

Moving Average: Holy Grail or Fairy Tale - Part 2

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Prominent Nobel laureates in economics often point to a large body of evidence that supports the *Efficient Market Hypothesis (EMH)*, which states that no one can beat the markets over the long haul. Many renowned financial experts further declare that passive investing in a diversified index like the S&P500 is the only sensible way to manage money. I respect their opinions but I am unable to verify their claims. By examining the evidence, I show that the Moving Average Crossover (MAC) system offers a superior risk-return profile to a buy-and-hold strategy.



I tested the simplest form of active investing, the MAC system, against a buy-and-hold approach on the S&P500 total return index from January 1871 to April 2009. With no data mining or systems optimization, such that anyone analyzing the same [S&P500 database](#) would have made the same investment decisions, this basic trend-following system beats the markets.

“How dare you challenge the Canon of Finance with such heresy as ‘beating the markets?’” the experts are sure to respond.

I must have found the Holy Grail, or else the buy-and-hold logic is flawed!

Before I continue, let me recap my key findings in [Part 1](#). I tested different moving average lengths from 2-months to 23-months. By comparing the results of the best of class (6-months) and the worst of class (23-months) to those of the buy-and-hold benchmark, I can make an objective assessment on the MAC system as a whole relative to the markets.

MAC performances that beat the buy-and-hold benchmarks are in green; those that don't are in red.



CAGR is the Compound Annual Growth Rate. Terminal Equity Value is how much \$1 invested in January 1871 would grow to at the end of April 2009. Risk-adjusted return is the average annualized monthly return divided by the standard deviation of annualized returns. Drawdown is the percentage decline in equity value from its recent peak.

Aggregate versus periodic performance

The table above compares aggregate performance over 138 years. But aggregate results are not the only information pertinent to investing. You want to know periodic performance as well. For example, how did the systems perform during bear markets? How often and how brutally did the markets turn against you when the systems told you to stay the course? What were the monthly, annual, and decadal performances?

Bear market risks

Let's first find out which system protects us better from the wrath of bear markets. Three growth curves are shown in *Figure 1*. The red one is the buy-and-hold benchmark. The 6- and 23-month MACs are shown by the blue and the green curve, respectively.

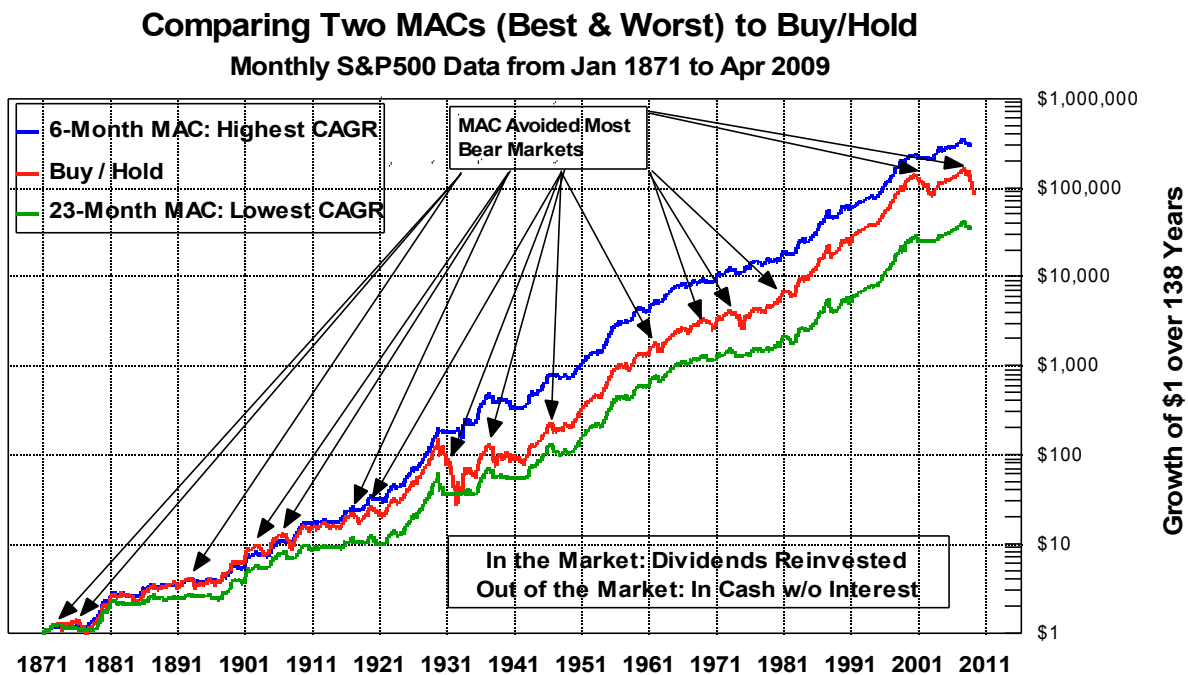


Figure 1



Each curve represents how an initial investment grows over time. A smooth and rising curve is preferred. All three investors invested \$1 in the S&P500 total return index in January 1871. The buy-and-holder reinvested his dividends at all times. The two active investors reinvested dividends only when the S&P500 index was above its moving average but otherwise kept the proceeds in non-interest bearing cash.

Figure 1 not only shows which investment wins the race in wealth accumulation (6-month MAC), but also graphically illustrates how the three systems play out in historical bear markets. MACs won't get you out at every market peak, but they would have preserved some – if not most – of your accumulated wealth. In contrast, passive advisors willingly handed over their clients' hard-earned money to every hungry bear they encountered! Worse, by the time a passive investor realizes that a bear is eating his lunch, his strategy calls for him to do nothing to try to stanch his losses, lest he miss the market's rebound. Don't laugh! That's the passive experts' "[*Missing out*](#)" logic!

Market exposure risks

Full market exposure is risky – even during bull markets – because it increases the risk of drawdown. There is a material difference between actual loss and drawdown. Actual loss is painful but the healing process begins as soon as the investor realizes the loss. Drawdown, on the other hand, is like an open wound. It represents the pain of holding stocks when the markets turn against us. The pain continues to grow with every additional price decline. Exposure to uncertain and unfriendly markets is more harmful to investors' mental health than actual loss is to their wallets.

Both the duration and the magnitude of drawdown for the two MAC systems are shown in *Figure 2*. The blue stripes are the 6-month MAC and the green are the 23-month. The average drawdowns for the two systems are 2 and 4 percent, respectively. Drawdowns of greater than ten percent were rare during the 138-year period. In comparison, the average drawdown of the buy-and-hold system was a painful 26 percent.

Drawdown of the Best and the Worst MAC System
Monthly S&P500 Data from Jan 1871 to Apr 2009

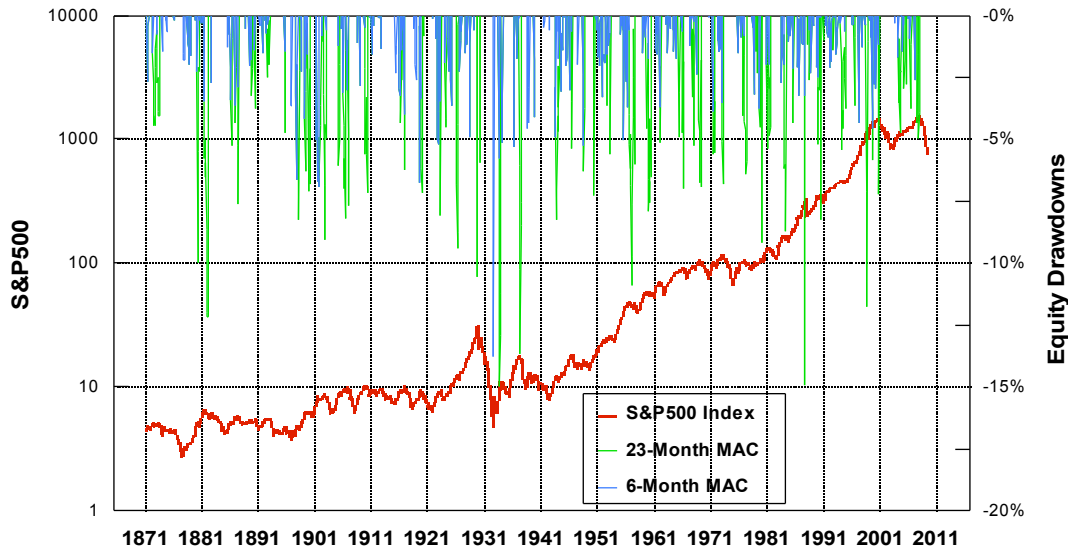


Figure 2

Figure 2 shows that the MAC system would never expose investors to an unfriendly market for more than a few months at a time. On the contrary, buy-and-holders could be underwater for over ten or even twenty-five years before breakeven, as shown in *Figure 5* in my [“Missing out”](#) article. The mental anguish of suffering in a hostile market environment for such a prolonged period of time is unimaginable.

Active investments offer much lower market exposure risks than the buy-and-hold approach, both in magnitude and in duration of drawdown. Which camp would you rather join?

Annual performance tradeoffs

Markowitz's *Efficient Frontier* is an instructive way to compare monthly performance because it shows risk-reward tradeoffs on a single diagram. *Figure 3* shows annualized monthly returns (reward) versus standard deviations of annualized monthly returns (risk). To keep the graph legible, I show only the 6-month MAC (green squares) against the buy-and-hold (red squares) benchmark.

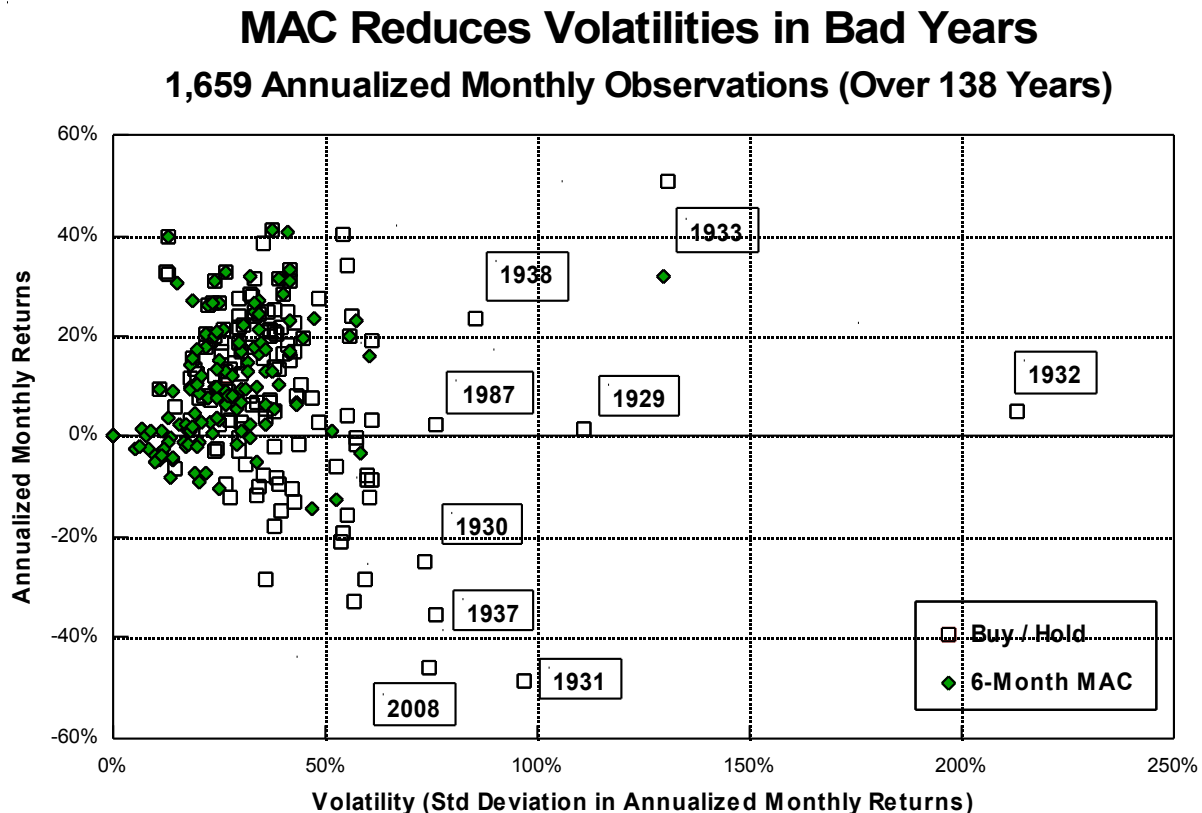


Figure 3

The *Efficient Frontier* lies at the top-left portion of the graph where most green squares reside. This means that MAC's annual returns are generally higher than those of buy-and-hold at the same level of risk. The undesirable portions of the graph (bottom and right) are mostly occupied by red squares. All except one of the extremely high volatility years are in red. If Markowitz favors investments at the *Efficient Frontier*, then he would surely prefer the MAC system to the buy-and-hold approach.

Doesn't *Modern Portfolio Theory* call for absolute correlations between return and risk? Hence any investment offering high returns with low risks must be flawed. On the contrary, *Modern Portfolio Theory* does not postulate that high intrinsic risks are an

inherent characteristic of high-return investments. Rather, it simply points out that rational investors would logically ask for additional risk premium to compensate for the extra risk they are taking. The performance of the MAC system is theoretically sound.

Based on the risk-and-return tradeoffs presented in *Figure 3*, no rational investor would subscribe to the buy-and-hold scheme as it offers no adequate risk premium to compensate for its enormous volatilities.

Monthly performance comparisons

The monthly performance comparisons between the MAC and the buy-and-hold method are best illustrated with a histogram. Again, I show only the 6-month MAC to keep the graph legible. The horizontal axis in *Figure 4* shows different increments of monthly percentage change. The vertical axis tabulates the number of occurrences of each of these increments in 1,659 months.

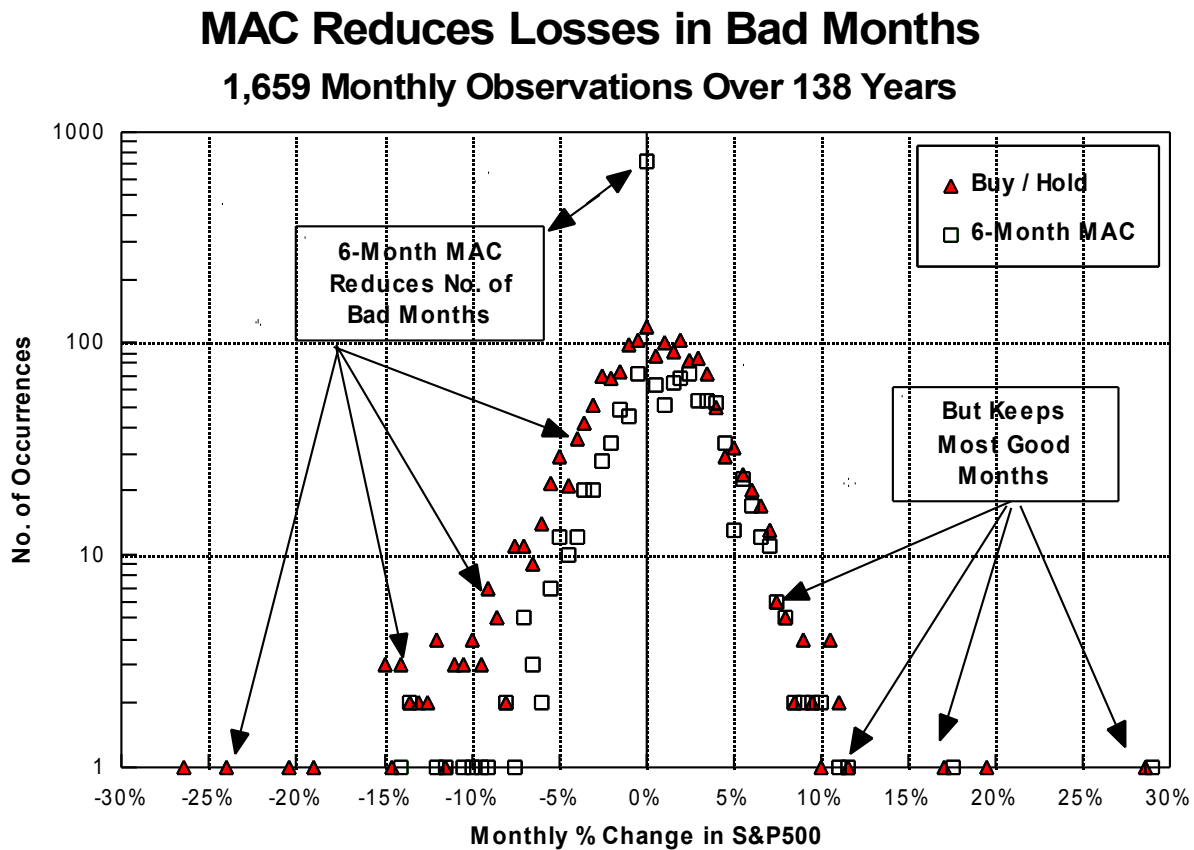


Figure 4



On the positive-return side of the distribution, green squares capture all the winning months of the markets, including the few unusually strong rallies of 10 to 30 percent. When the markets are bullish, the MAC system does not miss the best months.

On the negative-return side, there is a sizable gap between the two systems. The MAC system is able to elegantly sidestep the markets during most of the losing months. Proceeds from all these bad months are safely kept in cash as reflected by the single green square floating at the very top of the vertical axis. Many red triangles suffer worse than fifteen percent losses, while green squares rarely incur losses of more than five percent.

Figure 4 illustrates graphically how the 6-month MAC system beats the markets. There is no fairy tale if a system can consistently avoid the losers but stay with the winners 1,659 times over 138 years.

Holy Grail or fairy tale?

I am not trying to persuade anyone that the MAC system is the Holy Grail. Indeed, I discovered MAC's limitations when evaluating its decadal performances, which I will discuss in Part 3. Stay tuned!

What I have tried to convey is that all claims should be treated as hypotheses until they are proven by objective evidence - even a claim as sacred as the eminent passive investment doctrine. Perhaps the generally accepted buy-and-hold investment principle is only a fairy tale!

Theodore Wong graduated from MIT with a BSEE and MSEE degree. He was General Manager of several Fortune-500 companies designing sensors for satellite and military applications. He started a hi-tech company via a LBO in partnership with a private equity firm. He now consults on management and investment best practices. While studying for his MBA, he discovered his true passion was in investment research. He combines engineering analytics with econometrics modeling to enhance quantitative investment analysis. He seeks absolute returns by active risk management in both up and down markets. He can be reached at tswong.advisory@gmail.com.

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