decrease

	Monthly	Quarterly	Annual
	Probability of Market Decline		
All Returns	40.70%	36.96%	28.26%
Yld Spread	46.45%***	56.13%***	66.45%***
	Average Excess Return if Market Declines		
All Returns	-3.29%	-5.59%	-12.87%
Yld Spread	-3.32%	-6.08%	-12.40%
	Average Excess Return if Market Increases		
All Returns	3.31%	6.28%	16.44%
Yld Spread	2.82%*	5.42%*	11.09%***

Notes. Monthly, quarterly, and annual probabilities are given for all returns and for those following the bottom decile ranking of yield spread. Excess returns relative to the risk-free rate are shown for when the market declines or rises. ***, **, and * denote significant difference at the 1%, 5%, and 10% level from the overall averages.

Although the yield curve signals an increase in the probability that the market declines, the magnitude may be even more important. Table 2 shows the excess return when the market actually declines and the opportunity cost when it does not. Somewhat surprisingly, the decline when the yield curve signals an overextended market is not significantly worse than the overall average when the market declines. The gain from using the yield spread appears to be based on the increased probability the market will decline, and the smaller opportunity cost when it doesn't.

The opportunity cost of exiting the market after a yield spread signal is 2.82%, 5.42%, and 11.09% for monthly, quarterly, and annual periods respectively. These values show that the cost of being wrong is much less compared to the mean of all excess returns if the market does not decline, 3.31%, 6.28%, and 16.44% respectively. From an annual standpoint, if one is wrong about avoiding a -12.40% excess return loss, the excess return cost is only 11.09%.

To quantify the value of exiting the market, three decision rules are examined: 1) exit and stay out while the yield spread signal is in force, 2) exit until the signal moves

back to a normal range as defined to be above the second decile, or 3) exit and return within a year when a particular decline barrier is reached. The third idea is if an investor reduces or eliminates exposure to what is considered an overvalued market, a decline may be needed to induce the investor to re-enter the market. However, it is assumed the investor will re-enter the market no more than a year later, assuming the yield spread is still not indicating an overvalued market.

Equation 1 is applied to the three rules along with different loss thresholds for rule 3 ranging from 5% to 15% with a maximum wait duration of 12 months. Table 3 below shows the expected returns relative to buy-and-hold. The expected return from exiting until the yield spread is no longer in the bottom decile is 3.53%, while waiting for it to return above the second decile increases the expected return to 5.14%. These positive expected returns remain across sub-periods and are statistically significant except for the last sub-period which only has 8 observations.

TABLE 3
Expected value from exiting the market after a yield spread in the bottom decile

	Exit Bottom Decile	Exit & Return in 3rd Decile	Wait for 5% Decline	Wait for 10% Decline	Wait for 15% Decline
			Expected Returns		
1946 to 2016	3.53%***	5.14%***	5.53%***	6.74%***	8.11%***
1946 to 1975	1.76%*	2.79%***	3.23%***	6.14%***	7.33%***
1976 to 1995	8.58%***	12.54%***	14.77%***	9.91%***	10.32%***
1996 to 2016	2.86%*	0.84%	-8.58%	-0.52%	7.88%
			Expected Returns for 22 Non-Overlapping Annual Periods		
1946 to 2016	0.36%	1.32%	3.12%	4.88%	4.47%

Notes: Expected value of exiting the market when yield spread is in bottom decile only, when yield spread returns to 3rd decile, and waiting for decline thresholds. ***, **, and * denote significantly greater than zero at the 1%, 5%, and 10% level.

Although not shown in Table 3, to evaluate the expected returns from waiting for a decline threshold, it is noteworthy to examine the probability of a 5%, 10%, or 15% loss at any time which is 33%, 20%, and 12% respectively. In years following a yield spread in the bottom decile, these probabilities are all significantly greater at the 1% level ranging in value from 61% for a 5% loss, 41% for a 10% loss, and 26% for a 15% loss. The probabilities remained relatively stable across the time periods.

Similar to the first two strategies, the expected returns when using decline thresholds are all significantly positive. This holds for the sub-periods as well. The only exception is for the 5% and 10% loss barriers in the 1996 to 2016 sub-period due to the 38% opportunity cost from exiting in 2009. There are only eight months during 1996-2016 in which a signal is given and this one wrong signal causes the overall average to be negative. The yield spread gives a correct signal in six of the eight periods.

One of the drawbacks from the above results is that they are based on statistics using every month the yield spread is in the bottom decile and not implementable on an on-going basis since the time periods overlap. Results are also computed based on non-overlapping 12-month periods and shown at the bottom of Table 3. There are 22 annual periods from 1946 to 2016 that meet this qualification. Reaffirming the above results, the average excess return from exiting when the yield spread is in the bottom decile is greater than remaining in the market. The average annual return for the market over these 22 periods is 5.29%, while exiting when the yield spread is in the bottom decile results in an additional return of 0.36%, and if one waits until the yield spread returns to the 3rd decile or higher gives an excess return of 1.32%. Exiting and waiting for a 5%, 10%, or 15% decline results in even better excess returns of 3.12%, 4.88%, or 4.47% respectively. The percentage of time outperforming a buy-and-hold strategy for these 22 non-overlapping periods did not fall below 59% regardless of the decline threshold since just holding the risk-free asset outperformed remaining in the market 59% of the time with an average return of 4.91%, albeit a negative overall excess return of -0.38%.

Finally, to compare directly to a buy-and-hold strategy over the 1946 to 2016 period, the three decision rules are applied on an ongoing basis to a beginning wealth level. Table 4 below shows the results. Exiting and remaining out of the market only when the signal is in force has a larger average monthly return, but insignificantly so, both statistically and economically which might be expected give the fairly large monthly standard deviations. However, using the yield spread does result in a lower standard deviation, and higher Sharpe and Sortino ratios along with a slightly higher VaR. The geometric annualized return is also larger, 11.09% compared to 10.75%. These results are consistent across sub-periods in addition to the last 20 years.

TABLE 4
Average returns and risk metrics based on yield spread.
1946 to 2016

	All Returns	Strategy 1	Strategy 2	10% Decline	15% Decline
Geo. Ann. Mean 46-2016	10.75%	11.09%	11.62%	11.93%	12.32%
Geo. Ann. Mean 46-1975	9.88%	9.96%	10.23%	11.96%	12.24%
Geo. Ann. Mean 76-1995	14.59%	15.56%	17.43%	16.58%	17.10%
Geo. Ann. Mean 95-2016	10.04%	10.17%	9.81%	9.14%	9.57%
		Monthly Data: 1946-2016			
Mean	0.96%	0.97%	1.00%	1.02%	1.05%
St. Dev	4.18%	3.87%	3.56%	3.58%	3.55%
Sharpe	0.15	0.16	0.18	0.19*	0.20**
Sortino	0.37	0.40	0.47	0.48	0.50
VaR	-6.11%	-5.66%	-4.95%**	-4.99%**	-4.89%***

Notes. Monthly returns following percent ranking of yield spread based on preceding 10 years for 1946 to 2016. Strategy 1 is exiting for when ranking is in bottom decile. Strategy 2 is exiting when ranking is in bottom decile and re-entering when 3rd decile is

attained. The decline columns are based on re-entering after a decline threshold is met. ***, **, and * denote significant difference at the 1%, 5%, and 10% level from the overall averages. VaR significance is based on being different than results using all the returns.

Remaining out until the yield spread returns to the third decile or higher is associated with better results, but not statistically so. The geometric annualized return increases to 11.62% while the monthly average return increases to 1.00%. The Sharpe, Sortino, and VaR values are superior as well. There is a slight decline in the 95-2016 period due to the 2009 exit in which the market increased 38%.

The third strategy is exiting until a particular loss threshold is met. Decline barriers of 10% and 15% are shown. Decline barriers greater than 15% led to declining results as the probability of ever greater declines becomes increasingly small. Using either threshold led to much higher geometric annual returns relative to buy-and-hold--more than 1% larger. Mean monthly returns are also larger along with higher Sharpe and Sortino ratios and significantly larger VaRs. Thus, exiting the market when the yield spread declines into the bottom decile, regardless of what exact strategy is implemented appears to increase returns and reduce risk. It should also be noted that even though the 15% decline barrier has the best returns, the probability of success in terms of re-entering the market after a 15% decline is only 26%. Thus, in practice, a more conservative decline barrier of 10% or even less may be more prudent.

CONCLUSION

Successful market timing by professionals or individual investors appears be an elusive accomplishment. Over the last 5 years, 84% of large cap managers and 90% of small cap managers have underperformed their benchmarks, (Soe, 2015). Just four actively managed funds have beaten the S&P 500 over the last eight years, (Jaffe, 2015). Individual investors do even worse as Dalbar (2016) reports that the average equity fund investor has only averaged 5% over the last 20 years compared to 9.8% for the typical index fund.

Against that backdrop, regardless of when you are reading this, there is a 90%+ probability that one could exit the market today and re-enter at a lower price. There is an approximate 45-50% chance the market will be down 5% sometime in the next year. With those odds, successful market timing appears inherently possible. However, if one exits the market and it doesn't decline, the annual opportunity cost averages 17%. Thus, it is imperative to either improve the odds of being correct or reduce the opportunity cost when one wants to temporarily reduce or eliminate market exposure.

This study shows that when the earnings yield T-bond spread falls into the lowest decile relative to its previous 10-year average, the probability of a market decline increases significantly. Not only does the yield spread indicate an increase in the probability of a market decline, but it reduces the average cost of being wrong over the following year to 11%. From a pure expected return viewpoint, exiting the market and waiting for the yield spread to return to more normal levels or using decline barrier

thresholds to re-enter the market leads to an expected excess return from 5% to 8% in the year it is implemented. In addition, the increase in expected return is associated with a lower risk profile as measured by Sharpe, Sortino, and VaR values.

The strategy suggested in this study can best be described as an occasional market timing tool. Over the past 70 years, there have only been 22 instances of non-overlapping annual time periods where the strategy could be implemented. In the past 20 years, there have only been 3 non-overlapping periods. The last signal was May 2009, and even that signal could be considered questionable since the PE went over 100 for a few months due to the huge losses in the financial sector creating the first, and so far, only negative earnings quarter for the S&P 500. After the 2009 signal, the market was up 38% over the next year demonstrating the signal often works, but doesn't always work. As always, past results are no guarantee of future success, but extremely low values of the yield spread certainly appear to be an indicator of dangerous market conditions. Even for long-term stalwart buy-and-hold investors, a reduction in exposure during such environments appears to be the more optimal strategy.

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ENDNOTES

[1] The Sharpe ratio is given as:

$$\frac{R_p - r_f}{\sigma_p} \quad (2)$$

where R_p is the return to the portfolio, r_f is the risk-free rate and σ_p is the standard deviation from the monthly returns.

[2] The Sortino Ratio is calculated as:

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

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.

[3] The test for VaR significance is:

$$(\frac{1}{N}\sum_{n=1}^{N} Hit_n - \alpha)/\sqrt{\alpha(1-\alpha)/N} \rightarrow N(0,1)\ as\ N \rightarrow \infty \quad (4)$$

where Hit_n equals one if the timing return is lower than the buy-and-hold VaR, zero otherwise, N is the number of timing returns and α equal 5%.


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