



## Theoretical Support for the Moving Average Crossover

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*This article matches an appropriate descriptive theory about how asset markets work with a recently published normative theory about using the moving average crossover as an indicator for timing portfolio changes in active portfolio management strategies. Specifically, I propose that the theory of "Rational Belief Equilibrium" in asset markets, developed by Stanford University professor, Mordecai Kurz, helps to explain why moving average crossovers have demonstrated predictive value in the stock market in the past, and why they might continue to offer predictive value in the future. I make specific reference to a series of recent articles on the subject of moving average crossovers, by Theodore Wong, published in Advisor Perspectives.*

A recent series of articles written by Theodore Wong offers compelling empirical support for the "Moving Average Crossover (MAC) System" as an alternative to buy-and-hold in the asset markets (See Advisor Perspectives: [What the "Missing Out" Argument Misses](#), [Moving Average: Holy Grail or Fairy Tale – Part 1](#), [Moving Average: Holy Grail or Fairy Tale – Part 2](#), [Moving Average: Holy Grail or Fairy Tale – Part 3](#)). Mr. Wong's evidence is compelling. His research demonstrates that a simple, rules-based trading discipline that goes long the *S&P 500 Index* when the index is trading above its 6-month moving average, while shifting to cash when the index is below its 6-month moving average, generates superior risk-adjusted returns relative to buy-and-hold over most intermediate and long-term holding periods for the index dating back to 1871.

Despite the evidence in favor of the strategy, die-hard proponents of buy-and-hold investing might still contend that Mr. Wong's empirical support for the MAC System is incomplete because it lacks a proper theory to explain *why* the system works – the way the theory of efficient markets (EMH) supports a buy-and-hold investment prescription, for example. "The data is fascinating," a proponent for efficient markets might say, "but why should anyone expect the MAC System to be effective in the future just because it worked during a small sample period of (ahem) 137 years?"

Although Mr. Wong does not expand into descriptive theory to support the MAC System in the articles listed above, such a theory does exist. It is called "Rational Belief Equilibrium" (RBE), and it was developed at Stanford University over the past 15 years



by Economics professor Mordecai Kurz (See: "Endogenous Uncertainty and Rational Belief Equilibrium: A Unified Theory of Market Volatility," Mordecai Kurz, Stanford University, July 1999).

RBE represents a true advance in our understanding of asset market behavior. It generalizes its primary predecessor theory – EMH – by resituating EMH as a special case within a broader descriptive theory of how asset markets work. RBE explains why asset markets tend toward *cycles* – bull and bear markets, booms and busts – in a way that EMH never could.

The key ingredient in Kurz' model of market behavior is ignorance. Not that some investors are ignorant at the expense of others, mind you, but rather that we are *all* ignorant about what matters most in investing – the future.

The assumptions that underlie RBE are refreshing, in that they acknowledge what most people outside of academia consider to be obvious – that none of us are clairvoyant! Contrast this with the critical assumption underlying EMH, known as "rational expectations equilibrium," which requires market participants to continuously incorporate the world's known information into a "correct" price for all tradable assets like a swarm of emotionless robots.

Rather than assume market prices are always "right," in the sense that they represent the single best approximation of true intrinsic value at any moment in time, Kurz' theory allows for the probability that *rational* investors will mistakes from time to time. In Kurz' model, market prices are flat-out wrong from time to time.

According to RBE, our ability to forecast the future is constantly derailed by *structural changes* within the systems we must forecast. Who knew in 1996, for example, how this new thing called the Internet would impact the future of business and society?

How suddenly was the world view of the average American profoundly altered in a matter of hours on December 7<sup>th</sup>, 1941 and September 11, 2001?

More recently, the proliferation of financial innovations like subprime lending, loan securitizations, credit default swaps and structured investment vehicles (among many others) rendered the historical record of home prices utterly useless as a guide to what might happen when this confluence of innovations devolved into a self-reinforcing death-spiral for residential real estate prices.

Such is the nature of structural change – we can't rely upon the historical record to model its future impact on the world (or on the price of IBM stock) because nothing quite like it has ever happened before.



RBE fits into the discussion about Mr. Wong's "MAC System" trading strategy because the MAC System succeeds by exploiting *cycles* in the asset markets. RBE explains *why* these cycles exist in the first place. In this sense, RBE is to the MAC System what EMH is to Modern Portfolio Theory – a descriptive theory of how markets work that justifies a prescription for what we should do about it as investors.

According to RBE, cycles emerge in asset markets whenever the mistakes we make as investors become correlated. Consider the recent housing bust as an example. All lenders to the housing market shared the same historical data about house prices, which showed occasional booms and busts on a *regional* basis, but never a meaningful decline on a *national* basis. The benign track record of national home prices prior to 2007 seemed to validate the logic of national diversification among housing lenders in the form of pooled investment products like mortgage backed securities, CMOs, CDOs, etc. Unfortunately, slicing risk into more pieces in the name of diversification doesn't change the total amount of risk assumed any more than slicing a pizza into 10 slices creates more pizza than slicing it into six.

As the volume of credit flowing into the housing market expanded over the past 10 years, the behavior of lenders began to influence the price of the assets they were lending against, creating a self-reinforcing feedback loop of rising collateral values, more credit, etc., until basic shelter became unaffordable to a large percentage of the population in many markets around the country and the market broke under its own weight.

Once home prices drifted below the lower limit that had been plugged into risk models throughout the banking industry, participants in the market experienced an "Oh-No" moment when they recognized they had made a mistake. Their assumptions about the downside risk in home prices were wrong. They stood to lose a lot of money as a consequence of their error. A new feedback loop developed in the opposite direction, where declining collateral values triggered a reduction in available credit, which added further downside pressure to collateral values, etc.

Such is the nature of booms and busts – self-reinforcing feedback loops built upon a foundation of assumptions that includes at least one, as yet un-recognized, error. These are followed by a self-reinforcing unwind when market participants recognize their collective mistake; they then overwhelm whatever demand remains for their asset with excessive supply for sale.

Bull and bear market cycles reveal themselves in a time series of asset prices in the form of serial correlation, or market "memory" within the data. When conditions in an asset market today (or last week, month, etc.) can influence likely conditions in the market tomorrow (or next week, month, etc.), knowing something about recent conditions in the market can offer predictive value about what might happen next.



Horace “Woody” Brock suggests using the weather as an analogy. If I know it is cold in Kearney, Nebraska today, I can predict with relative accuracy it might be cold again tomorrow. This phenomenon is more commonly known as “winter!”

More importantly, if I am a farmer in Kearney County I will go broke if I design my farm for the *annual* mean-variant temperature in my region. January is not an ideal time for crops to reach maturity in the high plains, for example. Rather than plant the ideal crop for the annual mean-variant temperature in Kearney County, I need manage around the seasons so that I cut corn in the fall and winter wheat in the spring.

Active investment strategies like the MAC System attempt to follow the example of the Kearney County farmer, rotating investment “crops” with the seasons. Unfortunately for investors, asset markets don’t offer the same predictability as the seasons. But there is memory in asset market data! The Moving Average Crossover is one of several technical tools capable of revealing it.

Consider the following data as an example of memory in the asset markets. The study shows the difference in monthly returns for the *S&P 500 Index* during one-month periods that follow a positive moving average reading (i.e. the previous month-end price for the index is above its 10-month moving average), vs. monthly periods following a negative moving average reading:

<b>S&amp;P 500 Index 1926 – 2009 1,002 Monthly Observations</b>			
<b><u>Post-Condition</u></b>	<b>Pre-Condition</b>		
	<b><u>Index Above 10-Mo. Mov.Avg.</u></b>	<b><u>Index Below 10-Mo. Mov.Avg.</u></b>	
<b>Avg. Monthly Return</b>	-	1.18%	0.42%
<b>% of Months with Negative Return</b>	-	34.60%	40.75%
<b>Cumulative Annualized Return*</b>	-	13.94%	1.82%

\* “Cumulative Annualized Return” represents the linked, annualized return of all monthly periods that met each pre-condition criteria, respectively.

Source: Standard & Poor’s; Bloomberg LP; Ibbotson; Capital Advisors, Inc.



This data suggests that the domestic stock market has seasons too – bull seasons and bear seasons. Knowing which “season” stocks are in today – defined objectively with a moving average calculation – provides a meaningful clue about what is statistically most likely to happen next in the market. The data suggests that monthly returns in the stock market *are not random*. “Good” months occur more frequently in bullish seasons, while “less good” months are more prevalent in bearish seasons.

More importantly from an investor’s perspective, the cumulative difference between long-term exposure to bullish seasons and similar exposure to bearish seasons appears to leave plenty of room to cover the reasonable friction costs associated with an active, MAC-based investment strategy.

Active investors would be wise to familiarize themselves with the research program underway at Stanford University that focuses on the theory of Rational Belief Equilibrium. If the RBE model of how markets work is more accurate than EMH, perhaps active management strategies like the MAC System deserve a little respect from the efficient markets crowd and a closer look from investors seeking alternatives to buy-and-hold?

## **Appendix – Data and Indices**

S&P 500 Index – A capitalization-weighted index of 500 widely held stocks often used as a proxy for the U.S. Stock Market. Total return series provided by Ibbotson Associates and Bloomberg LP.

10-Month Moving Average – Historical calculations of the simple 10-month moving average of the S&P 500 Index provided by Bloomberg LP.

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## **Biography**

[Keith C. Goddard](#), CFA currently serves as President and Chief Investment Officer for [Capital Advisors, Inc.](#), a money management firm based in Tulsa Oklahoma. Capital Advisors was founded in 1978, and currently manages approximately \$730 million in assets for high net worth individuals, mid-size institutions, and a public mutual fund – the Capital Advisors Growth Fund (ticker: CIAOX). Keith earned his BA from the University of Colorado, Boulder in 1991, and received the CFA designation in 1995.

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