Diversification, Correlations & Rebalancing

– Potentially Golden Opportunities in Agriculture –

Teucrium Trading, LLC **By Sal Gilbertie – 2017** **www.teucrium.com**

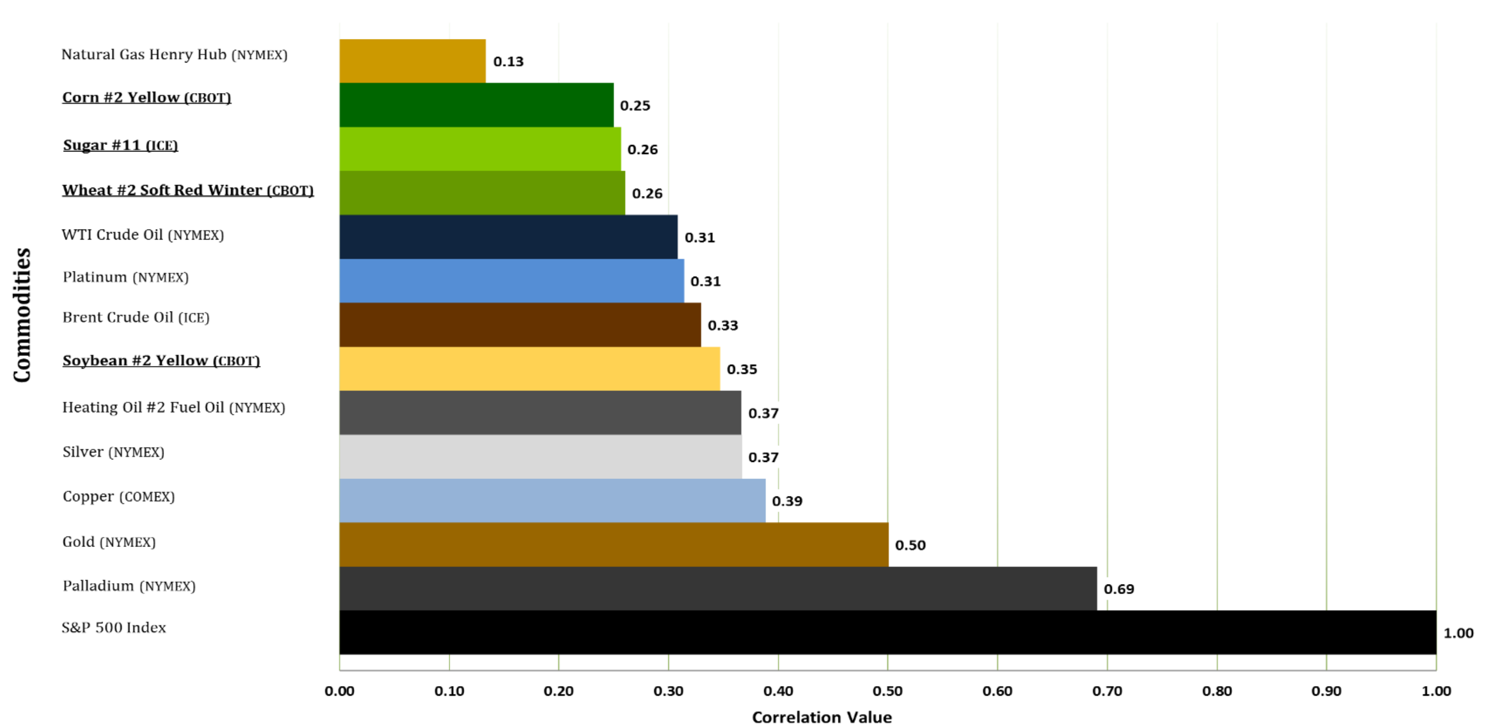
Correlations

Many professional investors are well aware that price movements in precious metals are generally not well correlated with the performance of stocks and bonds. **However, it often comes as a surprise to investors that many commodities in the agricultural sector have price movements that are less correlated with stocks and bonds than other well-known commodities, including precious metals**. Investors of all kinds routinely include precious metals and energy in their portfolios for diversification purposes, but analysis shows that over time the price movements of both precious metals and crude oil seems to be more closely correlated with stocks and bonds than are the price movements of agricultural commodities.

Long-term, 20-year analysis of thirteen specific commodities (all available to investors in the single commodity Exchange Traded Product format) consistently indicates sugar, grains and natural gas as the least correlated commodities when each are regressed against the S&P 500 Index. In fact, <u>the major agricultural commodities of sugar, corn, and wheat have all exhibited weaker correlations to the S&P Index than crude, gold and other precious metals over the last twenty calendar years ending December 2016</u>. Figure 1 illustrates the 20-year price correlation of these thirteen major commodities to the S&P 500.[1]

Figure 1

Correlation Coefficients of 13 Commodities to the S&P 500 – A 20 Year Look
1/1/1997-12/31/2016



Sources: Charts were prepared by Teucrium Trading, LLC, using Bloomberg Professional February 3rd, 2017
Note: Commodities values are from futures (generic first) spot continuation charts.
S&P 500 Index taken from Bloomberg: SPX Index – This is for illustrative purposes only and not indicative of any investment. An investment cannot be made directly in an index. Stocks in this example are represented by the Standard & Poor's 500.

[1] **For this purpose, the correlation analysis for each specific commodity is Spot Continuation (generic futures contracts)** as defined by and sourced on Bloomberg: "Generic contracts, such as US1, US2, US3, ..., are constructed by pasting together "rolling" contracts, according to the pre-selected roll types on the commodity default page. The generic contract uses the value of a particular contract month until it "rolls" to the next month in the series. You can access a generic contract by replacing the month/year code with the number 1, i.e. A 1<CMDTY>. Replacing the month/year code with the letter A will yield the active contract."

Comparing Gold, Grains & Sugar

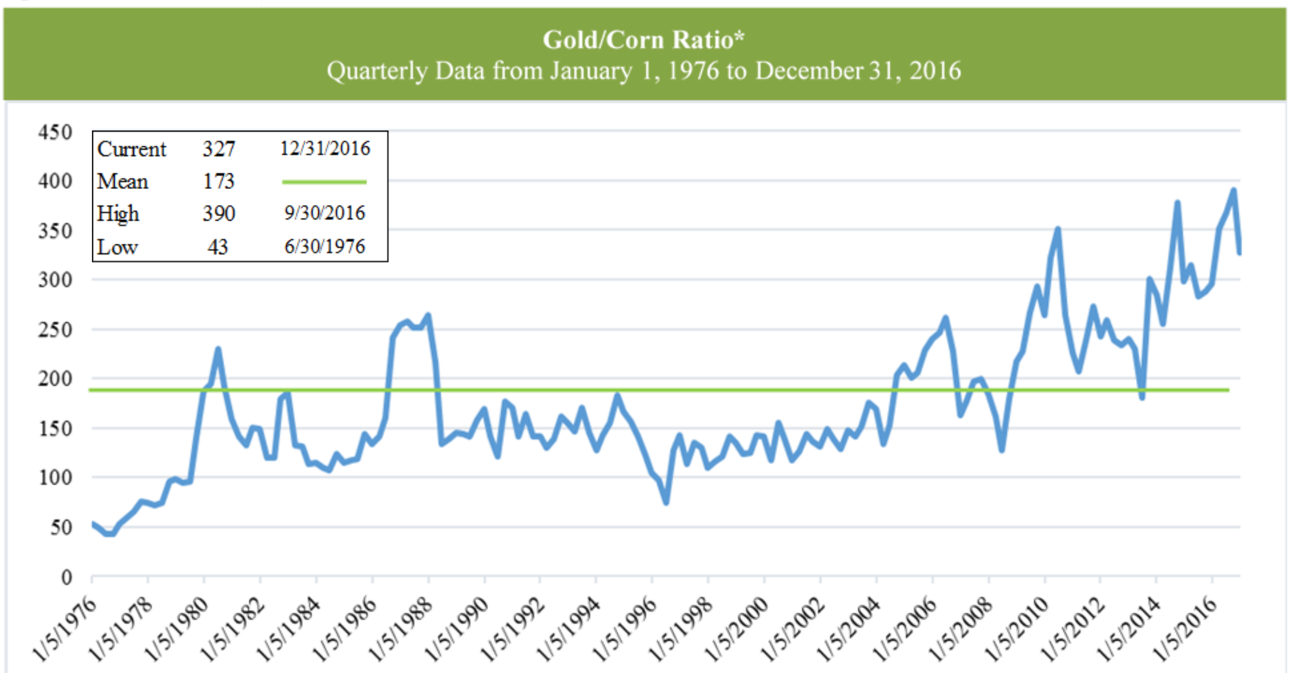
For a variety of reasons, gold is a widely held asset class within investment portfolios. Many investors include gold in their asset allocation mix for its perceived ability to act as both a diversifier and as a potential store of value in times of uncertainty; these perceptions contribute to the concept of gold as a "core holding" in many diversified portfolios. Indeed, with the notable exception of Warren Buffett,[2] some of the investment community's most distinguished names currently maintain investments in gold.[3]

Like any investment, gold is subject to rebalancing or reallocation when its value relative to other portfolio components shifts significantly. Examining quarterly data from the beginning of 1976 (the year that gold started trading freely in the United States) through the quarter ended December 31, 2016, suggests that gold is over-valued relative to historical price relationships with the major agricultural crops of corn, wheat, soybeans and sugar.[4]

At quarter end December 31, 2016, the gold/corn ratio, defined herein as the number of bushels of corn an investor could buy with the proceeds from selling one troy ounce of gold, was 327 bushels, versus a 41-year average value of 173 bushels.

Gold investors attempting to maximize portfolio performance through disciplined quarterly or annual rebalancing, may want to consider adjusting their gold holdings in tandem with their existing or anticipated agricultural sector portfolio investment mix.

Figure 2



NOT REPRESENTATIVE OF ANY TEUCRIUM PRODUCTS
Past performance is not indicative of future results

Source: Analysis & corresponding charts were prepared by Teucrium Trading, LLC, using Bloomberg Professional, January 4th, 2017

***Gold/Corn Ratio** – The Gold/Corn Ratio is defined as the number of bushels of corn one could buy with the proceeds from selling one troy ounce of gold at a specific day's settlement prices. The ratio is patterned after the same methodology used for the gold/corn ratio explored in Jeff Wilson's article from Bloomberg, "Corn Trading Cheapest to Gold Since 1975 Signals Bottom," dated September 23, 2014. https://www.bloomberg.com/news/articles/2014-09-23/corn-trading-cheapest-to-gold-since-1975-signals-bottom

About the data: Commodity values are from futures (generic first) spot continuation charts as defined by and sourced on Bloomberg: "Generic contracts, such as US1, US2, US3... are constructed by pasting together "rolling" contracts, according to the pre-selected roll types on the commodity default page. The generic contract uses the value of a particular contract month until it "rolls" to the next month in the series. You can access a generic contract by replacing the month/year code with the number 1, i.e. A 1<CMDTY>. Replacing the month/year code with the letter A will yield the active contract." No representation is being made that the Teucrium Funds are likely to achieve a performance record similar to that shown.

[2] "Why Warren Buffet Hates Gold." *NASDAQ* 15 Aug. 2013: Web. October 9th, 2014.https://www.nasdaq.com/article/why-warren-buffett-hates-gold-cm267928

[3] Based on the 13-F filings for holders of GLD, the SPDR Gold Trust, as of 9/30/15 and found using Bloomberg Professional, January 4th, 2017.

[4] Analysis & corresponding charts were prepared by Teucrium Trading, LLC, using Bloomberg Professional, January 4th, 2017. All supporting detail available upon request.

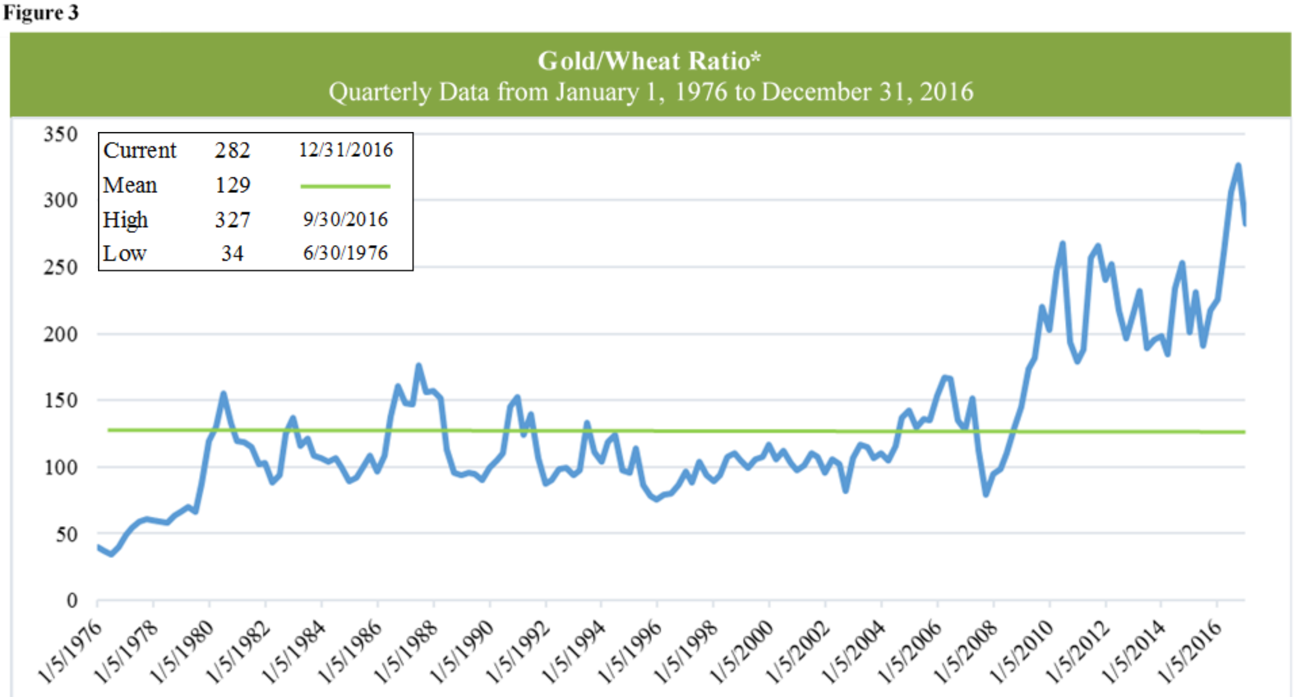
For example, the historical data for the gold/corn ratio suggests that a mean reversion[5] from December 31, 2016 levels of 327 bushels to the 41-year mean value of approximately 173 bushels of corn for each ounce of gold (bu/oz), could benefit an investor rebalancing gold for corn within their portfolio.

As illustrated in Figure 2 on page 2, at 327 bu/oz the gold/corn ratio is approximately 89% above its four-decade average of 173 bu/oz. Hypothetically, if an investor sold gold and purchased corn at the current 327 bu/oz level, and the ratio subsequently retraced to its historical mean value of approximately 173 bu/oz, the investor would then be able to sell the corn and buy back 89% more gold than was originally sold to make the temporary reallocation from gold into corn.

The gold/corn ratio may have been 89% above its 41-year historic mean value at the end of Q4 2016, but both the gold/wheat and gold/soybean ratios were also well above their historic 41-year mean values. The gold/wheat ratio was over 118% of its 41-year mean, and the gold/soybean ratio was over 65% of its 41-year historic mean value. The gold/sugar ratio began a mean-reversion in 2016, ending the year 23% above its historic 41-year mean value. Charts for the gold/wheat, gold/soybean, and gold/sugar ratios are shown below.

The current availability of both futures contracts and futures-based exchange traded products for gold, corn, wheat, soybeans, and sugar make rebalancing the gold and agricultural components within a portfolio easier than ever before. Investors and advisors need to make an assessment of the relative value of gold versus their other portfolio constituents, including agriculture, and appropriately adjust their allocations to suit their individual investment needs and objectives.

Figure 3



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Source: Analysis & corresponding charts were prepared by Teucrium Trading, LLC, using Bloomberg Professional, January 4th, 2017

***Gold/Wheat Ratio** – The Gold/Wheat Ratio is defined as the number of bushels of wheat one could buy with the proceeds from selling one troy ounce of gold at a specific day's settlement prices. The ratio is patterned after the same methodology used for the gold/corn ratio explored in Jeff Wilson's article from Bloomberg, "Corn Trading Cheapest to Gold Since 1975 Signals Bottom," dated September 23, 2014. https://www.bloomberg.com/news/articles/2014-09-23/corn-trading-cheapest-to-gold-since-1975-signals-bottom

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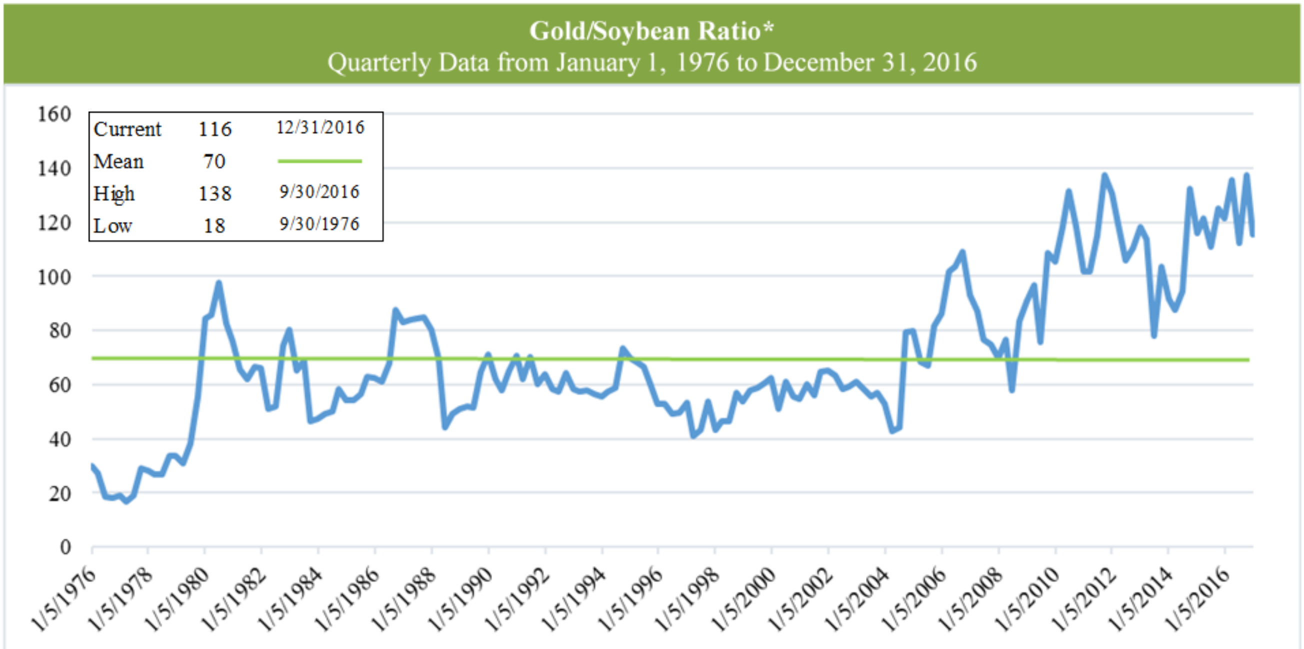
[5]Mean Reversion: A theory suggesting that prices and returns eventually move back towards the mean or average. This mean or average can be the historical average of the price or return or another relevant average such as the growth in the economy or the average return of an industry. Source: https://www.investopedia.com/terms/m/meanreversion.asp

Figure 4



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***Gold/Soybean Ratio** – The Gold/Soybean Ratio is defined as the number of bushels of soybeans one could buy with the proceeds from selling one troy ounce of gold at a specific day's settlement prices. The ratio is patterned after the same methodology used for the gold/corn ratio explored in Jeff Wilson's article from Bloomberg, "Corn Trading Cheapest to Gold Since 1975 Signals Bottom," dated September 23, 2014. https://www.bloomberg.com/news/articles/2014-09-23/corn-trading-cheapest-to-gold-since-1975-signals-bottom

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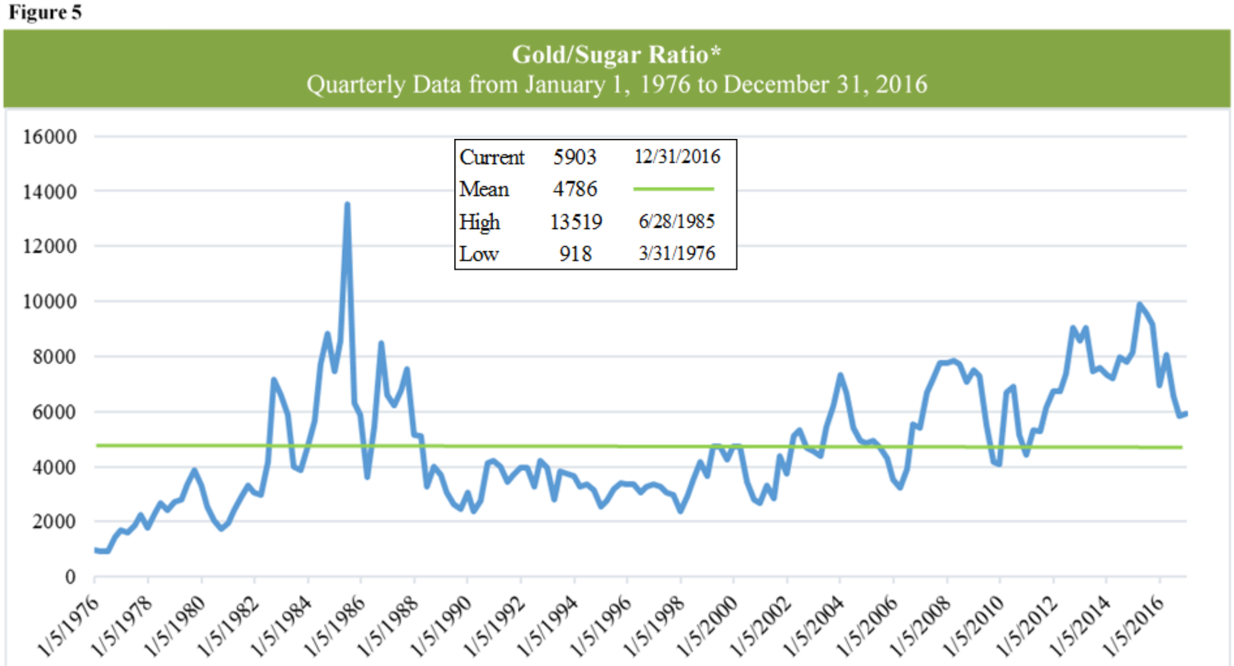
Figure 5



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***Gold/Sugar Ratio** – The Gold/Sugar Ratio is defined as the number of pounds of sugar one could buy with the proceeds from selling one troy ounce of gold at a specific day's settlement prices. The ratio is patterned after the same methodology used for the gold/corn ratio explored in Jeff Wilson's article from Bloomberg, "Corn Trading Cheapest to Gold Since 1975 Signals Bottom," dated September 23, 2014. https://www.bloomberg.com/news/articles/2014-09-23/corn-trading-cheapest-to-gold-since-1975-signals-bottom

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Shares of the Funds are not FDIC insured, may lose value, and have no bank guarantee. Foreside Fund Services, LLC is the distributor for the Teucrium Funds. The Teucrium Funds have a patent on the methodology employed by the Funds.

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CORN: http://www.teucriumcornfund.com/pdfs/corn-prospectus.pdf

SOYB: http://www.teucriumsoybfund.com/pdfs/soyb-prospectus.pdf

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