

Simple Market Timing

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Abstract

This paper describes a mechanical method for actively managing a retirement account with the goal of reducing volatility of the account, as compared to the equity market, while achieving reasonable compounded returns. The goal of the method is to avoid making annual withdrawals from a depressed account and to provide a more stable base for doing retirement planning.

Introduction

The heart of retirement financial planning is to “finance a constant, non-volatile spending plan using a risky, volatile investment strategy” [10]. There are two parts to the issue:

1. Create an optimal cash flow management plan to be executed during retirement.
2. Actively manage the retirement account in such a manner as to minimize volatility.

The Optimal Retirement Planner (ORP) [9] addresses part one of the issue. Given the retiree’s or potential retiree’s asset situation plus certain choices and forecasts, ORP computes a cash flow plan that maximizes the amount of after-tax money available for spending during retirement. ORP does this by optimally scheduling withdrawals from the three retirement accounts, IRA, Roth IRA and after-tax, as well as scheduling IRA to Roth IRA or to after-tax account transfers.

A fundamental ORP assumption is that the user’s forecasted rate of return on assets is constant over time.

Part two is the subject of this paper; to wit how to reduce the volatility in the value of retirement savings over time to be assured that withdrawals during market downturns do not significantly damage the retirement plan’s assets. A less volatile rate of asset return improves the credibility of ORP’s computed guidelines in light of ORP’s constant rate of return assumption.

Conventional retirement planning assumes that the buy and hold strategy is applied to the retirement account; i.e. the retirement assets are fully invested all the time and are completely at the mercy of the market’s volatility. However, an actively managed asset account can be made significantly more stable than a passively managed, fully invested account.

This paper presents a mechanical technique for doing Simple Market Timing (SMT) that avoids being invested during major market downturns. A simulator, using historical market data, has been implemented as a computer program to confirm that SMT is viable and to determine its optimal parameters.

SMT has few rules and is easy for anyone to implement. No special software is required; only access to www.yahoo.com or some similar source of data.

SMT has two objectives:

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- 1. Reduce the volatility of retirement assets.**
- 2. Obtain a reasonable rate of return on retirement assets while giving priority to objective 1.**

Reduced volatility is more important than asset returns during the distribution phase of retirement when annual withdrawals are being made from the retirement saving accounts regardless of the state of the market. Withdrawing from depressed asset savings requires the sale of many more shares of stock than during a market upswing. That constricts future recovery and growth of the retirement account and restricts future spending.

There is no perfect asset protection scheme. Cash is devoured by inflation. Bonds are volatile and offer low returns; when interest rates rise, bond values decline. Equities offer better returns at the risk of high volatility. SMT tries to achieve some of the stability of bond returns but with the higher returns characteristic of equities.

SMT operates by either having all of the portfolio assets in the market or in cash. When to do what is determined by the interaction of two moving averages. SMT is fully mechanical and requires no user interpretation of stock market data.

SMT's Method

SMT signals that the market is to be entered or exited based on the relative position and daily movement of a 222 day moving average (Long) and a 2 day moving average (Short) of the S&P 500 index.

A 2 day S&P 500 index [4] [12] moving average is the sum of the 2 most recent S&P 500 index values divided by 2 (days). Each day the oldest value is dropped from the sum and the most recent day's value is added to it. The 222 day moving average is computed in the same fashion. Appendix A describes the derivation of the numbers 2 and 222.

As we will discuss later, SMT requires no computations. Each evening the required, updated moving averages can be found on yahoo.com.

Figure 1 illustrates how the SMT rules are applied. It shows the interaction of the S&P 500 Long and Short for a three year time period. The SMT rules are:

1. If Short rises above Long then enter the market. In Figure 1 a buy event occurred in May 2003.
2. If Short falls below Long then exit the market. In Figure 1 a sell signal occurs in October 2000.
3. Short coming near or equaling Long does not count and is to be ignored. In Figure 1 there are three close, but no cigar, occurrences
4. Enter or exit the market the day after Short transverses Long; procrastination is not our friend here.

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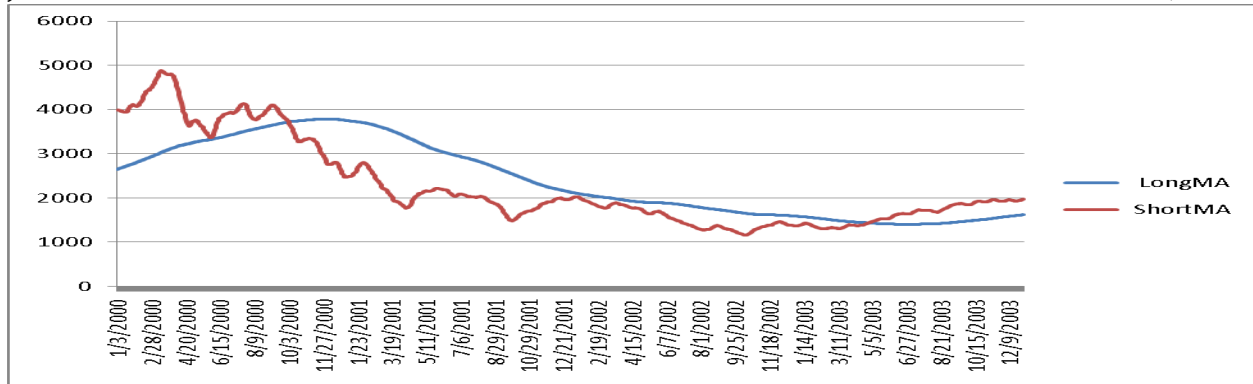


Figure 1: SMT Example

The idea of using moving crossing averages as market timing signals has been around for awhile [3] and is starting to attract renewed attention from researchers [6].

Computational Results

This section reports the results obtained from computer software that simulates the action of SMT over different time periods. The data in this report come from Yahoo.com as of November 1, 2010.

Table 1 shows the results of using SMT to manage an investment account using the S&P 500 Index from April 20, 1951 to November 1, 2010 and compares them to the policy of *Buy and Hold* (B&H). The B&H strategy is to be fully invested in the market at all times. SMT exits and enters in the market according to the SMT rules listed above.

Description	B&H	SMT
Compounded Gain	5273.80%	7769.00%
Average Annual Return	8.20%	8.40%
Worst Annual Return	-35.60%	-16.20%
# Years of Neg Returns	17	20
In Market	100.00%	69.20%
Out of Market		30.80%
# Trades		327
# Losing Trades		116
Worst Losing Trade		-3.20%

Table 1: S&P 500 Summary for 1951 to November 2010

The key to Table 1 is as follows:

- **Compounded Gains** is the amount of change over S&P 500's 60 years as a percentage of the S&P 500 index value (22.04) on April 20, 1951, the date on which the first 222 day moving average is available.)

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- **Average Annual Return** is the percentage return for each year summed and divided by the number of years (59). An annual return is the change in value over one year divided by the year's starting value. There is an annual return for each year in the time span except for the first year. January 1 is the anniversary date for computing annual returns.
- **Worst Annual Return** is the smallest of all of the annual returns computed.
- **# Years of Neg Returns** is the count of years in which the annual return for the year is negative.
- **In Market** is the percentage of days in which the account is invested in the market.
- **Out of Market** is the percentage of days the investment account is out of the market.
- **# Trades** is the number of times that SMT entered or exited the market.
- **# Losing Trades** is the number of times that SMT entered the market and subsequently exited at a loss. It does not include the number of times that SMT exited the market and reentered at a higher index value.
- **Worst Losing Trade** is the largest trade loss taken.

In Table 1 SMT's Worst Annual Return is half that of Buy and Hold. SMT's better asset returns reflect an overall reduction in volatility in the account.

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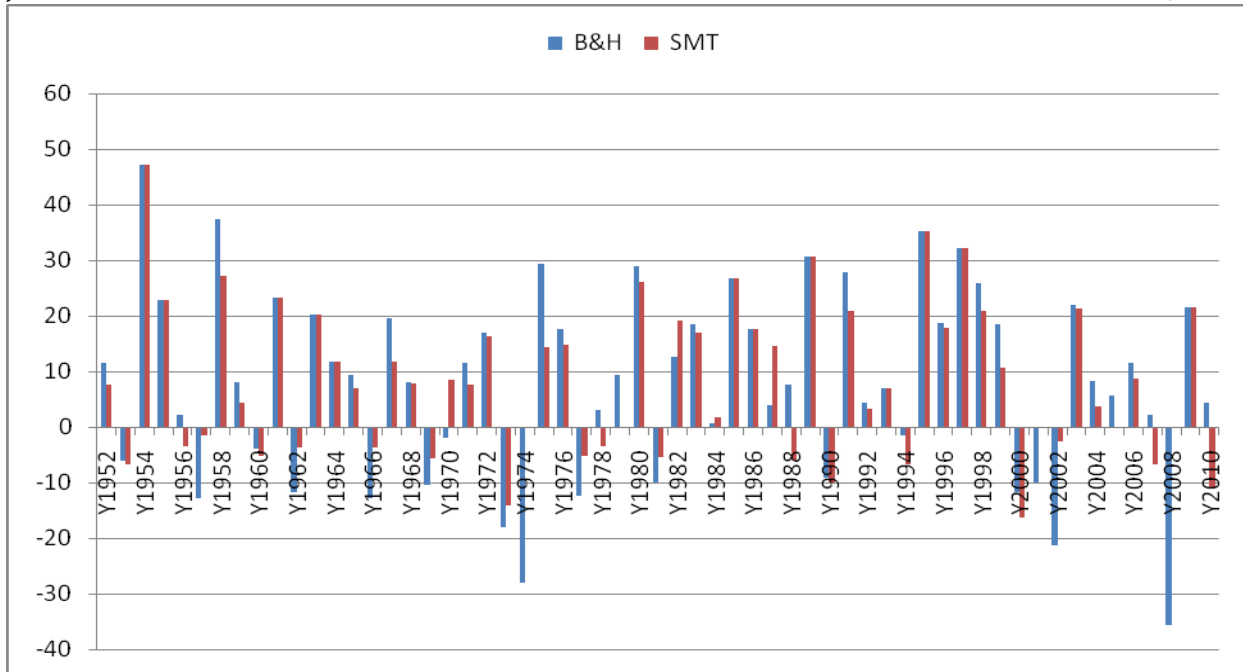


Figure 2: S&P 500 Annual Returns, 1951 to November 2010

Figure 2 shows the annual returns for B&H and SMT. Years without an SMT bar indicates that SMT is out of the market for the full year (2001 and 2008 for example). Only in years 2000 and 2010 did SMT sustain a larger loss than did B&H.

The important point here is that there was no year in which SMT sustained severe losses.

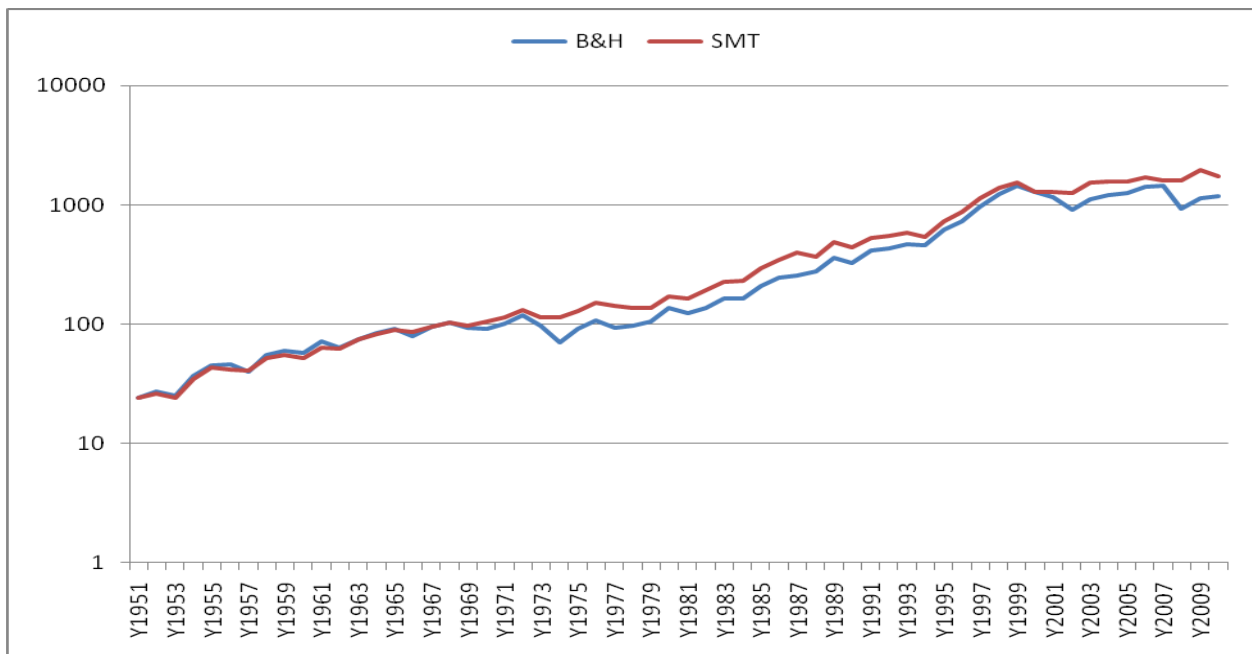


Figure 3: Compounded Values for 1951 to November 2010

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Figure 3 shows the compounded values for B&H and SMT using a logarithmic vertical scale.

Four market eras can be identified in Figure 3:

1. The years 1950 through 1971 were the *Post WWII Era*.
2. The years 1972 through 1982 were the *Vietnam War Era* when an economic downturn was accompanied by inflation leading to a difficult market.
3. The *Great Bull Market* was from 1983 through 1999.
4. 2000 to 2010 is the volatile *21st Century Market*.

The following four sections discuss SMT's performance in each of these market eras.

The Post WWII Years

Table 2 shows SMT and B&H performance for the time period of 1951 through 1971.

Description	B&H	SMT
Compounded Gain	363.20%	418.50%
Average Annual Return	8.70%	8.90%
Worst Annual Return	-12.80%	-6.60%
# Years of Neg Returns	7	7
In Market	100.00%	69.90%
Out of Market		30.10%
# Trades		83
# Losing Trades		27
Worst Losing Trade		-2.10%

Table 2: The S&P 500 for 1951 through 1971

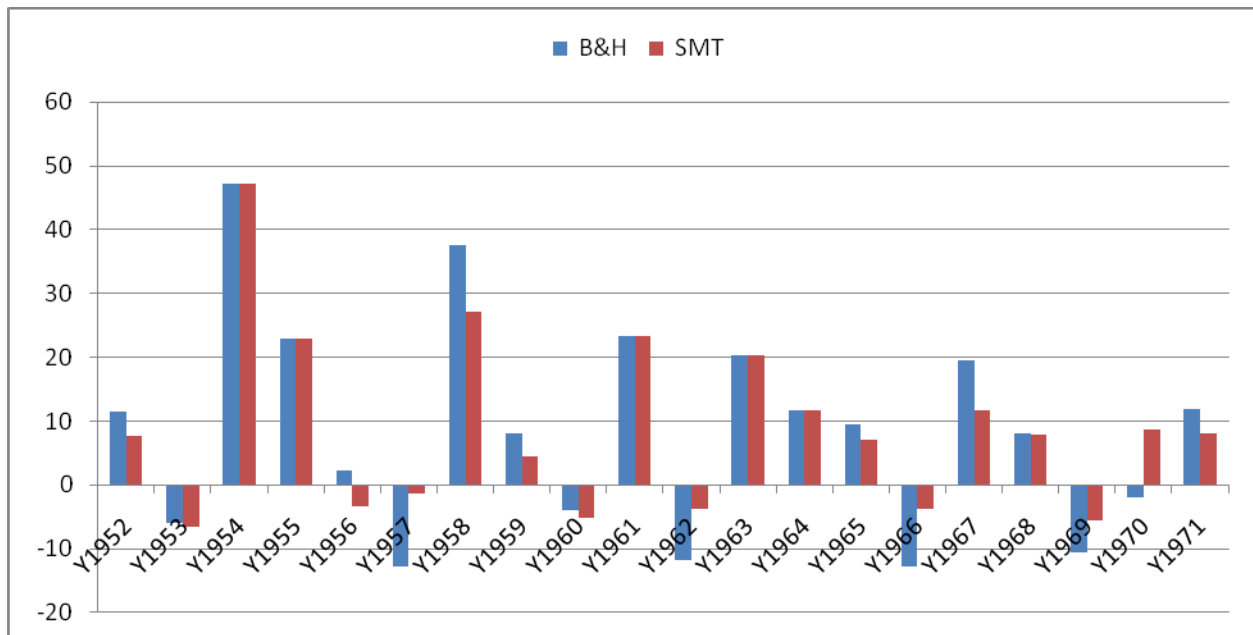


Figure 4: S&P 500 Annual Returns, 1951 through 1971

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Figure 4 shows the annual returns for B&H and SMT, from January to January, for each year of the Post WWII Era. In those years that SMT lost money its level of annual loss was not severe.

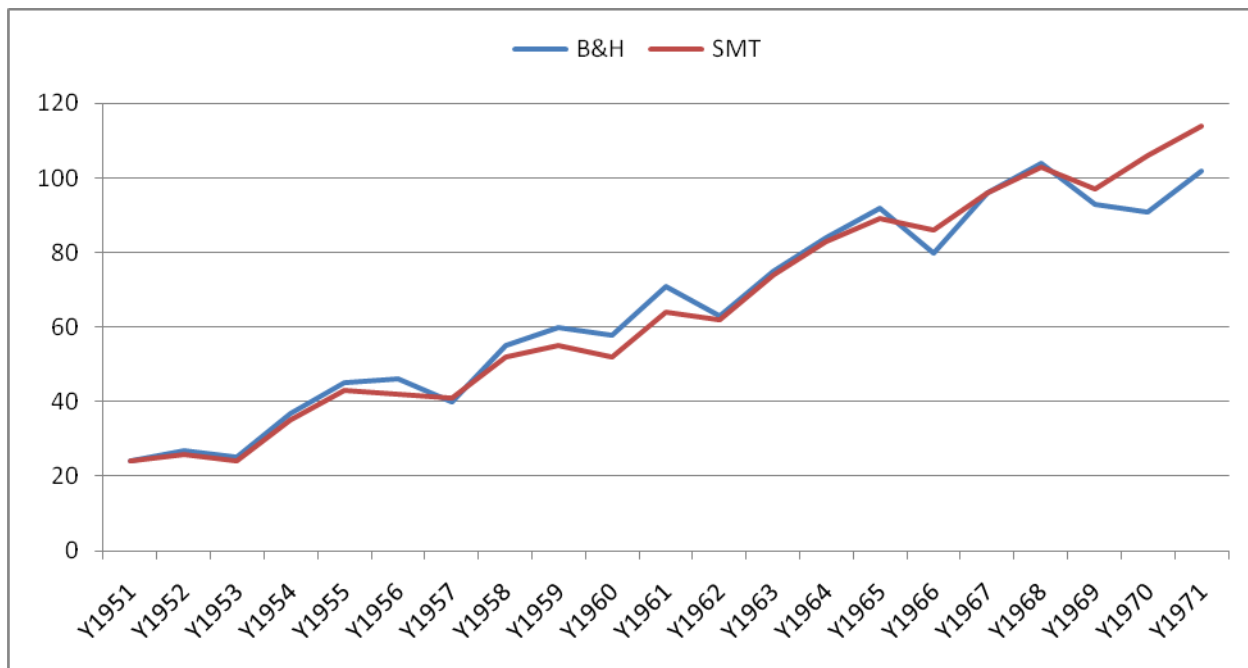


Figure 5: Compounded Values, 1951 through 1971

Figure 5 shows the compound values for B&H and SMT during the Post WWII Era. The S&P 500 has a nice upward slope and lacks much of the volatility noted in other market eras.

The Vietnam War Era

Table 3 shows SMT and B&H performance for the time period of 1972 through 1982.

Description	B&H	SMT
Compounded Gain	38.30%	73.60%
Average Annual Return	4.70%	5.90%
Worst Annual Return	-28.10%	-14.00%
# Years of Neg Returns	4	5
In Market	100.00%	57.40%
Out of Market		42.60%
# Trades		71
# Losing Trades		25
Worst Losing Trade		-1.70%

Table 3: S&P 500 Summary for 1972 through 1982

During the turbulent market of the 1970's SMT did a pretty good job keeping losses down while making reasonable asset returns.

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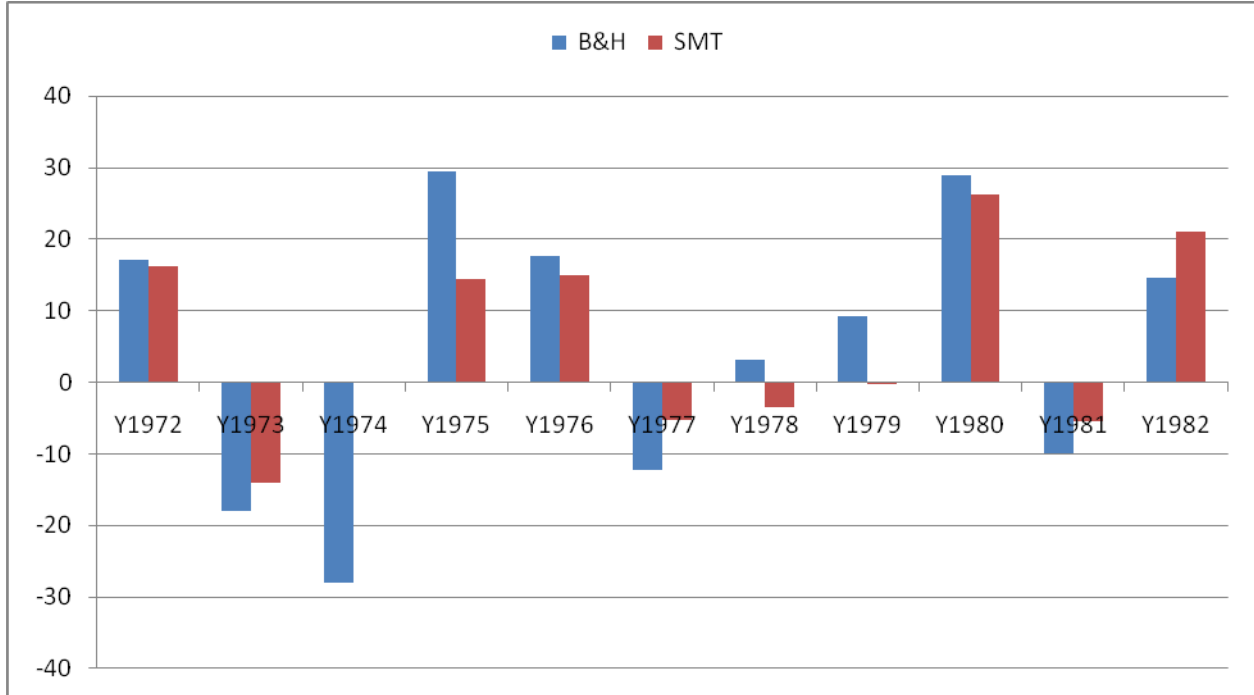


Figure 6: S&P 500 Annual Returns for 1973 through 1982

1974 has no bar for SMT because it was out of the market for the full year.

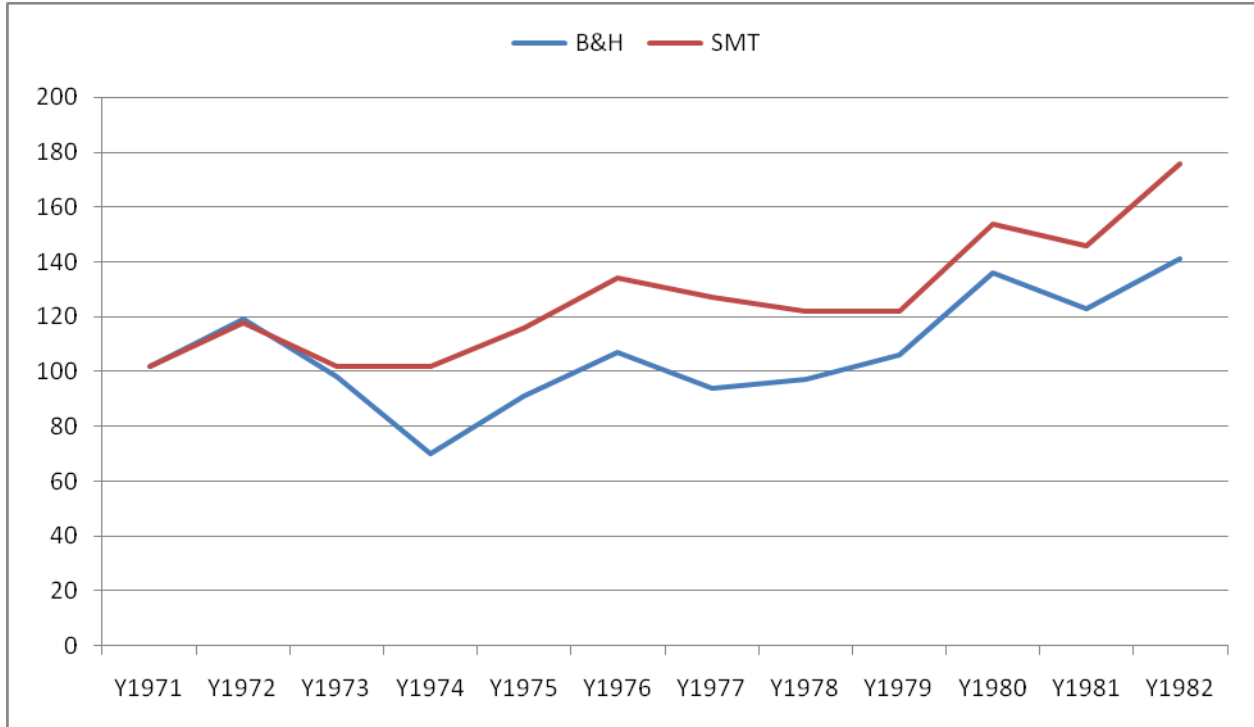


Figure 7: Compounded Values for 1972 through 1982

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Figures 6 and 7 show that SMT's asset protection performance in the bear market of 1973 gave it a running start for asset compounding for the rest of the decade.

The Great Bull Market

Table 4 shows SMT's performance during the Great Bull Market of the 1980's and 1990's.

Description	B&H	SMT
Compounded Gain	795.50%	507.60%
Average Annual Return	14.50%	12.10%
Worst Annual Return	-9.20%	-9.90%
# Years of Neg Returns	2	4
In Market	100.00%	84.40%
Out of Market		15.60%
# Trades		89
# Losing Trades		33
Worst Losing Trade		-3.20%

Table 4: S&P 500 Summary for 1983 through 1999

Table 4 tells us that there is no need for market timing in a bull market.

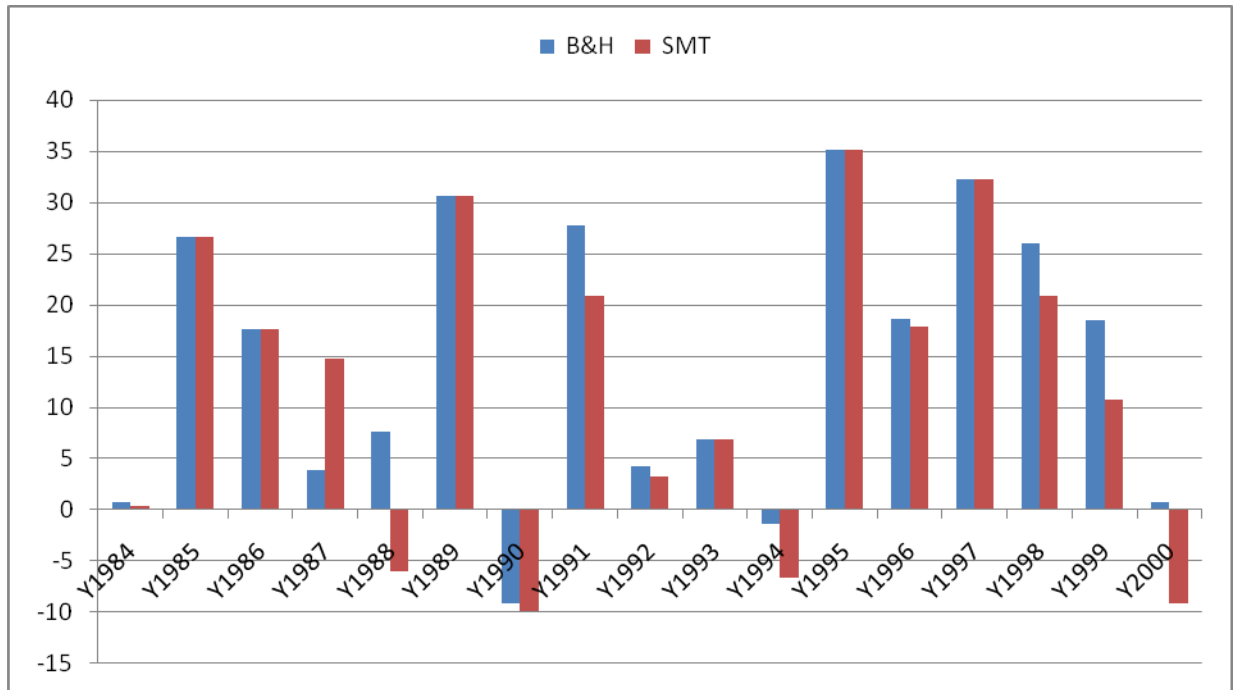


Figure 8: S&P 500 Annual Returns for 1983 through 1999

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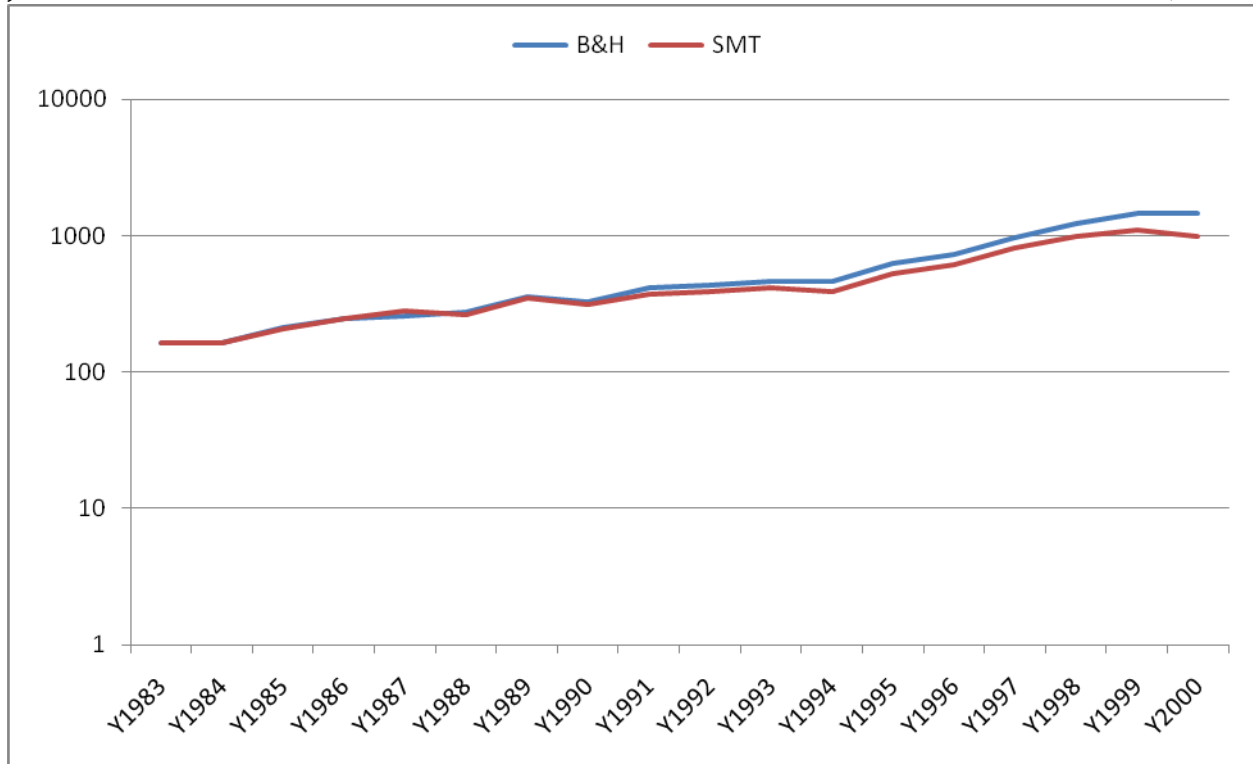


Figure 9: Compounded Values for 1983 through 1999

In Figure 9 the vertical scale is logarithmic. SMT is no match for B&H in a bull market.

The 21st Century Market

Table 5 shows SMT's results during the first decade of the new millennium.

Description	B&H	SMT
Compounded Gain	-18.60%	12.90%
Average Annual Return	-0.30%	1.70%
Worst Annual Return	-35.60%	-16.20%
# Years of Neg Returns	4	5
In Market	100.00%	55.70%
Out of Market		44.30%
# Trades		93
# Losing Trades		38
Worst Losing Trade		-3.20%

Table 5: S&P 500 Summary for January 2000 to November 2010

The 2000's were not good for the Buy and Hold strategy as anyone who tracks their 401K investments can testify to.

SMT was out of the market nearly as much as it was in. 58 trades in 10 years indicate that SMT was relatively active in this volatile market.

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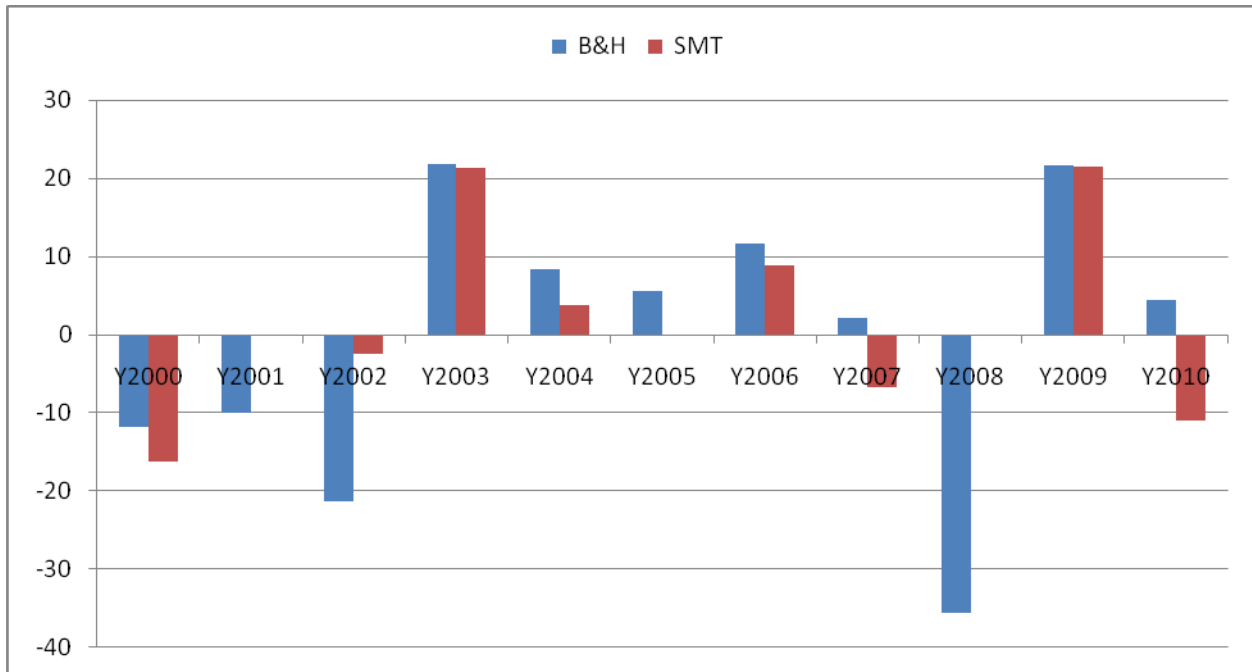


Figure 10: S&P 500 Annual Returns for January 2000 to November 2010

SMT was out of the market altogether in 2001 and in 2008 while the market was taking major losses.

Whipsaw

Figure 10 shows that SMT is not doing well in 2010. This requires a closer examination.

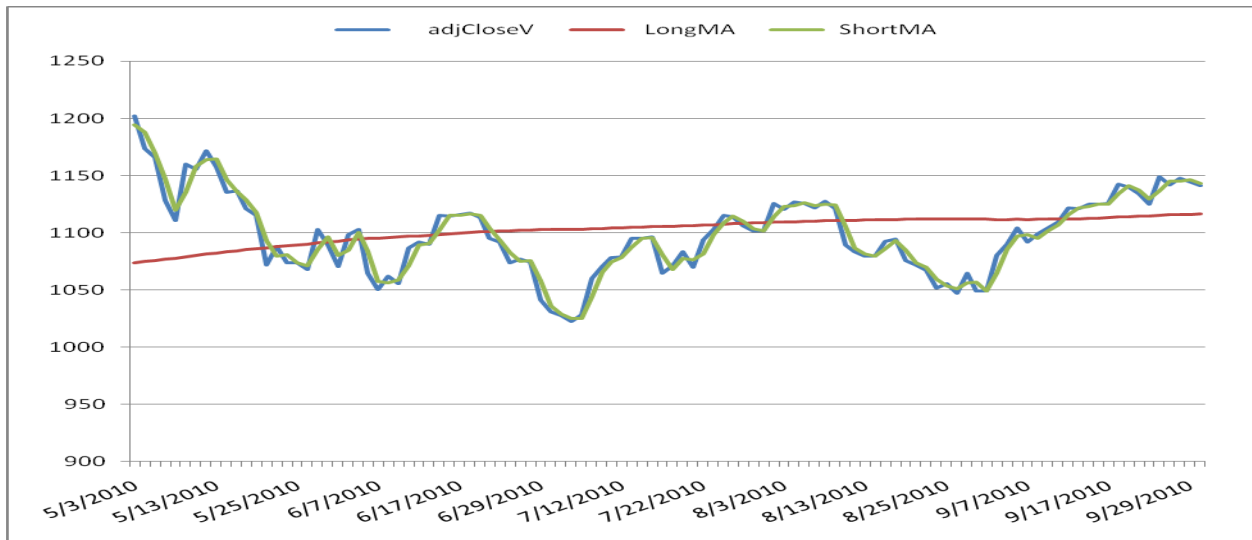


Figure 11: 2010 S&P 500 Index and Moving Averages

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The cause of SMT's distress in 2010 is shown in Figure 11 which displays the S&P index, Long and Short activity for the summer of 2010. The S&P 500 index was in a trading range right on top of its 222 day moving average (Long). This is about the worst thing that can happen to SMT short of a market crash. For the entire summer Short, and the S&P 500 index criss crossed Long. Each intersection resulted in a trade. Each sale was for a small loss but in aggregate contributed to a significant loss for 2010. Referring back to Figure 10 we see that the same thing happened in 2000. In 2000 there were 12 trades and in 2010 there were 13. On the other hand in 2008 there were no trades and in 2009 there was 1. The problem is that at the time the moving averages cross SMT has no way to tell the difference between the one that occurred on July 26 which was a whipsaw and the one that occurred on September 13 which was a major move.

The whipsaw market of 2000 preceded a major meltdown. The whipsaw of 2010 is probably preceding a market upside move. SMT can't tell the difference.

Episodes such as this have to be endured because the whipsaw can turn into a breakout in either direction at any time. This phenomena has happen occasionally over the past 50 years, including twice in the 2000's decade.

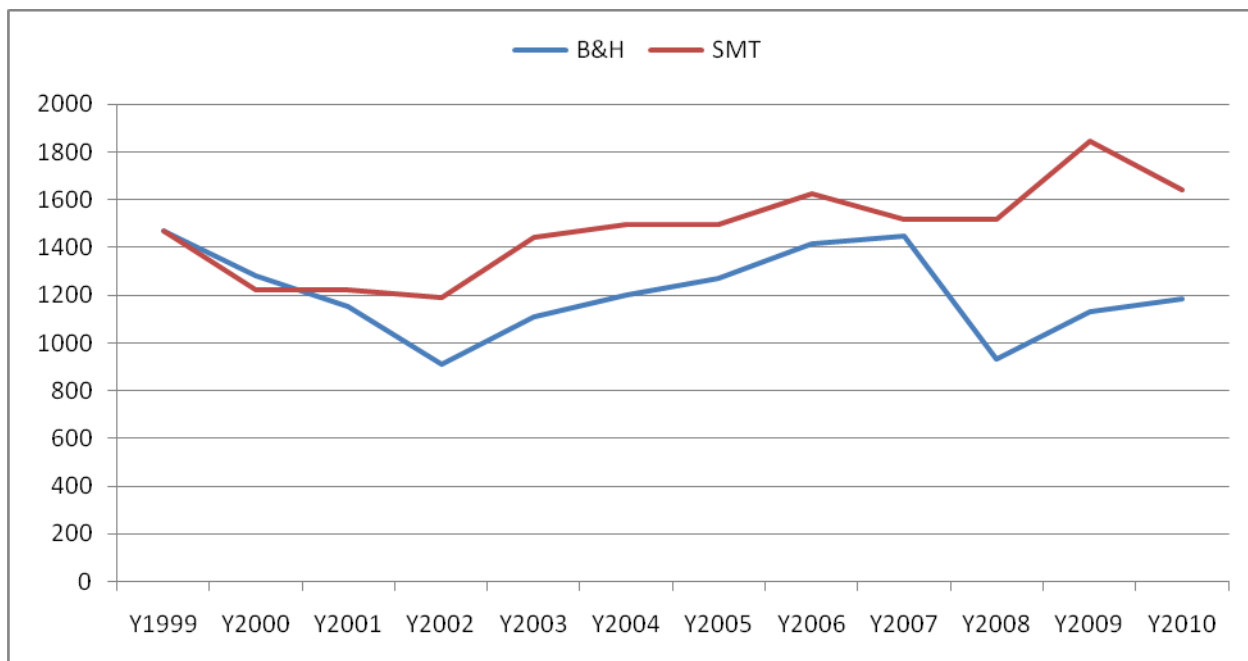


Figure 12: Compounded Values for January 2000 to November 2010

Figure 12 shows the compounded values from a common starting point at the end of 1999 to November 2010. SMT's return was flat in 2002 and 2008 because it was out of the market. Although SMT has not do well in 2010 its performance for the decade is positive which cannot be said of B&H (Table 5).

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Using SMT

Thanks to yahoo.com using SMT is easy:

1. Go to the Internet page: <http://finance.yahoo.com/q?s=GSPC>
2. On the left hand side of the page select the *Interactive* option under the *Charts* heading.
3. This brings up the S&P 500 index for the current day as indicated by the highlighted *ID* at the bottom of the chart.
4. Change the *ID* to *IM* (1 month) which will display the S&P 500 from the current day back to the same day last month.
5. Along the top of the chart select *Technical Indicators* and *Simple Moving Averages* from the drop down menu.
6. In the popup boxes enter 2 and 222 and click *Draw*
7. The Short and Long moving averages will be added to the chart. The most recent intersection of Short and Long will give the IN or OUT market status of SMT.

To achieve SMT simulator's results, both good and bad, the rules of the computer simulation have to be followed. Most importantly, since Yahoo's data are updated later in the evening after the market closes the entering or exiting of the market needs to be done following day.

Since SMT is built using the S&P 500 index the most reliable use of SMT is to trade the SPDR S&P 500 ETF (symbol SPY) which tracks the S&P 500 index with reasonable precision. SPY invests in all of S&P 500 stocks based on market capitalization, i.e. big companies carry more weight than small companies.

When SMT gives an *enter-the-market* signal, buy SPY. When SMT gives an *exit-the-market* signal sell all SPY holdings.

Most importantly if you use SMT, stick to the strategy. Don't get emotional or panicky, particularly when SMT returns go down as the market goes up.

Conclusion

The results shown here support the assertion that SMT, as an active account manager, should reduce the volatility of a retirement account. SMT gives competitive compounding performance when compared to the Buy and Hold policy. This conclusion is not limited to the S&P 500 but can be extended to other actively managed investment strategies oriented toward capital preservation.

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Description	B&H	SMT	Improvement
1951-2010	-35.60%	-16.20%	54.5%
Post WWII	-12.80%	-6.60%	48.4%
Vietnam	-28.10%	-14.00%	50.2%
Great Bull Market	-9.20%	-9.90%	-7.6%
21st Century	-35.60%	-16.20%	54.5%

Table 6: Worst Annual Return

Table 6 shows the Worst Annual Return rows from Table 1 through Table 5. The first row is for the entire time period for which data was available. The remaining rows are for the four stock market eras of that time period. The B&H column shows the value for the unmanaged S&P 500. The SMT column shows the worst value for an account that was actively managed using SMT. The Improvement column shows the percent improvement of SMT over B&H.

These results show that ORP's assumption about the use of constant, average asset return values in its model is reasonable because the volatility of the S&P 500 has been reduced by 50%. This improves the ORP user's confidence in the retirement cash flow plan computed by ORP.

Table 5 indicates that 1.7% annual asset returns are what can be expected over the next few years. This is a poor return for risky investments but it is better than the -2% return that S&P 500 Buy and Hold produced.

Disclaimers

The usual caveats apply to SMT and this report:

1. Use SMT at your own risk.
2. Past experience is no guarantee of future performance; particularly since we are drawing some rather sweeping generalizations based on only 60 years of data.
3. Because individual circumstances vary nothing in this paper should be considered as financial advice or a recommendation to buy or sell any particular security.
4. I have no affiliation of any kind with yahoo.com.
5. Taxes were ignored in this study. Most ORP users are managing their IRAs and Roth IRAs where there are no tax consequences from trading. For After-Tax Accounts most periods invested in the market are long enough to enjoy capital gains tax rates to investment returns. Loses tend to be short term. ETFs such as SPY are tax favorable. SMT's low trading frequency will produce mostly long term gains few short term gains. B&H pays taxes only on withdrawals or rebalancing.
6. Trading fees were also ignored. With an Internet accessible brokerage account trading fees are negligible.

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Acknowledgements

SMT is based on concepts first presented to me by Dr. Mark Pankin during one of his Arlington (VA) Library talks in 2003 [3]. Dr. Pankin's review of this paper is also appreciated. Appendix B describes Triple 40 and shows a comparison of Triple 40 to SMT.

Mark Vadakin has independently constructed a spreadsheet implementing the crossing moving averages concept. Although coming at the problem using a totally different implementation, his results, as shown in Table 7 are consistent with SMT. These results are for the NASDAQ, 1971 to July 2010.

Description	Spreadsheet	SMT
Compound Gain	10.9%	11.4%
Max drawdown	-37.3%	-12.8%
Number of trades	45	45
In Market	70%	70%
Out of Market	30%	30%

Table 7: Spreadsheet Comparison to SMT

SMT's simulator was implemented in c language.

Appendix A: Justification

Why 2 day and 222 day moving averages?

The 2 day moving average is a smoothed out proxy for the S&P 500 daily index value. It is preferred to the daily value because it doesn't jump around as much and creates fewer unnecessary and undesirable market entrances and exits.

222 is a little harder to explain. The SMT simulator runs SMT for all combinations of Long moving average values ranging from 190 to 240 using S&P 500 index data and for Short values of 1 through 10 for the time period 1951 to 2010. The simulator shows that Long set to 222 and Short set to 2 gives the best results using historical S&P data.

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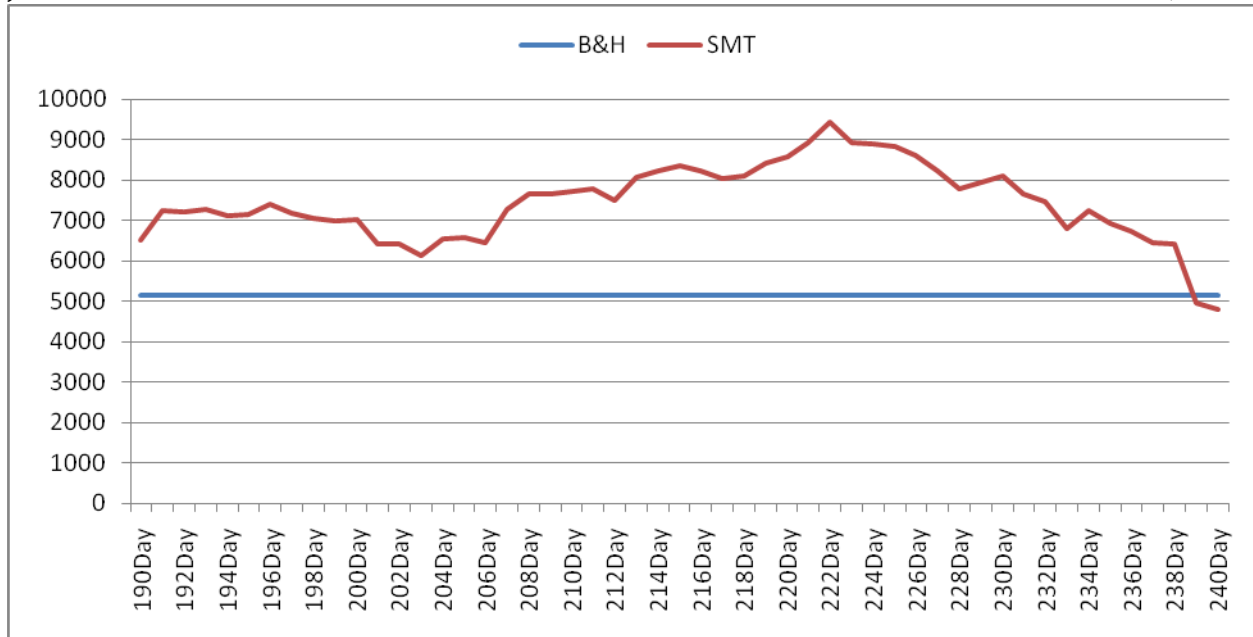


Figure 13: Effectiveness of Various Moving Average Spans

Figure 13 shows one example, for Short set to 2, of the results of these tests. The horizontal axis of Figure 13 is the number of days in the Long moving average. The vertical axis shows the range of potential percentage gains from April 20, 1951 to November 1, 2010. The horizontal line is for the S&P 500 index which had a percentage gain of 5,163% for this period. The other line represents the percentage gain for SMT trading on the S&P 500 Index using a Long moving average for the range of values and for Short set to two days.

Not only is 222 the best of the moving averages but the moving averages on both sides of it slope away from it. Figure 13 indicates that any moving average from 219 to 226 will probably give comparable results in the out-of-sample future.

Figure 14 shows the results of another run, with Short set to 2, that was made for the time period April 20, 1951 to January 1, 2000. It also pointed to 222 as the optimal moving average time span.

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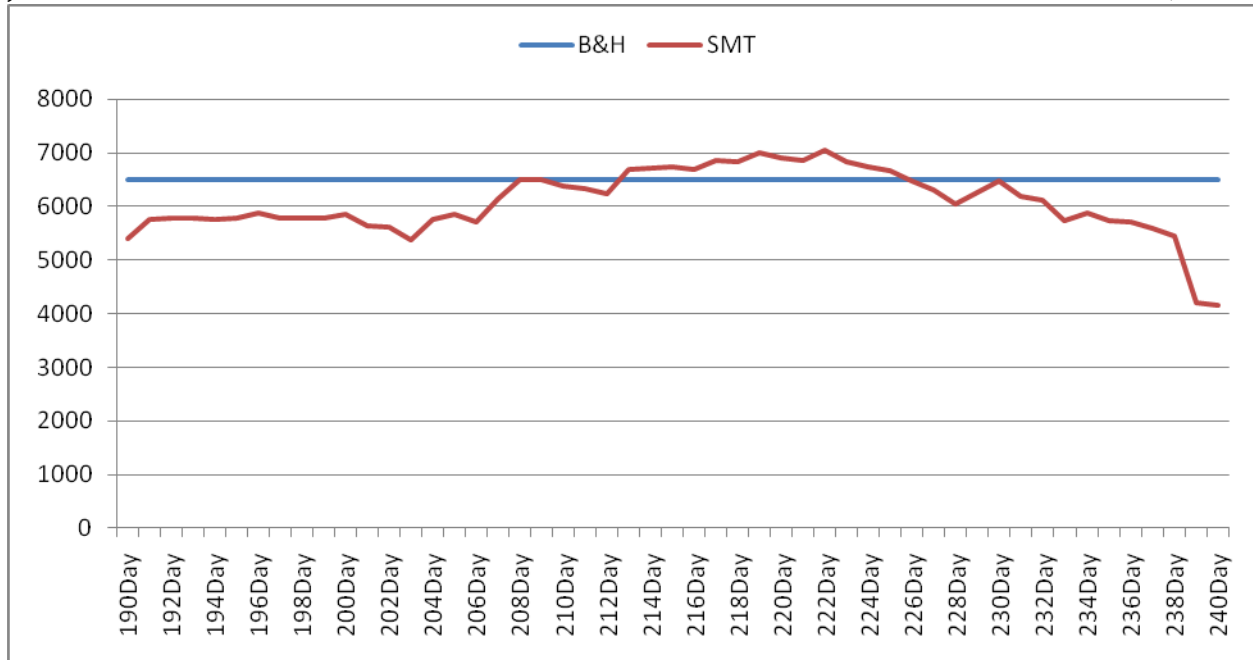


Figure 14: Spans for 1951 through 2010

That best percentage total return for this time period was closer to the buy and hold value than was the case in Figure 13. The reason for this is that from 1951 to 2000 there were 3 stock market eras. Only the 10 years of the Vietnam War Era were volatile. The other two eras of 35 years were predominantly bull markets. SMT is inferior to B&H in an up market. The difference between Figures 13 and 14 is that Figure 13 includes the current decade which was more volatile than any since the Great Depression. The moral to this story is that when evaluating any market timing technique be careful which time periods are chosen to demonstrate its efficacy. In a bull market everybody is a genius.

Based on Figure 14 the results reported in section title *The 21st Century Market* could be considered to be out-of- sample.

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Similar experiments were performed on Short values from none to 10. The results were that the 2 day moving average is the optimum value for Short.

Description	B&H	2 Day	Index
Compounded Gain	5163.00%	9447.60%	7606.80%
Average Annual Return	8.20%	8.70%	8.30%
Worst annual Return	-35.60%	-14.60%	-16.20%
# Years of Neg Returns	17	18	20
In Market	100.00%	69%	69%
Out of Market		31%	31%
# Trades		222	328
# Losing Trades		66	116
Worst Losing Trade		-3.40%	-3.20%

Table 8: Comparison of 2 day Short to No Moving Average

In Table 8 simulator results show that trading on the S&P 500 index's daily value proved to be inferior to the 2 day moving average. Trading using the S&P 500 index value crossing Long shows significant degradation in most categories except Worst Losing Trade. The time period for this experiment was 1951 through November 1, 2010

Appendix B: Triple 40

One popular example of trend following, moving average crossing techniques is Triple 40 [3]. As explained by [3] the computational rules for the Triple 40 market timing tool are as follows.

Triple 40 uses three 40 week moving averages as recorded on Friday after the market close. The closing value for the week is added to the sum of the most recent closing values and the oldest one is removed from the sum. The sum is then divided by 40 (weeks) to obtain the moving average. (40 weeks is more or less equivalent to 200 trading days).

The three 40 week moving averages used by Triple 40 are:

1. S&P 500 index value
2. 90 day T-bill interest rate
3. 10 year bond interest rate.

The Triple 40 trading rules are:

1. **Buy** if the S&P 500 index value is above its 40 week moving average and either of the bond interest rates is below their 40 week moving average.
2. **Sell** if the S&P index value is below its 40 week moving average.
3. **Sell** if both of the bond interest rates are above their 40 week moving averages.

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Table 9 compares SMT to the Triple 40 results reported by [3] for the time period Jan 1, 1993 through December 31, 2002.

S&P 500	B&H	Triple 40	SMT
Compounded Returns	7.3%	8.9%	10.7%
Worst Losing Year	-49.1%	-14.5%	-9.7%
Year	2002	2002	2000
Average Trades per year		2.05	3.70
Time in Market	100%	51%	71%

Table 9: SMT's Triple 40

Table 9 shows that Triple 40 and SMT produced comparable results for the period 1993 through 2002. SMT spends more time in the market than does Triple 40 because it is a significantly more active trader.

The big advantage that SMT enjoys over Triple 40 is that SMT timing signals are easily derived from a publicly available chart on Yahoo.com while Triple 40 requires the user to maintain a spreadsheet weekly. SMT's disadvantage is that it has to be monitored daily instead of weekly

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