

## **Individual Commodity/Currency Correlations Irregular**

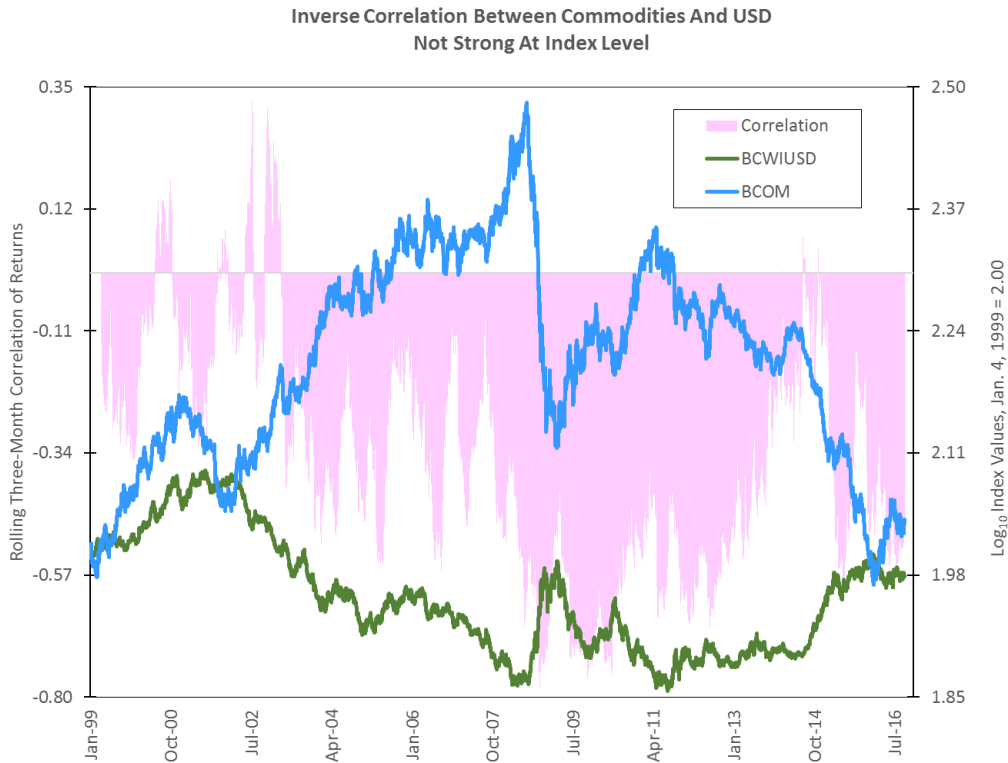
If you have yet to be aggravated by some market pundit opining “commodities” rose or fell because “the dollar” fell or rose, congratulations; this means you have been spending your days pursuing useful endeavors instead of listening to gasbags.

The logic behind the association may seem sound as most physical commodities in global commerce are priced in U.S. dollars. This is not a law of nature and may in fact change some day, but having multiple-currency clearing and settlement systems for already-volatile goods simply invites unnecessary complexity. Perhaps this could be tackled by Fintech 2.0 once everyone figures out what Fintech 1.0 actually is.

In any case, a stronger dollar therefore raises the local currency price of those commodities for buyers, and vice-versa. However, if you look at the gearing of various commodity price movements to changes in currency exchange rates, many times they are just out of the bounds of economic reality. Moreover, the common shorthand for “the dollar,” the ICE dollar index, is weighted very heavily to currencies with only minor importance in global commodity production; the euro alone is 57.6 percent of the dollar index and the Japanese yen and British pound are 13.6 and 11.9 percent, respectively. Only the Canadian dollar at 9.1 percent has a plausible linkage to the world of physical commodity production. The linkage is even more tenuous for commodity consumption. China is the largest importer and marginal buyer of many physical commodities and the yuan remains in a very controlled range against the dollar.

Let’s take a momentary detour before discussing the central thesis we should focus on individual commodity/currency relationships and look at index-level relationships and their rolling three-month correlation of returns. The commodity index used here is the Bloomberg index, the successor to the Dow Jones-UBS index, which in turn was successor to the Dow Jones-AIG index, which in turn might have been the successor to something Vasco de Gama (remember him?) discovered en route to India back in the Fifteenth Century. The currency index used here is the Bloomberg correlation-weighted index, a complex construct that has the advantages of changing weights and a lower concentration in the euro; 15.2 percent at the end of September 2016.

Both the commodity and currency indexes are displayed on a common logarithmic scale reindexed to the January 1999 advent of the euro. While there are some periods of inverse movement, such as April 2002 – July 2008, the rolling three-month correlation of returns was never lower than -0.80 and has been positive on numerous occasions, mostly prior to the Federal Reserve’s first declaration of war on deflation in May 2003.



Source: Bloomberg

### Comparative Regimes

The variation in index-level correlations of returns over time and their association with major events such as policy changes or the start of bull and bear phases in either set of markets suggests individual commodity/currency correlations of returns might be different across different time periods. Let's take two periods related to crude oil's market regimes, the first beginning with the June 2014 start of its most recent bear market and ending with the January 2016 low and the second extending from January 2016 to the late September 2016 time of this writing.

Now let's take a set of cash market prices for 19 different physical commodities; the two exceptions where continuous front-month futures had to be used in lieu of cash markets were sugar and frozen concentrated orange juice. The use of cash markets eliminates the problems associated with futures' potentially large discontinuities when contracts are rolled.

In addition, let's take a set of six currencies, the euro, yen, Canadian and Australian dollars, the Brazilian real and the Russian ruble. The last four currencies in this set are for broadly commodity-linked currencies; countries whose currencies are strongly linked to a narrow list of commodities such as Norway or Colombia are not included. Each of these currencies can be quoted on consistent "USD per" basis when, as in the cases of the ruble, Canadian dollar and yen, they are commonly quoted on a "per USD" basis.

A correlation matrix of each commodity's daily returns against each currency's returns is presented below for the entire January 1999 – September 2016 period, more than 4,600 data points. Only one pair, the silver/Australian dollar, has a correlation over 0.40, meaning in no case can we explain more than 17 percent of a commodity's variance of returns with a currency. Nearly all of the yen's correlation values are negative.

**Correlations of Returns**  
**January 1999 - September 2016**

	BRL	RUB	AUD	CAD	JPY	EUR
Aluminum	0.209	0.187	0.303	0.293	0.041	0.213
Nickel	0.171	0.150	0.242	0.242	0.044	0.151
Silver	0.187	0.178	0.403	0.364	0.116	0.340
Orange Juice	0.046	0.033	0.085	0.077	0.017	0.056
Coffee	0.099	0.054	0.105	0.102	0.012	0.085
Copper	0.240	0.202	0.374	0.342	0.066	0.219
Gold	0.108	0.115	0.333	0.294	0.209	0.365
Crude Oil	0.195	0.281	0.290	0.342	0.047	0.171
Natural Gas	0.002	0.029	0.039	0.025	0.001	0.011
Gasoline	0.132	0.178	0.204	0.236	0.045	0.105
Cattle	0.091	0.071	0.096	0.099	0.044	0.022
Hogs	0.040	0.007	0.035	0.044	0.029	0.026
Corn	0.107	0.092	0.167	0.173	0.001	0.135
Soybeans	0.163	0.107	0.215	0.205	0.021	0.139
Wheat	0.121	0.064	0.176	0.177	0.011	0.136
Heating Oil	0.147	0.225	0.249	0.287	0.021	0.136
Cotton	0.116	0.099	0.186	0.181	0.041	0.149
Sugar	0.114	0.080	0.142	0.117	0.004	0.102
Cocoa	0.071	0.093	0.149	0.128	0.016	0.144

Source: Bloomberg

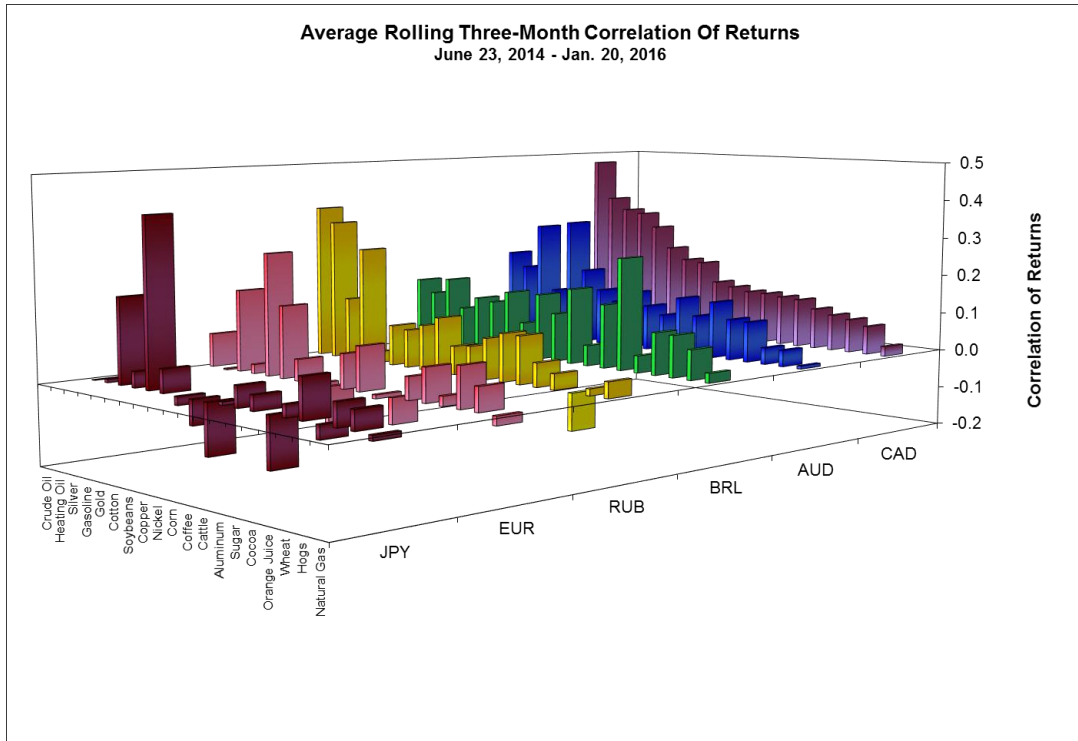
Now let's return to the two sample periods noted and crunch the numbers, which always makes a pleasant sound not unlike eating potato chips if nothing else. We can calculate the average returns and standard deviations of those returns for each commodity and for each currency over both periods along with the probability the two periods had different returns statistically. The markets are then sorted along that probability measure.

	June 2014 - Jan. 2016		Jan. 2016 - Sep. 2016		Prob. Diff.
	Avg.	Std. Dev.	Avg.	Std. Dev.	
Coffee	-0.09%	1.09%	0.16%	0.96%	98.8%
Crude Oil	-0.28%	2.59%	0.31%	3.19%	98.3%
Heating Oil	-0.32%	2.41%	0.29%	3.22%	97.3%
Silver	-0.09%	1.51%	0.19%	1.51%	96.4%
Orange Juice	-0.01%	2.07%	0.30%	2.27%	93.4%
Gasoline	-0.27%	3.08%	0.24%	3.28%	92.9%
Nickel	-0.22%	1.88%	0.13%	2.01%	91.8%
Gold	-0.05%	0.89%	0.11%	1.02%	91.6%
Sugar	0.08%	1.83%	0.25%	2.15%	90.5%
Copper	-0.16%	1.27%	0.06%	1.18%	87.8%
Soybeans	-0.04%	1.43%	0.05%	1.47%	79.8%
Natural Gas	-0.10%	3.32%	0.22%	3.52%	79.7%
Cotton	0.00%	1.15%	0.07%	1.25%	77.8%
Aluminum	-0.09%	1.14%	0.06%	1.06%	76.7%
Wheat	-0.02%	1.84%	-0.13%	1.61%	40.5%
Cattle	-0.10%	1.16%	-0.10%	1.40%	39.6%
Hogs	0.01%	2.37%	-0.08%	1.87%	37.5%
Cocoa	0.03%	1.23%	0.02%	1.36%	28.4%
Corn	-0.03%	1.54%	-0.08%	1.57%	16.5%
BRL	-0.11%	1.17%	0.14%	1.19%	99.2%
RUB	-0.16%	1.85%	0.14%	1.29%	99.1%
CAD	-0.05%	0.67%	0.06%	0.64%	98.5%
AUD	-0.07%	0.51%	0.06%	0.76%	95.2%
JPY	0.01%	0.53%	0.08%	0.84%	91.3%
EUR	0.00%	0.66%	0.02%	0.52%	82.9%

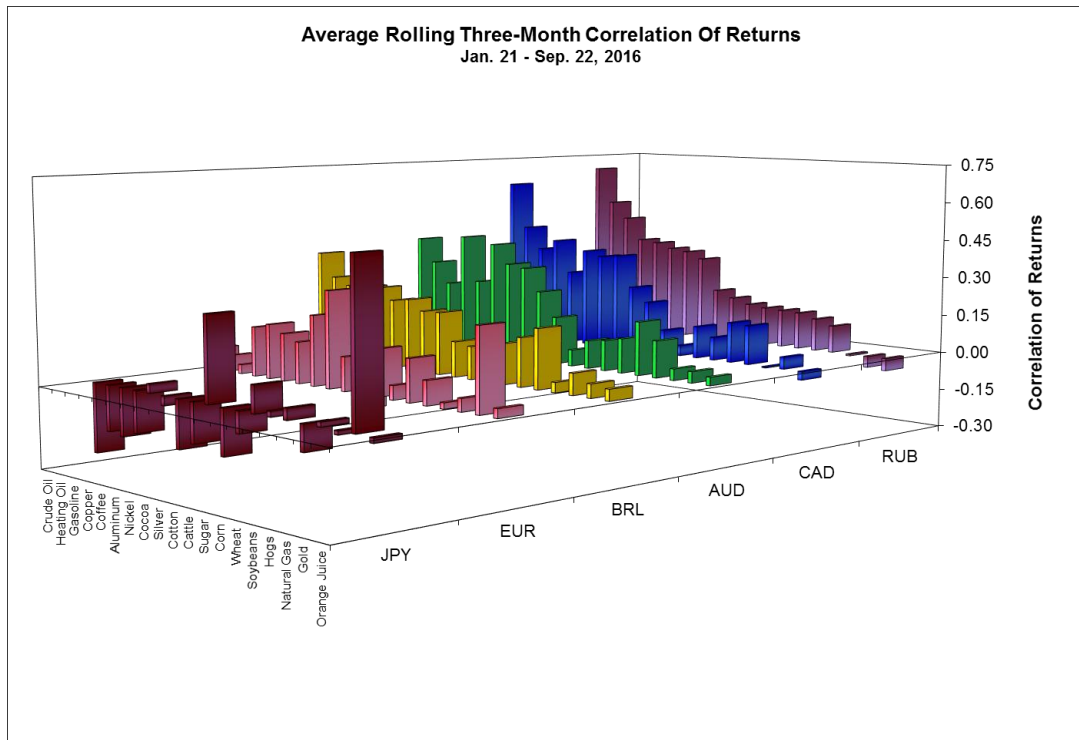
Source: Bloomberg

Nine of the nineteen commodities' returns shifted higher with a greater than 90 percent significance from the first to the second period. The shifts for currencies were just as profound, with five of the six currencies' returns shifting higher from the first to the second period. In other words, the preponderant shift was for stronger commodities to be accompanied by a weaker dollar over these two periods. On this basis, the narrative of “weaker dollar/stronger commodities” holds for the well-defined time periods in question.

The average correlations of returns for each commodity/currency pair can be calculated over each period and sorted from lowest to highest commodity linkage for each currency. The data can then be sorted along the most commodity-linked currency, the Canadian dollar in the first period and the ruble in the second.



Source: Bloomberg



Source: Bloomberg

Do the data contain any surprises? The order of commodity linkage amongst the currencies during the first period is unremarkable and confirms the conventional wisdom both the Canadian and Australian dollars are strongly commodity-linked. However, the magnitudes of these correlations may strike you as very low, with the CAD/crude oil pair leading the way at 0.47. The euro, which dominates the ICE dollar index, is something of a mess; its highest correlation of returns was 0.30 against gold. Moreover, it had negative correlations against heating oil, copper, nickel, live cattle, aluminum and natural gas. As ragged as the euro was, the yen was worse, with negative correlations against crude oil, soybeans, copper, nickel, aluminum, orange juice and natural gas.

At the end of it all we are left with another one of those perplexing non-rules of thumb, something along the lines of whether the stock market rises or falls with crude oil prices or long-term interest rates. The answer always depends on the time periods used and on the specific markets used. Simplicity may have its virtues, but being able to explain time-varying relationships between the members of different broad-based indexes is not one of them.