A Quantitative Approach to Tactical Asset Allocation

MEBANE T. FABER

MEBANE T. FABER
is the managing director and portfolio manager at Cambria Investment Management, Inc. in Los Angeles, CA.
mf@cambriainvestments.com

Many global asset classes in the 20th Century produced spectacular gains in wealth for individuals who bought and held those assets for generational long holding periods. However, most of the common asset classes experienced painful drawdowns,[1] and many investors can recall the 40–80% declines they faced in the aftermath of the global equity market collapse only a few years ago. The unfortunate mathematics of a 75% decline requires an investor to realize a 300% gain just to get back to even. It would take fifteen years of compounding at the rate that equities have returned for the previous century (~10%) to erase a 75% deficit. Individuals unlucky enough to be invested in U.S. stocks in the late 1920s and early 1930s, German asset classes in the 1910s and 1940s, U.S. real estate in the mid 1950s, Japanese stocks in the late 1980s, or emerging markets and commodities in the late 1990s (to name a few) would reason that owning these assets was decidedly not the best course of action.

Modern portfolio theory postulates that the volatility and drawdowns associated with the aforementioned capital markets is the tradeoff an investor must accept to achieve corresponding levels of return. However, what if a passive investment in an asset class is not the optimal way to gain exposure to that asset class? This discussion becomes increasingly important as many investors are transitioning to the separation of alpha and beta portfolios.

This article examines a very simple quantitative market-timing model. This trend following model is examined in-sample on the U.S. stock market since 1900 before out-of-sample testing across more than twenty other markets. The attempt is not to build an optimization model (indeed, the chosen model is decidedly sub-optimal, as evidenced later in the article), but to build a simple trading model that works in the vast majority of markets. The results suggest that a market timing solution is a risk-reduction technique rather than a return-enhancing one. The approach is then examined in an allocation framework since 1972, including such diverse asset classes as the Standard and Poor's 500 Index (S&P 500), Morgan Stanley Capital International Developed Markets Index (MSCI EAFE), Goldman Sachs Commodity Index (GSCI), National Association of Real Estate Investment Trusts Index (NAREIT), and United States Government 10-Year Treasury Bonds.[2] The empirical results are equity-like returns with bond-like volatility and drawdown, and over thirty consecutive years of positive returns.

MARKET TIMING AND TREND FOLLOWING

The application of a trend following methodology to financial markets is not a new endeavor, and an entire book by Michael Covel [2005] has been written on the subject. The

rules and criteria of a trend following strategy are incredibly varied and unique. Although we touch briefly on some of the academic literature, a more thorough treatment of the subject is presented by Tezel and McManus [2001].

Two of the oldest and most discussed trend following systems are Dow Theory, developed by Charles Dow, and the Four Percent Model, developed by Ned Davis. "The Research Driven Investor" by Timothy Hayes [2001], and "Winning on Wall Street" by Martin Zweig [1986], present good reviews of each system, respectively.

The group at Merriman Capital Management (MCM) has completed a number of quantitative backtests utilizing market timing on various asset classes, namely equities, bonds, and gold. The group uses their own strategies to manage client money, and the results presented later in this article both verify and extend the work they have completed over the years. Tilley and Merriman [1998–2002] describe the characteristics of a market timing system, as well as the emotional and behavioral difficulties in following such a system.

Wilcox and Crittenden [2005] in "Does Trend-Following Work on Stocks?" take up the question applied to the domestic equities market. They conclude that trend following can work well on stocks even when adjusting for corporate actions, survivorship bias, liquidity, and transaction costs.

An entirely different product area where trend following is heavily utilized is in the futures arena. Many global macro hedge funds and commodity-trading advisors (CTAs), such as John Henry and Bill Dunn, have been using trend following systems on futures for years, amassing billions of dollars under management. While futures trend following is quite a different strategy than what is detailed in this article, Mulvey, Simsek, and Kaul [2003] present a description of the components of the total return of a futures trend following strategy. The return consists of collateral yield (cash sitting in T-Bills), trend following gains, and rebalancing gains in order of return contribution. They assert that collateral yield is the largest chunk of return, a point often overlooked.

There have been many attempts to describe the success of trend following and momentum trading systems. They work, presumably, because the market exhibits momentum (positive serial correlation) due to undereaction and overreaction at different timescales. Kahneman and Tversky [1979] provided a behavioral theory, entitled prospect theory, which describes how humans have an irrational tendency to be less willing to gamble with profits than with losses. In short, investors tend to sell their winners too early, and hold on to losers too long.

THE QUANTITATIVE SYSTEM

In deciding on what logic to base this system on, there are a few criteria that are necessary to produce a simple model that investors can follow yet is mechanical enough to remove emotion and subjective decision-making. They are:

1. Simple, purely mechanical logic.
2. The same model and parameters for every asset class.
3. Price-based only.

Moving average based trading systems are the simplest and most popular trend following systems, according to Taylor and Allen [1992] and Lui and Mole [1998]. The most often cited long-term measure of trend in the technical analysis community is the 200-Day Simple Moving Average. In his book "Stocks for the Long Run," Jeremy Siegel [2002] investigates the use of the 200-day SMA in timing the Dow Jones Industrial Average since 1900, and he concludes that market timing improves the absolute and risk-adjusted returns over a buy-and-hold of the DJIA. Likewise, when all transaction costs are included (taxes, bid-ask spread, commissions), the risk-adjusted return is still higher when market timing, though timing falls short on an absolute return measure. When applied to the Nasdaq Composite since 1972, the market timing system thoroughly out-performs the buy-and hold, both on an absolute and risk-adjusted basis. (Note: Sigel's system is more active than the system presented in this article, thus increasing the transaction costs). We will use the monthly equivalent of Siegel's 200-Day SMA—the 10-Month SMA.

Because we are privy to Siegel's results before conducting the test, this query should be seen as in-sample. It is possible that Siegel already optimized the moving average by looking back over the period in which it is then tested. To alleviate fears of datasnooping, the approach will be applied out-of-sample to over twenty other markets to test for validity.
The system is as follows:

BUY RULE

Buy when monthly price > 10-month SMA.

SELL RULE

Sell and move to cash when monthly price < 10-month SMA.

1. All entry and exit prices are on the day of the signal at the close.
2. All data series are total return series including dividends, updated monthly.
3. Cash returns are estimated with 90-day commercial paper, and margin rates (for leveraged models to be discussed later) are estimated with the broker call rate.
4. Taxes, commissions, and slippage are excluded (see "practical considerations" section later in the article).

S&P 500 FROM 1900–2005

To demonstrate the logic and characteristics of the timing system, we test the S&P 500 back to 1900.[3] Exhibit 1 presents the yearly returns for the S&P 500 and the timing method for the past 100+ years. A cursory glance at the results reveals that the timing solution improved return (CAGR), while reducing risk (standard deviation, drawdown, worst year, Ulcer Index[4]), all while being invested in the market approximately 70% of the time and making less than one round trip trade per year.

The timing system achieves these superior results while under-performing the index in roughly 40% of the years since 1900. One of the reasons for the overall out-performance is the lower volatility of the timing system, due to high volatility diminishing compound returns. This fact can be illustrated by comparing average returns with compounded returns (the returns an investor would actually realize.) The average return for the S&P 500 since 1900 was 11.66%, while timing the S&P 500 returned 11.72%. However, the compounded returns for the two are 9.75% and 10.66%, respectively. Notice that the buy-and-hold crowd takes a 191 basis point hit from the effects of volatility, while timing suffers a smaller, 106 basis point decline. Ed Easterling [2006] has a good discussion of these "volatility gremlins" in John Mauldin's book, "Just One Thing."

Exhibit 2 (a logarithmic scale) makes it apparent that the timing is superior over the past century, largely avoiding the significant bear markets of the 1930s and 2000s. Timing would not have left the investor completely unscathed from the late 1920s to early 1930s bear market, but it would have reduced the drawdown from a catastrophic –83.66% to –42.24%.

Examining the most recent 15 years, a few features of the timing model become evident**.** Exhibit 3 is charted on a non-log scale to detail the differences in the two equity curves. First, a trend following model will underperform buy-and-hold during a roaring bull market similar to the U.S. equity markets in the 1990s. The ability of the timing model to add value needs to be recognized over the course of an entire business cycle, however. The second feature is that the timing model will not participate in a lengthy and protracted bear market. The timing model exits the long investment in October of 2000, thus avoiding two of the three consecutive years of losses, and the –44.73% drawdown that buy-and-hold investors experienced, with a more mild –16.52%.

EXHIBIT 1

S&P 500 Total Returns and Timing Total Returns, 1900–2005

	SP500	TIMING
CAGR	9.75%	10.66%
Stdev	19.91%	15.38%
Sharpe	0.29	0.43
MaxDD	(83.66%)	(49.98%)
MAR Ratio	0.14	0.23
UlcerIndex	20.33%	11.70%
%TimeinMkt	100.00%	69.77%
RT Trades/Year	-	0.67
% + Trades	-	63%
Best Year	52.88%	52.40%
Worst Year	(43.86%)	(26.69%)

EXHIBIT 2

S&P 500 Total Returns and Timing Total Returns, 1900–2005

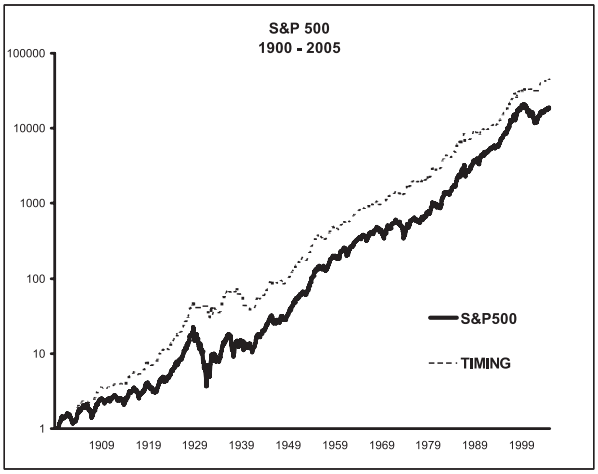
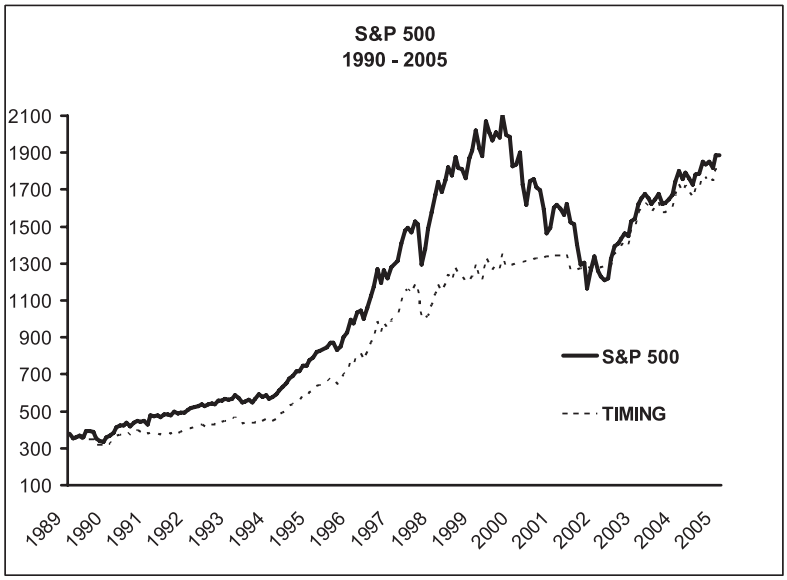


EXHIBIT 3

S&P 500 Total Returns and Timing Total Returns, 1990–2005



A glance at Exhibit 4 presents the ten worst years for the S&P 500 for the past century and the corresponding returns for the timing system. It is immediately obvious that the two do not move in lockstep. In fact, the correlation between negative years on the S&P 500 and the timing model is approximately –0.37, while the correlation for all years is approximately 0.82.

Exhibit 5 shows the excess returns (over money market rates, rt – rf) generated by the timing system versus excess returns of buy-and-hold (rm – rf). Just from the graph, it can be inferred that there exists a linear relationship for positive returns, while the negative returns are much more scattered.

Exhibit 6 gives a good pictorial description of the results of the trend following system applied to the S&P 500. The timing system has fewer occurrences of both large gains and large losses, with correspondingly higher occurrences of small gains and losses. Essentially the system is a model that signals when an investor should be long in a riskier asset class with potential upside, and when to be out and sitting in cash. It is this move to a lower volatility asset class (cash) that drops the overall risk and drawdown of the portfolio.

It is possible that Siegel (or others) have optimized the moving average by looking back over the period tested. As a check against optimization, and to show that using the 10-month SMA is not a unique solution, Exhibit 7 presents the stability of using various parameters. Calculation periods will perform differently in the future as cyclical and secular forces drive the return series, but all of the parameters below seem to work similarly for a long-term trend following application.

The grey boxes highlight the best performing moving average length for each return and risk statistic. The 10-month SMA is not the optimum parameter for any of the statistics, but it is evident that there is very broad parameter stability across the five moving average lengths.

EXHIBIT 4

S&P 500 10 Worst Years vs. Timing

		S&P 500	TIMING
WORST 10 Years	1931	(43.86%)	2.49%
	1937	(35.26%)	(7.37%)
	1907	(29.61%)	(0.50%)
	1974	(26.47%)	9.73%
	1917	(25.26%)	(3.33%)
	1930	(25.26%)	3.29%
	2002	(22.10%)	(4.73%)
	1920	(19.69%)	(3.50%)
	1973	(14.69%)	(15.02%)
	1903	(14.65%)	0.19%

EXHIBIT 5

S&P 500 Excess Returns (rm – rf) vs. Timing Excess Returns (rt – rf), 1900–2005

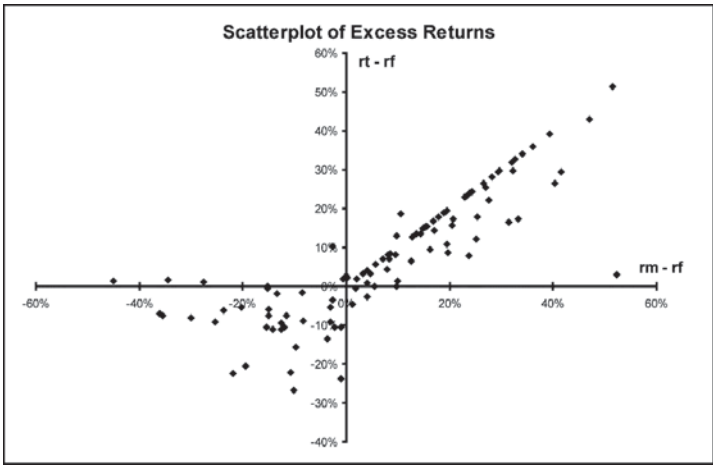


EXHIBIT 6

Yearly Return Distribution, S&P 500 and Timing 1900–2005

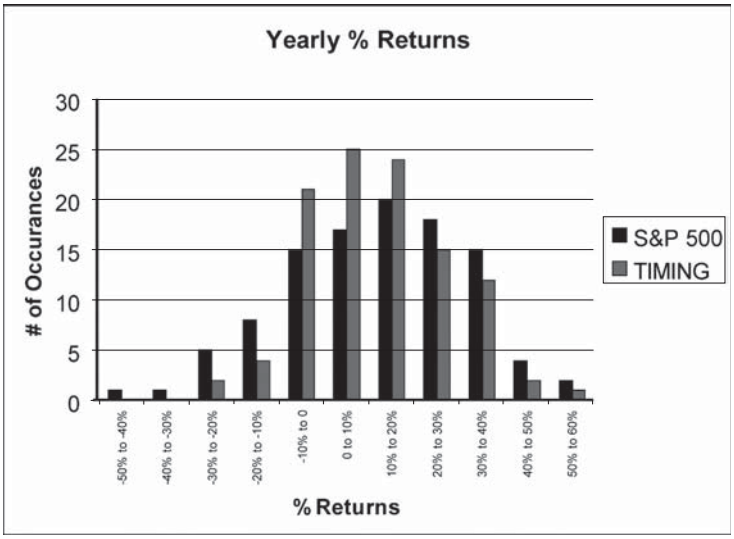


EXHIBIT 7

S&P 500 vs. Various Moving Average Timing Lengths

	S&P 500	6 month	8 month	10 month	12 month	14 month
CAGR	9.75%	10.02%	10.60%	10.66%	**10.80%**	10.55%
Stdev	19.91%	**15.08%**	15.37%	15.37%	15.57%	15.81%
Sharpe	0.29	0.40	0.43	0.43	**0.44**	0.41
MaxDD	-83.66%	**-44.65%**	-56.09%	-49.98%	-47.74%	-51.35%
MAR	0.14	**0.25**	0.21	0.23	**0.25**	0.23
%TimeinMkt	100%	69.00%	70.00%	70.00%	71.00%	72.00%
UlcerIndex	20.33%	**11.55%**	13.35%	11.70%	11.76%	12.86%

OUT OF SAMPLE TESTING AND SYSTEMATIC TACTICAL ASSET ALLOCATION

To address the possibility of data snooping, the quantitative model is tested out-of-sample on over twenty additional markets. The results of a stable model should translate to all asset classes. The results are confirmatory, and in approximately 70% of markets the absolute returns were improved. In over 90% of the market's risk-adjusted return, Ulcer Index, and maximum drawdown were improved upon. Exhibit 8 conveys the results.

King, Silver, and Guo [2002] described the effectiveness of a one-year lookback momentum based asset allocation strategy that improved absolute and risk-adjusted returns. Here we examine the results of a simple trend following asset allocation model that follows the same timing system presented earlier. In addition to the S&P 500, four diverse asset classes were chosen including foreign stocks (MSCI EAFE), U.S. bonds (10 Year Treasuries), commodities (GSCI), and real estate (NAREIT). Exhibit 9 presents the results for each asset class and the respective timing results.

While timing model returns are approximately the same as each asset class (although higher in four of the five), risk was reduced in every case across every measure — standard deviation, maximum drawdown, Ulcer Index,

EXHIBIT 8

Various Risk and Return Metrics for Buy and Hold vs. Timing Model. ("+" Conveys that the timing had superior results, "–" means timing was inferior)

	CAGR	Sharpe	Ulcer Index	Max DD
1900				
UK	-	+	+	+
France	+	+	+	+
Germany	+	+	+	+
Australia	+	+	+	+
1950				
Japan	-	+	+	+
Italy	+	+	+	+
Spain	+	+	+	+
Canada	+	+	+	+
Sweeden	-	+	+	+
DJ Corp. Bonds	+	+	+	+
CRB Index	+	+	+	+
1972				
Switzerland	+	+	+	+
S. Africa	-	-	-	-
Austria	+	+	+	+
Denmark	+	+	+	+
Finland	+	+	+	+
Hong Kong	-	+	+	+
Belgium	+	+	+	+
Gold	+	+	+	+
Nasdaq Comp.	+	+	+	+

EXHIBIT 9

Asset Class Total Returns vs. Timing Total Returns, 1972–2005

	SP500	TIMING	EAFE	TIMING	10Yr Bond	TIMING	GSCI	TIMING	NAREIT	TIMING	
CAGR	11.24%	11.18%	11.34%	12.02%	8.35%	8.73%	12.03%	12.46%	10.60%	12.33%	
Stdev	17.47%	14.00%	22.19%	18.17%	11.24%	10.87%	24.58%	20.44%	20.21%	12.92%	
Sharpe	0.41	0.51	0.33	0.44	0.39	0.44	0.33	0.41	0.33	0.64	
MaxDD	(44.73%)	(23.26%)	(47.47%)	(23.23%)	(18.79%)	(11.18%)	(48.25%)	(37.98%)	(58.10%)	(16.42%)	
MAR	0.25	0.48	0.24	0.52	0.44	0.78	0.25	0.33	0.18	0.75	
UlcerIndex	12.85%	6.30%	15.00%	7.48%	4.13%	3.29%	16.64%	13.92%	13.93%	4.43%	
Best Year	37.58%	37.58%	69.94%	69.94%	44.28%	44.28%	74.96%	74.96%	48.97%	48.97%	
Worst Year	(26.47%)	(15.02%)	(23.20%)	(13.74%)	(7.51%)	(4.96%)	(35.75%)	(21.98%)	(42.23%)	(14.34%)	Averages
%TimeinMkt	-	75.79%	-	72.13%	-	77.26%	-	69.44%	-	74.02%	73.73%
RT Trades/Year	-	0.59	-	0.71	-	0.76	-	0.79	-	0.62	0.69
% + Trades	-	63.00%	-	56.00%	-	52.00%	-	44.00%	-	59.00%	54.80%
Avg win trade	-	25.35%	-	27.22%	-	17.96%	-	38.90%	-	30.02%	27.89%
Avg win trade length	-	19.20	-	16.53	-	20.92	-	20.27	-	20.46	19.48
Avg lose trade	-	(5.06%)	-	(5.17%)	-	(1.91%)	-	(3.67%)	-	(3.66%)	(3.90%)
Avg lose trade length	-	1.89	-	3.42	-	3.17	-	3.4	-	4.11	3.20

and worst year. Better yet, the results and trading statistics were consistent across the five asset classes.

The average winning trade was seven times larger than the average losing trade, and the length in winners was six times larger than the length of losing trades. Percent winning trades across the five asset classes was at an uncharacteristically high (for trend following systems) 54.8%.

Exhibit 10 presents the risk vs. arithmetic returns graph for the asset classes and the timing models. In every case, the market timing model shifted the position of an asset class left and in most cases up as well.

EXHIBIT 10

Risk vs. Return 1972–2005. Graph Constructed with Visual MVO Software Designed by Efficient Solutions, Inc.

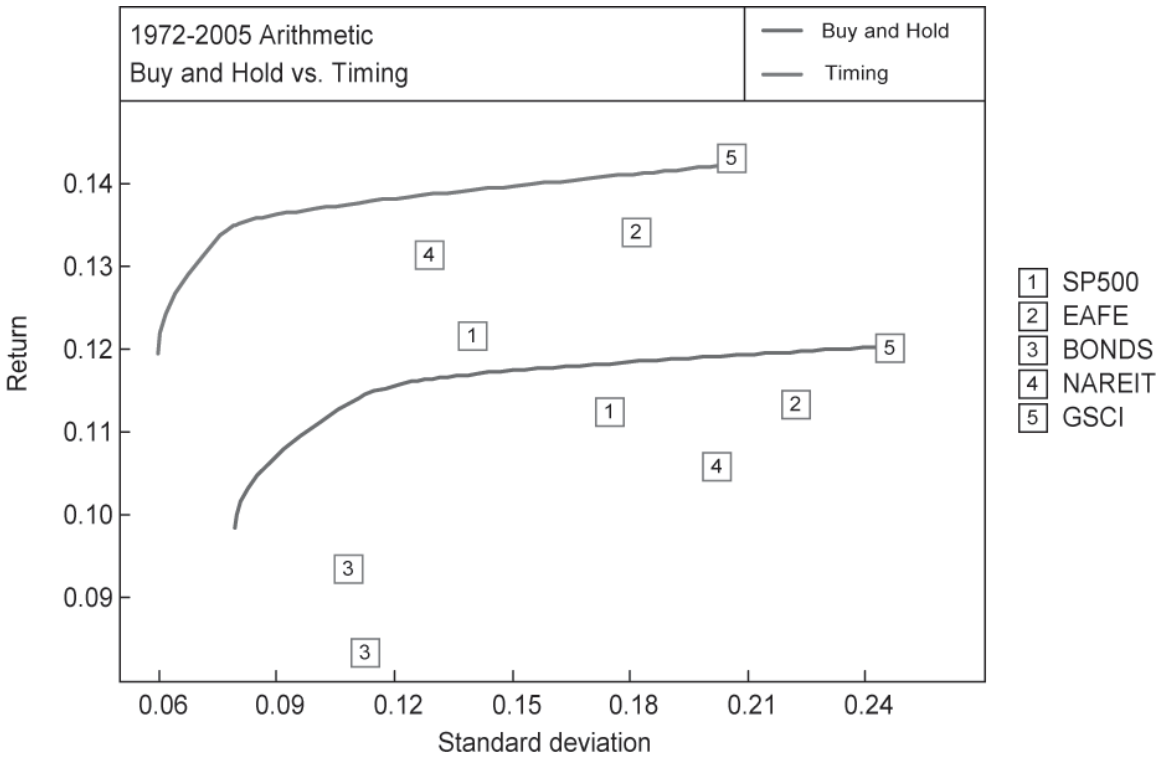


EXHIBIT 11

Number of Positions and their Frequency

# of Positions	# of Months	% of Months
0 (all cash)	4	0.98%
1	18	4.41%
2	46	11.27%
3	88	21.57%
4	150	36.76%
5 (100% invested)	102	25.00%
Total	408	100.00%

Given the ability of this very simplistic market timing rule to add value to various asset classes, it is instructive to examine how the returns would look in the context of an investor's portfolio. The returns for a buy-and-hold allocation are referenced as asset allocation (AA) and are equally weighted across the five asset classes. The timing model treats each asset class independently—it is either long the asset class or in cash with its 20% allocation of the funds. Exhibit 11 illustrates the percentage of months in which various numbers of assets were held. It is evident that the system keeps the investor 60–100% invested the vast majority of the time.

Exhibit 12 presents the results for the buy and hold of the five asset classes equal-weighted (AA) vs. the timing portfolio. The buy-and-hold returns are quite respectable on a stand-alone basis and present evidence of the benefits of diversification. The timing results in a reduction in volatility to single-digit levels as well as single-digit drawdown. The Ulcer Index gets cut in half, and the investor would not have experienced a down year since inception in 1972.

An obvious extension of this approach is to apply leverage to generate excess returns to the non-leveraged portfolio. Exhibit 13 adds a column for the 2X levered portfolio.

The first noticeable observation is that the 2X model does not produce 2X returns, and this is due to the fact the investor must borrow funds to finance his leverage.[5] The 2X levered portfolio produces very similar

EXHIBIT 12

Asset Allocation Buy-and-Hold vs. Asset Allocation Timing, 1972–2005

	AA	TIMING		AA	TIMING
1972	21.92%	21.11%	1989	19.25%	18.15%
1973	1.03%	7.67%	1990	(1.10%)	4.92%
1974	(11.80%)	13.35%	1991	18.19%	6.33%
1975	20.16%	1.40%	1992	3.88%	4.73%
1976	15.04%	15.95%	1993	11.90%	12.81%
1977	8.24%	7.17%	1994	1.76%	2.49%
1978	13.65%	11.94%	1995	22.74%	21.72%
1979	17.89%	14.63%	1996	19.32%	19.26%
1980	18.95%	12.69%	1997	9.96%	9.94%
1981	(3.34%)	4.57%	1998	(0.49%)	7.44%
1982	21.34%	22.10%	1999	14.16%	13.12%
1983	17.97%	15.74%	2000	12.73%	13.76%
1984	9.43%	6.92%	2001	(9.74%)	3.10%
1985	26.58%	26.17%	2002	2.09%	3.33%
1986	25.50%	21.52%	2003	25.70%	20.52%
1987	8.53%	11.86%	2004	17.44%	15.08%
1988	18.46%	11.83%	2005	11.74%	8.21%

	AA	TIMING	S&P 500	10Yr Bond
CAGR	11.57%	11.92%	11.24%	8.35%
Stdev	10.04%	6.61%	17.47%	11.24%
Sharpe	0.75	1.20	0.41	0.39
MaxDD	(19.62%)	(9.51%)	(44.73%)	(18.79%)
MAR	0.59	1.25	0.25	0.44
UlcerIndex	4.04%	1.70%	12.85%	4.13%
Best Year	26.58%	26.17%	37.58%	44.28%
Worst Year	(11.80%)	1.40%	(26.47%)	(7.51%)

EXHIBIT 13

Asset Allocation vs. Timing and Leveraged Timing, 1972–2005

	AA	TIMING	TIMING 2X
CAGR	11.57%	11.92%	16.56%
Stdev	10.04%	6.61%	13.88%
Sharpe	0.75	1.20	0.90
MaxDD	(19.62%)	(9.51%)	(21.87%)
MAR	0.59	1.25	0.76
UlcerIndex	4.04%	1.70%	5.10%
Best Year	26.58%	26.17%	46.42%
Worst Year	(11.80%)	1.40%	(5.51%)

risk statistics as buy-and-hold but adds approximately 500 basis points to the return. Exhibit 14 illustrates the equity curves for the S&P 500, Timing, and 2X leveraged portfolios.

PRACTICAL CONSIDERATIONS AND TAXES

There are a few practical considerations an investor must analyze before implementing these models for real world applicability—namely management fees, taxes, commissions, and slippage.

Management fees should be identical for the buy-and-hold and timing models and will vary depending on the instrument used for investing. 20–100 basis points is a fair estimate for these fees using ETFs and no-load mutual funds.

Commissions should be a minimal factor due to the low turnover of the models. On average, the investor would be making 3–4 round trip trades per year for the entire portfolio and less than one round-trip trade per asset class per year. Slippage likewise should be near negligible, as there are numerous mutual funds (0 slippage) as well as liquid ETFs an investor can choose from.

Taxes, on the other hand, are a very real consideration. Many institutional investors such as endowments and pension funds enjoy tax-exempt status. The obvious solution for individuals is to trade the system in a tax-deferred account such as an IRA or 401(k). Due to the various capital gains rates for different investors (as well as varying tax rates across time, as well as for dividends) it is difficult to estimate the hit an investor would suffer from trading this system in a taxable account. Most investors rebalance their holdings periodically—introducing some turnover to the portfolio—and it is reasonable to assume a normal turnover of approximately 20%. The system has a turnover of almost 70%.

EXHIBIT 14

S&P 500 vs. Timing and Leveraged Timing, 1972–2005, Log Scale

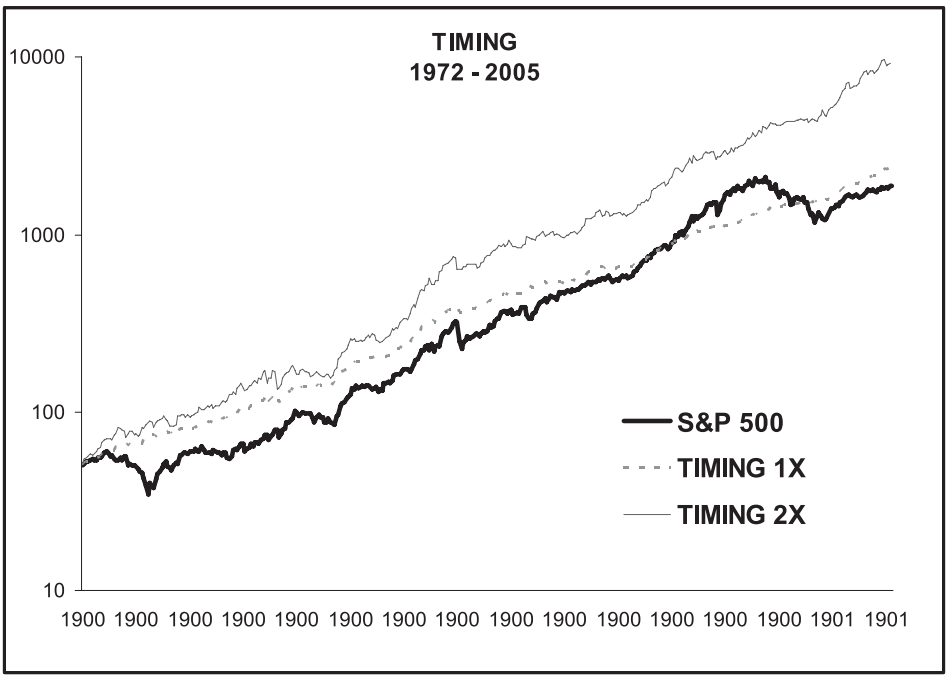
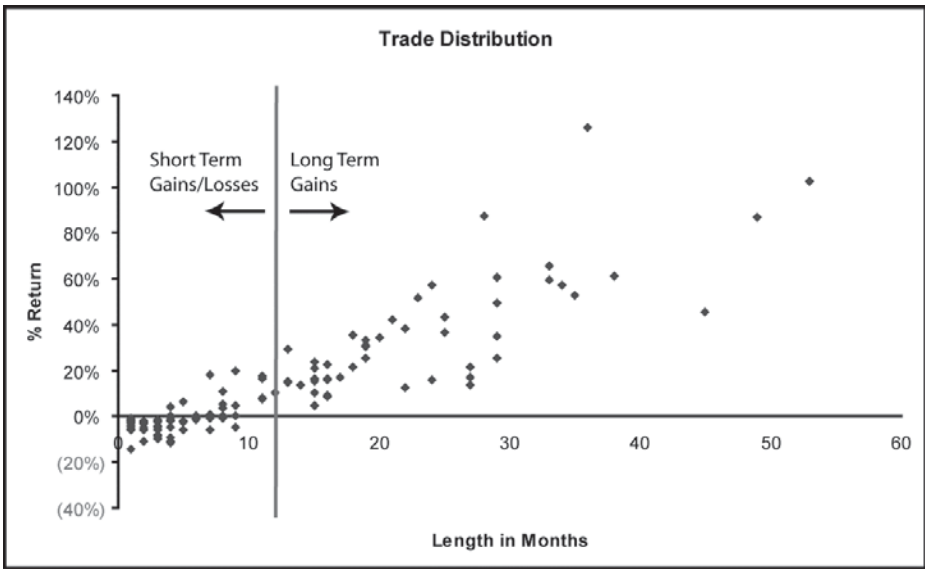


EXHIBIT 15

Trade Length Distribution for the Five Asset-Class Portfolio, 1972–2005



Gannon and Blum [2006] presented after-tax returns for individuals invested in the S&P 500 since 1961 in the highest tax bracket. After-tax returns to investors with 20% turnover would have fallen to 6.72% from a pre-tax return of 10.62%. They estimate that an increase in turnover from 20–70% would have resulted in less than an additional 50 basis point hit to performance to 6.27%.

There is a bright note for those who have to trade this model in a taxable account. The nature of the system results in a high number of short-term capital losses and a large percentage of long-term capital gains. Exhibit 15 depicts the distribution for all the trades for the five asset classes since 1972. This should help reduce the tax burden for the investor.

CONCLUSION

The intent of this article is to create a simple-to-follow method for managing risk for an asset class, and consequently, a portfolio of assets. A non-discretionary trend following model acts as a risk-reduction technique with limited to no impact on return. When tested on over twenty markets, risk-adjusted returns were almost universally improved. Utilizing a monthly system since 1972, an investor would have been able to increase his risk-adjusted returns by diversifying his assets and employing a market timing solution. In addition, the investor would have been able to side-step many of the protracted bear markets in various asset classes. Avoiding these massive losses would have resulted in equity-like returns with bond-like volatility and drawdown, and over thirty consecutive years of positive performance.

In "Reminiscences of a Stock Operator," Jessie Livermore states, "A loss never bothers me after I take it. I forget it overnight. But being wrong—not taking the loss—that is what does damage to the pocketbook and to the soul."

ENDNOTES

[1]Drawdown is the peak-to-trough decline an investor would experience in an investment, and we calculate it here on a monthly basis.

[2]All data are total return series, and are updated monthly.

S&P 500 Index—A capitalization-weighted index of 500 stocks that is designed to mirror the performance of the United States economy. Total return series is provided by Global Financial Data and results pre-1971 are constructed by GFD. Data from 1900–1971 uses the S&P Composite Price Index and dividend yields supplied by Cowles Commission and from S&P itself.

MSCI Developed Market Index (EAFE)—A market-capitalization-weighted index that is comprised of 20 countries outside of North America. Total return series is provided by Morgan Stanley.

U.S. Government 10-Year Bonds—Total return series is provided by Global Financial Data.

Goldman Sachs Commodity Index (GSCI)—Represents a diversified basket of commodity futures that is unlevered and long only. The returns include the collateral yield an investor would receive if invested in the index. Total return series is provided by Goldman Sachs.

National Association of Real Estate Investment Trusts (NAREIT)—An index that reflects the performance of publicly traded REITs. Total return series is provided by the NAREIT.

All other data sources in the out-of-sample backtest are provided by Global Financial Data.

[3]The S&P 500 Total Return Index is based upon calculations by Global Financial Data before 1971.

[4]The Ulcer Index (UI) takes into account depth and duration of drawdowns from recent peaks and is a measure of downside volatility. A lower number is more desirable. The Ulcer Index was developed by Peter G. Martin and Byron B. McCann and is detailed in their book, "The Investor's Guide To Fidelity Funds" (1989).

UI = square root [the sum of all R^2 values/N)
Where: R = the percent a fund is below its highest previous value
N = the number of measurements (days, months) in the period.

Sharpe ratio is a measure of excess returns versus volatility in general, and it uses yearly returns and 4% as the risk free rate. CAGR—Compounded annual growth rate, Stdev—Standard deviation, MaxDD—Maximum drawdown, Mar Ratio—absolute value of (CAGR/MaxDD),

[5] Margin rates are estimated with the broker call rate.

REFERENCES

Allen, H. and M. Taylor. "The Use of Technical Analysis in the Foreign Exchange Market." *The Journal of International Money and Finance* (June 1992), pp. 304–314.

Covel, M.W. *Trend Following: How Great Traders Make Millions in Up or Down Markets.* Financial Times Prentice Hall, 2005.

Gannon, N. and M. Blum. "After Tax Returns on Stocks Versus Bonds for the High Tax Bracket Investor." *The Journal of Wealth Management* (Fall 2006).

Hayes, T. *The Research Driven Investor*. McGraw-Hill, 2001.

Kahneman, D. and A. Tversky. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica*, Vol. 47, No. 2 (March 1979), pp. 263–292.

King, M. and B. Guo. "Passive Momentum Asset Allocation." *The Journal of Wealth Management* (Winter 2002).

Lefevre, E. *Reminiscences of a Stock Operator*. Doran and Co., 1923.

Lui, Y.H. and D. Mole. "The Use of Fundamental and Technical Analyses by Foreign Exchange Dealers: Hong Kong Evidence." *The Journal of International Money and Finance*, Vol. 17, No. 3 (June 1, 1998), pp. 535–545.

Martin, P. and B. McCann. *The Investor's Guide to Fidelity Funds*. John Wiley & Sons, 1989.

Mauldin, J. Ed. *Just One Thing*. John Wiley & Sons, 2005.

Mulvey, J, Kaul, S. and K. Simsek. *Evaluating a Trend-Following Commodity Index for Muti-Period Asset Allocation*. EDHEC Risk and Asset Management Research Centre, 2005.

Siegel and Jeremy J. *Stocks for the Long Run*. McGraw Hill, 2002, pp. 283–297.

Tezel, A. and G. McManus. "Evaluating a Stock Market Timing Strategy: the Case of RTE Asset Management." *Financial Services Review,* 10 (2001), pp. 173–186.

Wilcox, C. and E. Crittenden. "Does Trend-Following Work on Stocks?" *The Technical Analyst*, 14 (2005).

Zweig, M. *Winning on Wall Street*. Warner Books, Inc., 1986.

(All of the below can be found at www.fundadvice.com)

Dennis Tilley. 1999. "Which is Better, Buy-and-hold or Market Timing?"

Dennis Tilley. 1999. "Designing a Market Timing System to Maximize the Probability it Will Work."

Merriman, Paul. 2001. "The Best Retirement Portfolio We Know."

Merriman, Paul. 2001. "All About Market Timing."

Merriman, Paul. 2002. "The Best Retirement Strategy I Know Using Active Risk Management."

Merriman, Paul. 2002. "Market Timing's Bad Rap."