When to Own Stocks and When to Own Gold

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Abstract. We show that dynamic investment portfolio asset allocation based on secular market cycles outperforms a buy-and-hold portfolio of equities *and* outperforms a buy-and-hold portfolio of gold over long periods. An objective definition of secular market enables identification of an appropriate *ex-ante* risk-on or risk-off posture for a portfolio. We construct an objective measure which we term a "secular market indicator (SMI)" using a modified Shiller Cyclically Adjusted Price-Earnings (CAPE) ratio with gold as a reference point. This SMI has slightly greater predictive power than Shiller's CAPE Ratio in that it provides a consistent threshold signal for secular macroeconomic reversals. Finally, we use the SMI to create a simple decision rule to shift asset allocation between equity and gold depending on the secular market cycle. The resulting portfolio outperforms an all-equity portfolio and an all-gold portfolio over holding periods of 10+ years about 70% of the time, and produces superior risk-adjusted performance about 80% of the time.

Keywords: gold, asset allocation, secular market, regime shift, Shiller P/E, CAPE ratio.

JELCodes: E30, G12

The notion of secular economic cycles has existed at least since Joseph consulted to Pharaoh some 4,000 years ago. It stands to reason that a portfolio that holds risky assets during growth and safe assets during decline would fare better than any static portfolio asset allocation. Dozens of recent studies have examined "dynamic switching" approaches to portfolio management in the context of economic regime, including Clarke (1998), Chow (1999), Ang (2002), Lam (2004), and Kritzman (2012). We develop a method to objectively identify and classify economies as "secular bull" or "secular bear" using Shiller's Cyclically-Adjusted Price Earnings (CAPE) ratio and gold, the former having received (1) a Nobel Prize and (2) harsh criticism for its recent failure as a predictive model. Our aim is not to remedy or even modify the CAPE ratio, but to build better risk-adjusted portfolios based on objective identification of secular market trends.

SECULAR MARKETS

A secular[1] market trend is a long-term trend that lasts 5 to 25 years and consists of a series of dominant trends. A secular bear market may have cyclical bull markets, but they are relatively small and short-lived; likewise, a secular bull market will have cyclical bear markets interspersed among the larger upward trend.

Shorter-term cyclical bear and bull markets often have objective definitional criteria. For example, both Ned Davis Research and Standard & Poor's define cyclical bull and bear markets. The former uses a 13% change in about 150 days and the latter as a 20% move over an unspecified period.

While most people could point to a boom or bust on a graph, widely accepted and objective definitions of secular markets are elusive, particularly with respect to applicability to portfolio management.

Secular cycles are generally marked by periods of warfare and peace, severe or prolonged financial crises, prolonged deflation and reflation, technological innovation, and demographic change. Attribution of causes and delineation of start and end points are varied, subjective, and difficult. Some explanations include investors' perceived shifts in the long-run rate of future growth (Barsky, 1990), the degree of persistence in inflation (Martin, 2010), and global funding liquidity risk (Asness, 2013). Kritzman et. al. (2012) cite market turbulence, inflation, and economic growth as factors driving so-called "regime shifts."

Return distributions among secular markets are different for both equities and gold, and depend on whether the economy is in a state of long-term expansion or long-term contraction. Chow et. al. (1999) note conditions in which asset prices behave in an uncharacteristic fashion given their historical behavior pattern, including extreme price moves, decoupling of correlated assets, and converging asset correlations. Sheikh et. al. (2010) show that traditional asset allocation frameworks that are based on assumptions of normality in asset returns can significantly understate portfolio downside risk, and we believe this understatement is more pronounced in secular bear markets.

[1] *secular* bull and bear markets derive from the Latin word *saeculum* meaning "long period of time"

Extensive literature on mean reversion of equity returns, especially inflation adjusted returns, can be referenced in Shiller (1988, 1996, 2000), Benson (2011), and Bernstein (2015). Among the numerous mean-reversion models, Shiller's CAPE ratio (Exhibit 1) has received the most attention.

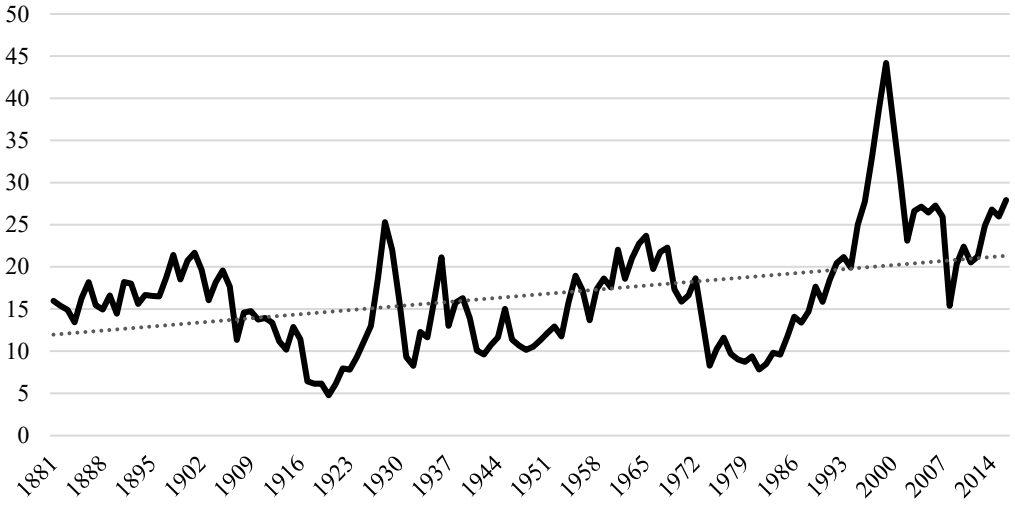
SHILLER CAPE RATIO AS A SECULAR MARKET INDICATOR

Campbell and Shiller (1988) demonstrated that a long moving average of inflation-adjusted earnings helps to forecast future inflation-adjusted dividends which in turn are correlated with returns on stocks. Campbell and Shiller (1998) later used the "dividend-price ratio" (i.e. dividend yield) as a forecast model, and concluded the market was overvalued and set for a ten-year bear market.

At the height of the dot-com bubble, Shiller published *Irrational Exuberance*. At that time the CAPE ratio predicted an impending stock market bust. The timing was apt; on March 10, 2000, the NASDAQ Composite peaked at 5,132.52, but fell 78% in the following 30 months. Shiller subsequently updated his book in 2005 to cover the US housing market bubble. The Standard & Poor's Case–Shiller Home Price Index peaked in July 2006, and subsequently fell 27% over the next 67 months.

EXHIBIT 1

Shiller CAPE Ratio since 1881



Deficiencies of the Shiller CAPE Ratio

Recently the CAPE model's predictive power seems to have evaporated. Since 1980, the CAPE ratio has trended upward. Since about 1990 it has largely remained above its long-term historical average. The resulting elevated CAPE ratio failed to provide a *timely* signal for a market reversal, failing as both a secular market indicator and cyclical market indicator. For example, in 1999 and 2000, the prices of technology stocks reached absurd levels, and CAPE proved an

excellent indicator of the impending decline. Then in 2008-2009, corporate earnings collapsed and P/E ratios soared. These seemingly polar opposite events occurred within ten years of each other. The CAPE model better predicted market returns than a simple *yield-plus-growth* model for five straight decades. In three of the last four it has underperformed.

Ibbotson et. al. (2003) found that P/E increases account for only a small portion of the total return of equity. The bulk of the return is attributable to dividends and growth in nominal earnings (including inflation and inflation-adjusted earnings growth.) These and other critiques have resulted in CAPE model critics and detractors advocating for revisions (Siegel, 2013) or even abandonment (Ro, 2014).

The inverse relationship between the CAPE ratio and future returns is apparent, and a potentially powerful valuation model. Despite this, application of the model in a consistent manner with respect to portfolio management is challenging. The model seems incomplete because absent a consistent and objective definition of a "high" or "low" CAPE ratio investors have difficulty determining when to act.

A BETTER SECULAR MARKET INDICATOR

We believe that a major drawback of CAPE as a secular market indicator is one of reference. Equity investments do not exist in isolation, but are part of a menu of choices used to satisfy different portfolio objectives and constraints. Investors are constantly choosing among asset classes and risks based on their own changing circumstances and perceptions of their expected future environment. Comparison of a current value against any historical value, be it average, moving average, or some other statistic introduces some fundamental problems, including:

- the endpoint reference problem: the numerical result developed is dependent upon the time period chosen; and
- the assumption of homogeneity problem: all periods are treated as equal when we know that is not the case (Siegel 2016 and Simonoff 2016 list many examples.)

We propose that a more meaningful and consistent indicator of secular market cycles emerges when the CAPE ratio is referenced against a real asset such as gold.[2] The resulting metric provides investors with an objective position of the economy, as well as in indication of whether the economy is in a state of secular expansion or secular contraction/stagnation. This information provides a predictive and actionable guide to asset allocation.

[2] In this paper we distinguish "real" assets (commodities and real estate) from financial assets (stocks and bonds). To avoid confusion, we do not use the word "real" to mean inflation-adjusted. We exclusively use the word "real" to mean physical assets. Where we intend to reference inflation-adjusted values, we specifically refer to them as "inflation-adjusted."

Why Gold?

Numerous studies have identified gold as a diversifying agent (Jaffe, 1989; Dempster, 2010; Chua, 1990), hedge (Baur, 2010), or form of portfolio insurance [Jensen, 2018). Lucey (2006) advocates for gold investment based on positive skewness. Gold's dominance in the precious-metal asset class and its high correlation with other precious metals are desirable properties for both price study and implementation in a portfolio.

We also rely on three important considerations:

1. Gold may be an effective inflation hedge over the extremely long term. There is some evidence that gold can be effective in a hyperinflationary environment, assuming the inflation-adjusted price of gold is stable (Harvey, 2013).

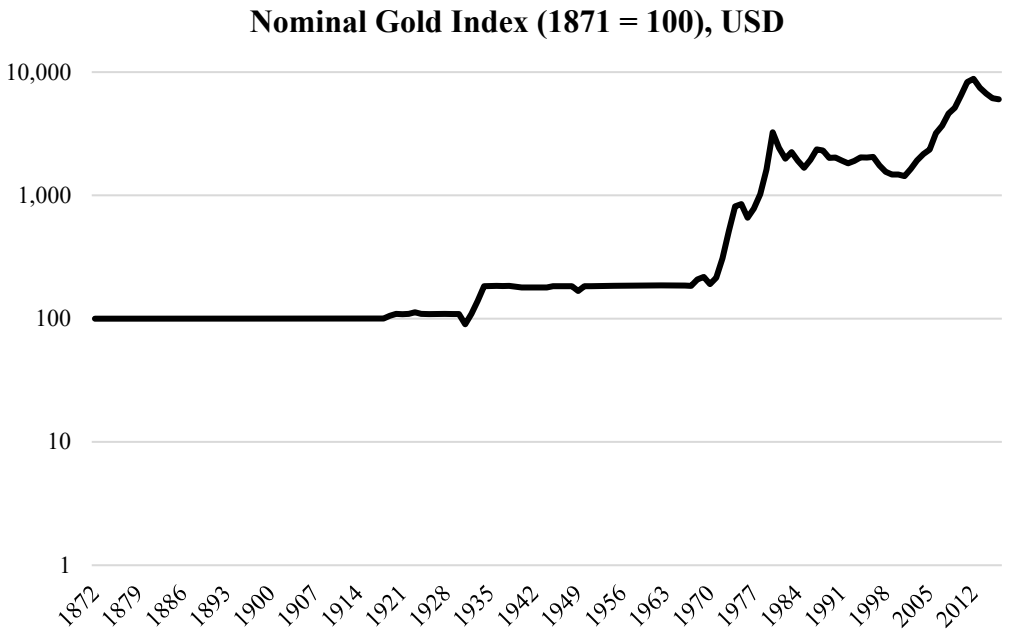
2. The inflation-adjusted price of gold mean-reverts over 10-year periods (Harvey, 2013). This finding is incredibly convenient given Shiller's use of a 10-year CAPE ratio.

3. Increase in economic policy uncertainty contributes to increases in the price of gold (Jones, 2016).

Inflation is a defining characteristic of secular cycles. To remove inflation from the picture is to remove the picture itself. Therefore, our model uses nominal gold prices (Exhibit 2) to reflect its use as an investment of last resort, particularly in times of economic stagnation or instability. With our approach we seek to transform an equity-only valuation ratio into a relative comparison of financial assets to real assets.[3] We do this through a new ratio, which we term a secular market indicator (SMI), the numerator of which might be said to reflect economic strength and confidence, while the denominator reflects economic weakness and uncertainty.

[3] Gold prices were fixed prior to 1971, and at first that fact may appear to weaken our conclusions. However, we duplicated this approach substituting the Shiller Home Price Index (as a proxy for real estate) for gold over the entire period. Those results were nearly identical to our results presented here and will be published in a future paper. This bolsters our confidence in our assertion that real assets play a role in the evaluation of secular market cycles.

EXHIBIT 2



METHODOLOGY, DATA, AND RESULTS

Our dataset spans 100+ years of annual data points through 2016 (Fulp 2016). Gold prices were obtained from http://onlygold.com/Info/Historical-Gold-Prices.asp. All other data (CAPE, S&P returns, and CPI) were obtained from Shiller's own datasets at http://www.multpl.com/sitemap.

CAPE-Gold

We first define a new time series

$$Y_t = \frac{C_t}{A_t} \tag{1}$$

where C is the Shiller CAPE ratio and A is the lognormal nominal price of gold.[4] Unlike the earnings in the CAPE Ratio, this denominator is not averaged over ten years; it is the spot price.

We used a generalized difference equation to mitigate autocorrelation and transformed nominal gold prices to lognormal values to mitigate any heteroskedasticity associated with the regression. We then regress Y_t against the ten-year forward lognormal return of the S&P 500 index S_t with lagged dependent and independent variables (a first differences approach):

$$Y_t - Y_{t-1} = \alpha_0(1-\rho) + \beta_0[\ln(S_t) - \rho\ln(S_{t-1})] + \varepsilon_t^* \tag{2}$$

[4] All performance presented in this paper is shown as lognormal return.

and

$$\rho = \frac{\varepsilon_t - \mu_t}{\varepsilon_{t-1}} \tag{3}$$

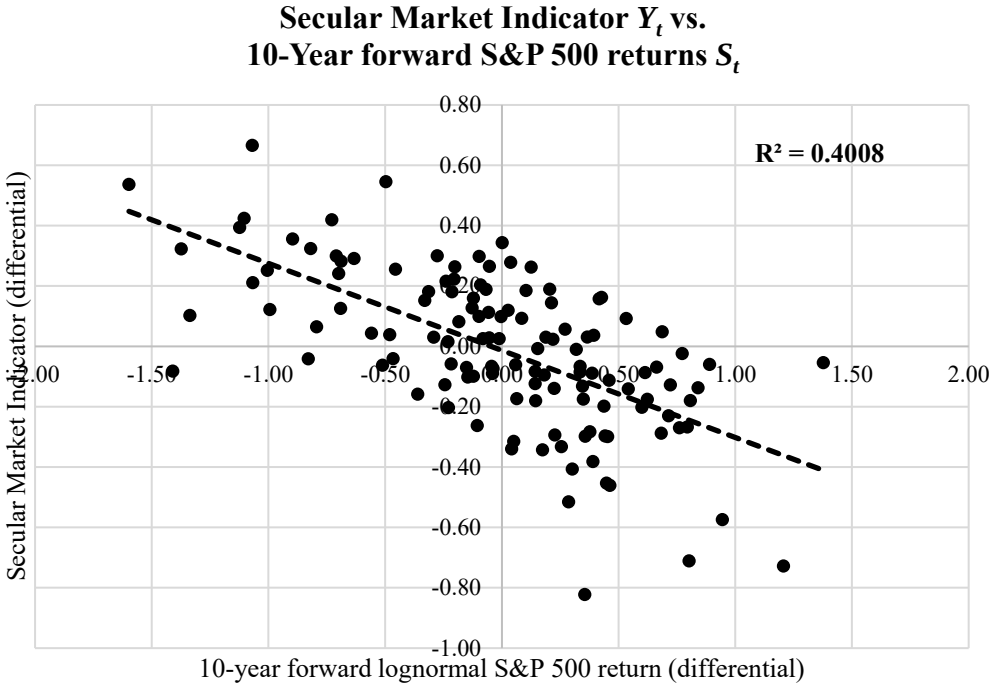
In our data set, $\rho \approx$ -0.04. The results are in Exhibits 3 and 4.

EXHIBIT 3

Regression Statistics	
Multiple R	0.63
R Square	0.40
Adjusted R Square	0.40
Standard Error	0.20
Observations	125.00

	Coefficients	***Standard Error***	***t Stat***	***P-value***
Intercept	(0.01)	0.02	(0.75)	0.46
Y*	(0.29)	0.03	(9.07)	0.00

EXHIBIT 4



The Secular Market Indicator

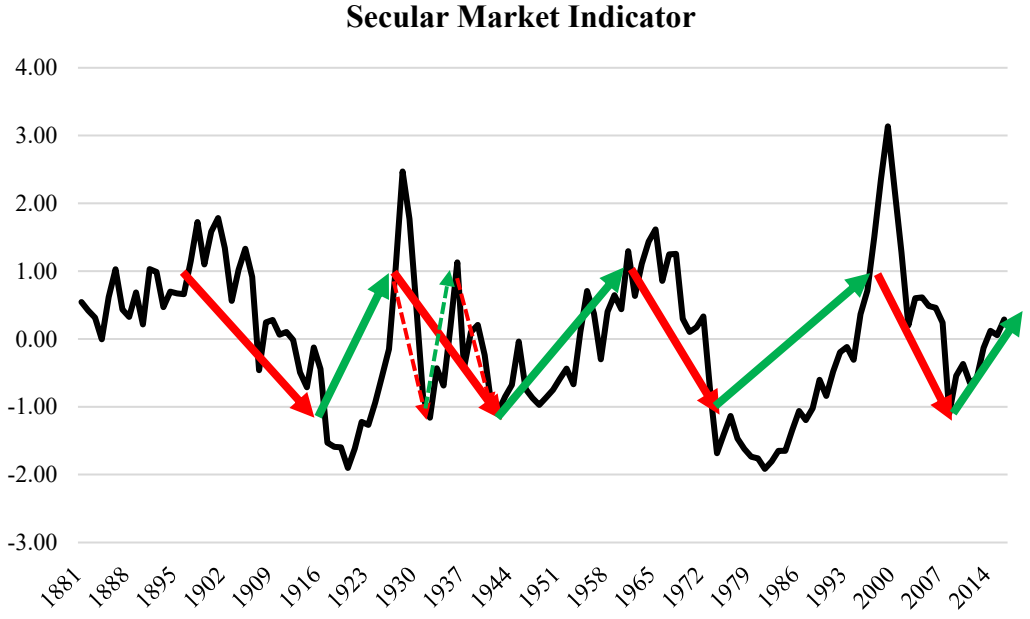
The SMI model offers only a slight improvement to the traditional CAPE model in terms of fit and statistical significance. While the results of the general relationship are compelling, they do not impart much more information than what was already suggested in the original CAPE model.

However, there are two key differences. The first is that this relationship holds for periods post-1980 when the CAPE ratio began its climb above its long-term historical average. The second, and most important, is that this method facilitates objective definitions of "secular bull market" and "secular bear market."

If we define "high" and "low" values for Y_t, the cycles become apparent. Exhibit 5 shows the secular market cycles as measured by Y. For the sake of convenience, we adjusted the intercept downward, so that most variations are centered around zero.[5]

As a trigger signal, we chose $Y > +1$ as "high" and $Y < -1$ as "low". We could have selected another pair of values, but for illustrative purposes a selection based on visual inspection suffices. From this definition, we can test the predictive power of the SMI by comparing Y_t to S_t for only those periods where $Y > +1$ or $Y < -1$. This is done by establishing a dummy variable $SMI^* = \{-1, +1\}$ and then regressing S_t against SMI*. These results are shown at Exhibit 6.

EXHIBIT 5



[5] We choose an intercept adjustment such that we minimize the squared variance around zero: $\alpha^* \approx -2.92$.

EXHIBIT 6

Regression Statistics	
Multiple R	0.78
R Square	0.61
Adjusted R Square	0.61
Standard Error	0.38
Observations	49.00

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.46	0.05	8.49	0.00
SMI*	(0.47)	0.05	(8.66)	0.00

Exhibit 7 summarizes the *subsequent* ten-year inflation-adjusted S&P 500 return corresponding to years in which a "high" (+1) or "low" (-1) signal occurred. Importantly, the two sets of ten-year forward returns are largely mutually exclusive. The only false positives occurred during the Great Depression when fiscal and monetary policies were schizophrenic. Otherwise, there are either "winning" decades or "losing" decades with virtually no overlap, demarcated by the dashed line. This graph also illustrates the dispersion of ten-year returns, indicating greater variability of returns in secular bear markets. Exhibit 8 shows the same regression result for gold, and we discuss these findings in our conclusion.

EXHIBIT 7

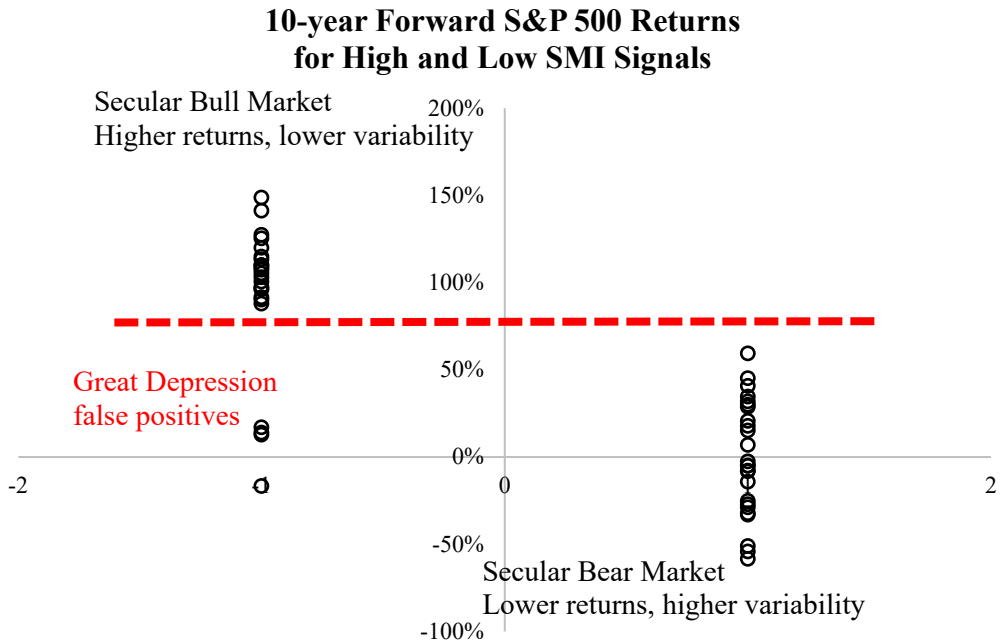
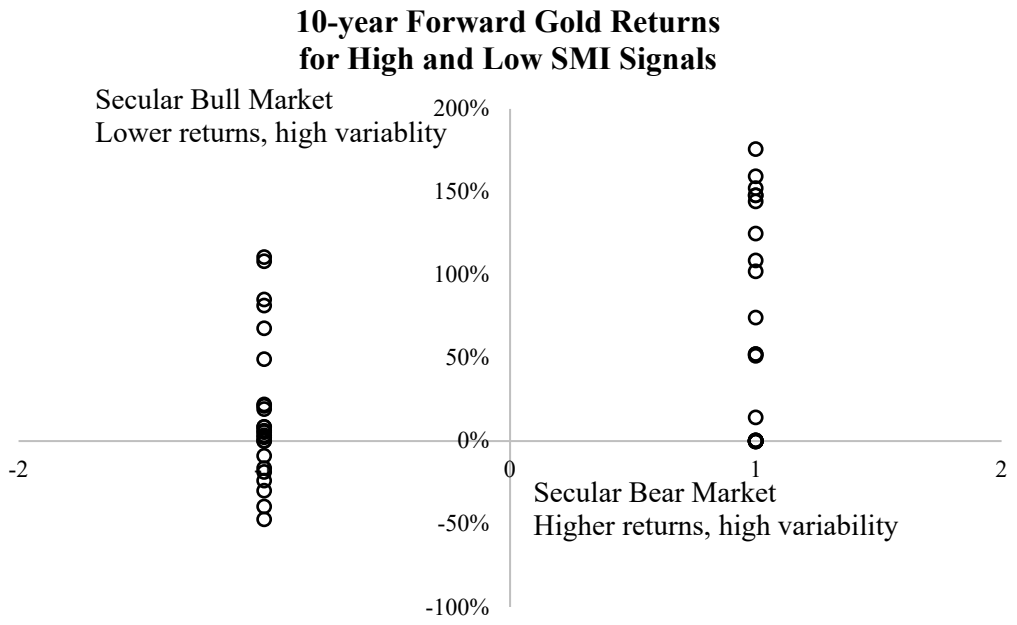


EXHIBIT 8



DISCUSSION AND APPLICATION

Prudent asset allocation begins with an understanding of where one is in the long-term economic cycle. These cycles run approximately 20 years in length, and consist of one secular bull market and one secular bear market.

Long-term strategic asset allocations, largely static in nature, ignore these cycles and naively diversify on the assumption that markets and economies are not easily and consistently predictable. Chua et. al. (2019) argue that investors typically assess correlations for a full sample, which masks an asset's diversification properties in various market environments. Their extensive study of conditional correlations concluded diversification based on unconditional covariances is unfounded.

Each secular semi-cycle is marked by distinct characteristics. Chow et. al. (1999) define financial market turbulence as a condition in which asset prices behave in an uncharacteristic fashion given their historical pattern of behavior, including extreme price moves, decoupling of correlated assets, and converging asset correlations.

We have summarized these characteristics, notably variability, range of returns, and average returns, in Exhibit 9.

EXHIBIT 9

Select Characteristic Data

	Secular Bear Markets		***Secular Bull Markets***	
	(n = 67 years)		*(n = 64 years)*	
	Equities	**Gold***	**Equities**	Gold*
Average	-2%	**13%**	**12%**	-1%
Best year	33%	**43%**	36%	**58%**
Worst year	-58%	**-19%**	**-28%**	-38%
S.D. of ann. ret.	20%	**12%**	**14%**	15%
Skewness	-0.66	**1.47**	-0.62	**0.96**
Sharpe ratio	-0.13	**1.08**	**0.88**	-0.05

*Statistics for gold are for years since 1971. Over a full 100-year period gold still dominates equity in secular bear markets, both in terms of performance and risk profile.

Decision Rule and Portfolio Construction

Application of the SMI in a portfolio context results in the following asset allocation rule:

When the SMI crosses above +1, overweight gold, and maintain this posture until the SMI crosses -1.

When the SMI crosses below -1, overweight equity, and maintain this posture until the SMI crosses +1.

Exhibit 10 shows the result of the decision rule as compared to two portfolios of 100% equity and 100% gold, where we allocated to either 100% equity or 100% gold based on the SMI. While the SMI itself is constructed with nominal gold returns, the portfolio results are presented in inflation-adjusted US dollars. Exhibit 11 uses 10-year rolling returns to illustrate the dominance of a secular driven portfolio over alternative allocations for most time periods. Select portfolio statistics are presented in Exhibit 12.

EXHIBIT 10

Performance of Stocks, Gold, and Secular-Driven Portfolios, Inflation-Adjusted

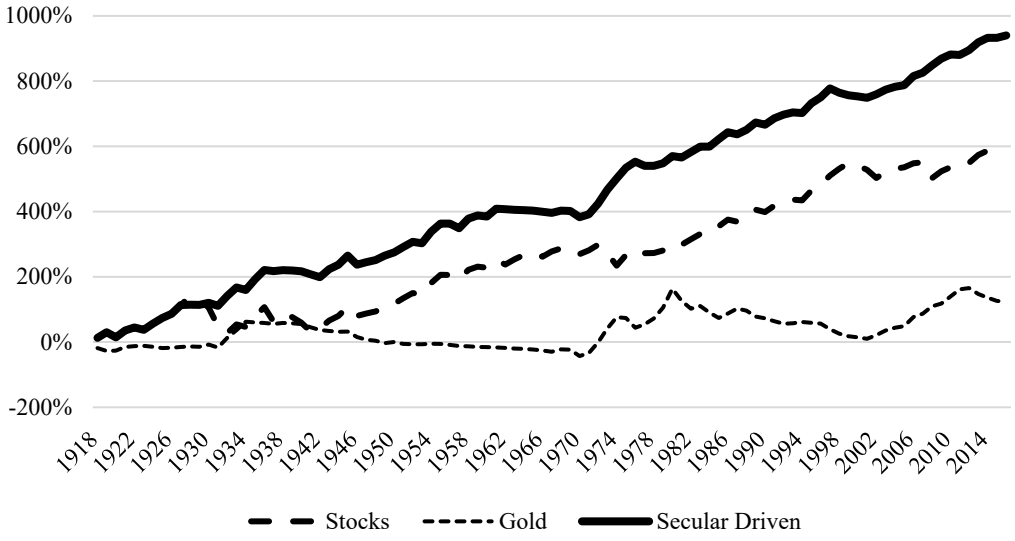


EXHIBIT 11

10-Year Rolling Returns for Stocks, Gold, and Secular-Driven Portfolios, Inflation-Adjusted

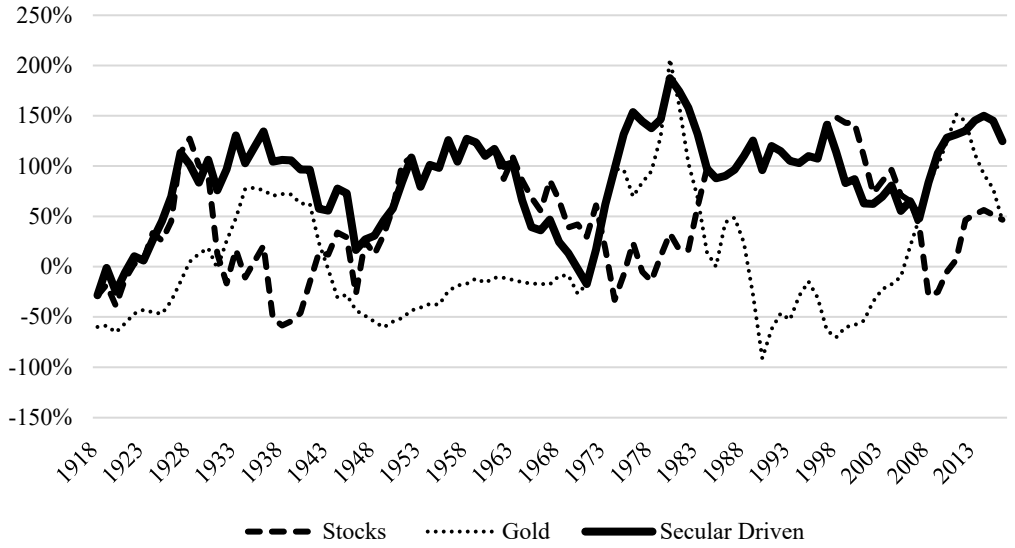


EXHIBIT 12

Selected Portfolio Statistics

	Stocks	*Gold*	*Secular Driven*
Since 1886			
Average	5%	1%	**8%**
Best year	36%	**58%**	43%
Worst year	-58%	-38%	**-28%**
S.D.	19%	14%	**14%**
Sharpe	0.26	0.05	**0.56**
Since 1946			
Average	7%	1%	**10%**
Best year	36%	**58%**	43%
Worst year	-48%	-38%	**-28%**
S.D.	17%	16%	**14%**
Sharpe	0.41	0.08	**0.66**

Caveats and Cautions

The way we constructed the indicator results in false indications shortly after the economy transitions from bull to bear and vice-versa, but the indicator is not necessarily designed to precisely identify peaks and valleys. Over a sufficiently long-term horizon these "misses" look more like risk management. That said, as one crosses a "too high" threshold, refinement to the timing of an asset allocation shift to "risk off" could be done using more granular approaches, such as monitoring changes in the yield curve or consumer sentiment.

In our backtesting, we encountered some 10-year false positives during the Great Depression. Nevertheless, following the asset allocation decision rule during that time would have still produced favorable results: an investor would have missed bear markets and crashes in 1929-32, 1937, and 1941.

The SMI model also appears to underperform during secular bear cycles. The reason for this is that equities in secular bear markets resemble volatile sideways trends rather than continual downward trends. However, because cyclical down-markets in secular bear cycles are deep and prolonged, an investor primarily benefits by avoiding large losses in equity. Hence an advantage to secular driven allocation includes capturing the magnitude of gain earned relative to the magnitude of loss avoided, and not just improving a "batting average" of hits and misses.

Because we rely on Shiller's original CAPE ratio, our model suffers from all the deficiencies inherent in the construction of that ratio.

Our model, like most others, is constructed with the benefit of hindsight. Hopefully, the stability of the SMI around -1 to +1 should give an investor some comfort that long-term *ex-ante*

asset allocation decisions could still be made without the benefit of fitting 100 years of data to a curve.

Lastly, our model of the macro economy is just that−a model. In our research we encountered perhaps the most eloquent statement ever made about financial modeling (Derman 2009):

> "To confuse the model with the world is to embrace a future disaster driven by the belief that humans obey mathematical rules." −Emanuel Derman

Advantages and Assertions

The conspicuous implication for long-life portfolios like endowments, foundations, and pensions is that one could beat the market by simply alternating among passive equities and gold as the SMI dictates. While we still view this as active management, it may also be viewed by ardent indexers as a compromise approach to the active-passive debate. Our use of binary-choice asset classes is intentional to illustrate the dominance of risk-on/risk-off asset switching over buy-and-hold alternatives.

Our model does not address portfolio constraints such as liquidity and income requirements. However, we anticipate investors will be intrigued by the possibility that a superior risk-adjusted portfolio with a 40-year time horizon could be implemented with as few as eight trades over its lifespan (one entry trade, three switches, and an exit). The SMI model allows for incorporation of passive investment theory into an active management framework. This suggests that such a portfolio may offer compelling after-tax returns.

One of the most appealing features of the CAPE-gold SMI model is its simplicity. Advisors and investors alike can easily relate to the concept of long-term economic cycles without reference to labyrinthian mathematics or a Gordian knot of economic theory. "If the economy is strong, hold stocks, if the economy is weak, hold gold." But the elegance of this statement is only actionable with a consistent and objective definition of "strong" and "weak."

Another behavioral consideration is the use of ten-year periods as interim investment horizons. Silver (2013) laments the demise of long-term investing in *The Signal and the Noise*, pointing out that the average holding period for a share of stock is now only six months. Overcoming this inertia is no small task, but one would hope Exhibit 5 would convince an investor to think seriously about the meaning of "long term investing."

Lastly, the SMI model provides structure against the carnival-like cacophony of hucksters selling fear (e.g. "Now is the time to buy gold!") and hype (e.g. "This stock is set to soar!"). Both statements could be true, but they are more likely to be true (or false) depending on the state of the macroeconomy. Absent this initial economic reference point, an investor's results may well be determined by (bad) timing, which is to say (bad) luck.

CONCLUSION

Prior research has evaluated the impact of regime shifts and dynamic switching strategies on portfolio performance and concluded that secular conditions cause performance to depart significantly from long-term average performance and covariances. Our research differs in that we use two well-known indicators in conjunction to arrive at an objective definition of "secular market cycle," providing a consistent signal to identify economic shifts. Exhibit 5, and the resulting portfolio constructed in Exhibit 10, provide a compelling story: investors must first evaluate the current state of the long-term macroeconomic cycle to properly select among risk-on and risk-off investment options. A secular-driven portfolio which alternates between equity and gold dominates all other portfolios nearly 70% of the time over ten-year periods. The average annual inflation-adjusted outperformance was 3% over equities and 8% over gold.

From the data in Exhibits 7, 8, and 12 we can also infer the following:

1. Participation in secular bull markets via equity is critical, since the magnitude and consistency of returns are so great. It is likely the case that some leverage during this time is acceptable.

2. Though not fully presented here, the predictive power of SMI with respect to future gold prices is weaker than that of future equity prices ($R^2 = 0.13$), and this is apparent in the large variability of ten-year returns in both bull and bear cycles. This suggests that leverage during this period is unwise, even if holding gold. Also, while gold may be *a* safe haven in secular bear markets, it may not be *the* optimal risk-off choice. However, it is certainly an improvement over holding passive equity for very long periods.

3. Our findings reinforce the notion that investment time horizon is also not absolute. From the perspective of an investment advisor, time horizon takes on added importance when viewed against a backdrop of secular markets. An advisor who sits down with a client and advocates for equities at the beginning of a secular bear market (on the basis that equity investing is "long-term" or mean-reverting) should also ascertain the investor's understanding of "long term." When entering a secular bear market, 12 years has proven to be too short to achieve the "long-term" average equity return. When entering a secular bull market, 12 years is plenty of time, and equities have always performed well.

Overall, our findings suggest that secular-driven investing improves both absolute and risk-adjusted performance, adjusted for inflation, over long periods.

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