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Spread Trading in CBOT Soybean Oil and BMD Crude Palm Oil

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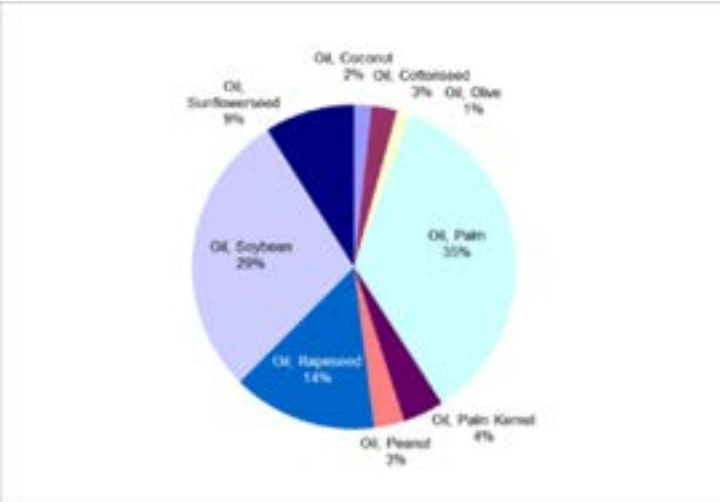
Edible vegetable oils are some of the most crucial cooking ingredients in the world. They are also used in the production of soaps, washing powders, personal care products and bio-fuels. Soybean oil and palm oil dominate the marketplace and account for roughly 64 percent of the total world production of edible oils.

Chart 1: World Edible Oil Production



Source: USDA December 2017

Soybean oil and palm oil are considered "substitute goods" because food processors often switch between the two ingredients as the prices fluctuate. Theoretically this should limit the variability in the price spread between the two markets, but that is not always the case. World soybean production is centered mostly in the U.S., Brazil and Argentina, and most of the world's palm oil comes from Indonesia and Malaysia. A drought in the U.S. or in South America could drastically alter the soybean oil supply one year, while disease and other production difficulties in Southeast Asia could alter the palm oil supply the next year. There have also been shifts in demand as the perceived health effects of consuming different types of fats and oils have been debated. This can create tremendous volatility in the spread relationship.

This paper will demonstrate how traders can use the Chicago Board of Trade (CBOT) Soybean Oil futures and Bursa Malaysia Berhad (BMD) Crude Palm Oil futures contracts to trade the spread relationship between the two products.

Defining the Spread

The CBOT Soybean Oil futures contract consists of 60,000 pounds, which is equivalent to approximately 27.22 metric tons. The BMD Crude Palm Oil (FCPO) futures contract is 25 metric tons (mt), so the two contracts are comparable, but not identical in size.

The CBOT contract is quoted in U.S. cents (USD) per pound (lb), while the BMD contract is quoted in Malaysian ringgits (MYR) per metric ton. To compare the two contracts, it is necessary to convert them into the same currency and volume measurements. The choice of which currency and which measurement (pounds, metric tons) is up to the individual trader. In this report, we will convert everything to USD per metric ton.

To convert the Soybean Oil futures contract price from U.S. cents per pound to USD per metric ton, first we convert the "cents" price to dollars by dividing by 100, and then we multiply the dollars per pound price by the number of pounds in a metric ton (2,204.622):

Soybean Oil ($ per lb) x 2204.622 (lbs per mt) = Soybean Oil ($/mt)

For example, a soybean oil price quoted at 33.00 cents/lb ($0.33/lb) is equivalent to $727.53/mt:

$0.33/lb x 2204.622 = $727.53 per mt

To convert the palm oil price from MYR per metric ton to USD per metric ton, we divide the ringgits per ton price by the exchange rate:

Palm Oil (MYR per metric ton) / exchange rate = Palm Oil ($ per metric ton).

For example, if the exchange rate is currently priced at 4.10 MYR per dollar and palm oil quoted is quoted at 2600 MYR per metric ton, then the Palm Oil futures price is $634.15 per metric ton:

2600 MYR per mt / 4.10 MYR per $ = $634.15 per mt

With both items quoted in the same units, it is easy to calculate the spread:

Spread = Soybean Oil minus Palm Oil Price

$93.38 per metric ton = $727.53 - $634.15

Historical Price Relationship

Chart 2 compares nearby futures prices for CBOT Soybean Oil and BMD Crude Palm Oil from January 2008 to December 2017.

This provides a long term view of the general relationship between the prices at the two exchanges, but there are limitations to this analysis. Because these are nearby futures there is a possibility that on any given date the two data series might be covering two different delivery times. (BMD lists all twelve months as the contract months for Crude Palm Oil futures, while the CBOT lists January, March, May, July, August, September, October and December as the contracts months for Soybean Oil futures). On June 1, the nearby BMD Crude Palm Oil futures contract is the June contract, which expires on the 15th of the month. On that same date the nearby CBOT Soybean Oil contract is the July futures contract, which expires mid-July.

Chart 2 on page 4 shows that Soybean Oil futures tend to be priced higher than Crude Palm Oil futures, which is not surprising given that soybean oil is generally considered to be a premium product. The two markets tend to move together, especially on big moves. But clearly, the relationship changes from time to time, most likely due to variations in supply and demand for the two oils.

Chart 2: CBOT Soybean Oil vs. BMD Palm Oil: Nearby Futures

Source: Commodity Research Bureau

Chart 3 below shows the CBOT Soybean Oil minus BMD Crude Palm Oil spread. The chart shows that from 2008 to 2017, the Soybean Oil-Crude Palm Oil futures spread stayed in a range roughly bounded by $0 to $250 per metric ton but that twice over that period Soybean Oil futures traded at more than a $400 premium to Crude Palm Oil futures. Since 2014 the range of the spread has been relatively narrow.

Chart 3: CBOT Soybean Oil minus BMD Palm Oil: Nearby Futures

Source: Commodity Research Bureau

Contract-Specific Spreads

Those observing the historical relationship between the prices typically examine how a specific spread behaves over the course of several years. For example, the December-December spread charts for each year would be reviewed for the December CBOT Soybean Oil futures versus December BMD Crude Palm Oil futures spread.

Correlation between CBOT Soybean Oil Futures and BMD Crude Palm Oil Futures

The correlations between price changes over different time periods in the nearby futures vary significantly, depending upon the time period covered. For example, using 1-week price changes for the two products, their correlation is 0.68. When a 52-week window is viewed, the correlation becomes much stronger at 0.86. As Table 1 indicates, the correlations tend to strengthen as the timeframes get longer.

These results are understandable. The two products are substitute goods, and over the long term they might be expected to correlate with each other quite well because if one oil gets too expensive relative to the other, end users would be inclined to switch to the other oil, while producers would have an incentive to increase output in the higher-priced product.

Over the near term, they may move quite differently. An example might be a year in which the palm crop in Southeast Asia is reduced due to poor weather but the soybean crops in North and South America are exceptionally large. We might expect to see higher palm oil prices due to scarcity and lower soybean oil prices due relative abundance. Even if the demand for soybean oil increases due to reduced palm oil availability, it may not be enough to compensate for the burdensome soybean oil supplies.

Table 1: Correlation Analysis: Weekly Nearby Soybean Oil vs. Weekly Nearby Crude Palm Oil (2008-2017)

Changes	Correlations
1 Week	0.68
4 Weeks	0.80
8 Weeks	0.84
12 Weeks	0.86
16 Weeks	0.86
26 Weeks	0.86
52 Weeks	0.86

Source: Commodity Research Bureau/The Hightower Report

Looking at nearby futures prices provides a long term view, but it poses a significant problem when doing correlation analysis because the price series will shift when a contract expires and the nearby month moves to the next one in line. For example, the last trading day for the 2017 October Soybean Oil futures was October 13, 2017. This means the "nearby" price for the week ending October 13 was the October futures settlement price, while the nearby price for the week ending October 20 was the December futures settlement price. The price change in this period reflected both the difference in the values of the two contract months as well as any change in the underlying price.

The last trading day for 2017 October Crude Palm Oil futures was October 13 as well, which was only about ½ day earlier than the 2017 October Soybean Oil futures expiration. This meant that the price shift from the contract roll occurred the same week for Palm Oil as it did for Soybean Oil. This should have improved the correlation analysis, except that the next contract month for the nearby Palm Oil price was November, while the next month for the nearby Soybean Oil price was December. Clearly, using the nearby contracts in correlation analysis has some drawbacks.

Problems with the contract roll can be avoided by conducting correlation analysis on specific contracts. Table 2 shows the results of analysis conducted on the December contracts from 2008 to 2017, and they varied substantially, with correlations ranging from 0.31 to 0.88. As Table 2 indicates, in some years the correlation improved with the length of time period examined, but it wasn't consistent across time periods. One explanation for this phenomenon is that a single year may not be enough time for the markets to converge after a supply or demand shock affects one of the products. Another possibility is that the most heavily traded contract in the Palm Oil futures has tended to be the third deferred month rather than the nearby month, which is more common in the Soybean Oil futures contract. This suggests that by December 1st open interest has already shifted from the January contract to the February contract and low liquidity may hurt the correlation results.

Interestingly, the average correlations across 10 years were quite similar for the 10-day, 20-day and 40-day changes.

Table 2: Correlation Analysis: December Soybean Oil vs. December Crude Palm Oil

Contract Year	1-Day Change	5-Day Change	10-Day Change	20-Day Change	40-Day Change
2008	0.56	0.72	0.73	0.81	0.65
2009	0.51	0.80	0.85	0.87	0.87
2010	0.43	0.81	0.83	0.74	0.82
2011	0.31	0.69	0.67	0.66	0.50
2012	0.51	0.57	0.67	0.75	0.84
2013	0.45	0.61	0.67	0.79	0.40
2014	0.36	0.73	0.81	0.84	0.88
2015	0.34	0.57	0.66	0.65	0.63
2016	0.52	0.72	0.72	0.66	0.74
2017	0.42	0.60	0.71	0.69	0.27
Average	**0.44**	**0.68**	**0.73**	**0.75**	**0.66**

Source: Commodity Research Bureau/The Hightower Report

This example follows the December contracts. Similar analysis can be conducted on other contract months as well, but that is beyond the scope of this paper.

Weak Correlation Only Strengthens Spread's Viability

The rather poor performance in the correlation analysis does not mean that the Soybean Oil/Palm Oil spread is not worth trading; on the contrary, the fact that the spread can be volatile underscores how important it can be for hedgers and speculative traders to watch and use futures to offset this risk of unexpected changes to this spread.

Contract Value Spread

It is important to note that the spreads shown above are not contract value spreads. They only show the price per metric ton relationship, and they do not exactly portray the trader's win/loss position if they were trading CBOT Soybean Oil futures against BMD Crude Palm Oil futures. As we noted earlier in this report, the CBOT contract consists of 60,000 pounds of soybean oil, which is approximately 27.22 metric tons, while the BMD Crude Palm Oil futures contract is for 25 metric tons. If a trader is long one contract of CBOT Soybean Oil futures and the price gains $1 per metric ton, their net position gains by $27.22. If this same person is short 1 contract of BMD Crude Palm Oil and the price rises by $1 per metric ton, their net position declines by $25. The difference in the sizes of the two contracts makes predicting the gain/loss on a spread based merely on the two prices quite complicated.

For example, consider a position in which a trader is long a CBOT Soybean Oil futures contract and short a BMD Crude Palm Oil futures contract. Let us look at three scenarios in which the Soybean Oil/Crude Palm Oil futures spread widens by $1 per metric ton:

Table 3: Long CBOT Soybean Oil/short BMD Crude Palm Oil

	Soybean Oil	Crude Palm Oil	Spread	Total
Scenario 1: Soybean Oil Futures Price Increases $1/mt, Palm Oil Futures Price Steady.				
Day 1	$750.00	$619.00	$131.00	–
Day 2	$751.00	$619.00	$132.00	–
Net Change in Value per contract	$1.00	$0.00	$1.00	–
Profit (Loss) per contract	$27.22	$0.00	–	$27.22
Scenario 2: Soybean Oil Futures Price Increases $0.50/mt, Palm Oil Futures Price Decreases $0.50/mt.				
Day 1	$750.00	$619.00	$131.00	–
Day 2	$750.50	$618.50	$132.00	–
Net Change in Value per contract	$0.50	($0.50)	$1.00	–
Profit (Loss) per contract	$13.61	$12.50	–	$26.11
Scenario 3: Soybean Oil Futures Price Steady, Palm Oil Futures Price Decreases $1/mt.				
Day 1	$750.00	$619.00	$131.00	–
Day 2	$750.00	$618.00	$132.00	–
Net Change in Value per contract	$0.00	($1.00)	$1.00	–
Profit (Loss) per contract	$0.00	$25.00	–	$25.00

Source: Commodity Research Bureau/The Hightower Report

In Scenario 1, the Soybean Oil futures price gains by $1 per metric ton, the Crude Palm Oil futures price is unchanged and the value of the trader's position increases by $27.22. In Scenario 2, Soybean Oil gains $0.50 per metric ton, Crude Palm Oil declines by $0.50 per metric ton and the value of the trader's position increases by $26.11. In Scenario 3, Soybean Oil is unchanged, the Crude Palm Oil price declines by $1 per metric ton and the value of the trader's position increases by $25.00.

As you can see, the futures spread in all three scenarios changes (improves) by the same amount ($1), yet the trading profit results of the three scenarios are all different due to the different contract sizes.

When looking at the historical spread relationship, the contract value spread will provide a more precise representation of the value of the trader's position. To determine a contract value spread, you take the value of the position of the contract you are long and subtract the value of the position you are short.

To find the contract value of a long CBOT Soybean Oil/short BMD Crude Palm Oil futures spread in USD, first determine the contract value of the Soybean Oil futures position by multiplying the price of the contract by the contract size:

$$\textit{Soybean Oil Futures Contract Value} = \textit{Soybean Oil Price (cents per pound)} \times 60{,}000 \textit{ pounds.}$$

If the soybean price is 34.00 cents, the contract value is:

$$\$0.3400 \textit{ per pound} \times 60{,}000 \textit{ pounds} = \$20{,}400$$

Then, determine the contract value of the Crude Palm Oil futures position by multiplying the price of the contract by the contract size and converting the value to USD:

Palm Oil Futures Contract Value = Palm Oil Price (MYR/mt) x 25 mt / Exchange Rate

If the Crude Palm Oil futures price is 2290 and the exchange rate is 3.60 ringgits per dollar, then the contract value is:

MYR 2290 per mt x 25 mt / 3.60 MYR per $U.S. = $15,903

The contract value of the futures spread is the difference between the two contract values:

$20,400 - $15,903 = $4,497

Following are two charts of the December 2017 Soybean Oil/December 2017 Crude Palm Oil futures spread. The first one is quoted in USD per metric ton and the second one is a contract value quoted in USD:

Chart 4: CBOT Soybean Oil minus BMD Crude Palm Oil: December 2017 Contracts

Source: Commodity Research Bureau

Chart 5: CBOT Soybean Oil minus BMD Palm Oil: December 2017 Contract Value Spread

Source: Commodity Research Bureau

The lines are similar, but the contract value spread is a closer representation of the trader's actual position because it takes into account the different contract sizes.

Fundamental Price Drivers

Over the past decade or more the primary driver for both soybean oil and palm oil direction has been strong global demand. World population and GDP has grown at a rapid pace, leading to increased demand for food and the use of both oils as feedstocks for biofuel production. This created a new source of demand for both oils. However, the cyclical nature of crop production often results in a lag in supply for short periods of time. We have seen this across all commodity groups in recent years, due to the exponential growth in demand from emerging markets.

Weather also plays a pivotal role in price direction. Most of the palm growing areas are located in rainforests, where wet weather is the norm. However, frequent cyclones that move through those areas can bring excessive rain, resulting in lower palm oil yield and the flooding of palm plantations. There are also periods of excessive dryness that can stress the palm trees, particularly in years when El Niño brings dry weather to Malaysia and Indonesia.

For soybean oil, pricing economics and weather tend to be the key drivers in overall production. As with palm oil, soybean oil prices are primarily determined by supply and demand, with supply often dependent on competing crops such as corn, wheat, rice and cotton. Depending on the corn/soybean price ratio, producers in many growing areas can easily switch between the two crops.

Often, the soybean oil price is not a major factor in determining its production because it is overshadowed by soybean meal prices. Each bushel of soybeans crushed produces 11 pounds of oil and 44 pounds of high-protein meal. Meal is primarily a feed ingredient, and if meal demand is strong and its price high, it can be the main determinant as to whether a crushing operation is profitable. If the crusher is facing a (relatively) low price for oil and a high price for meal, he may still chose to increase his crush rate. In those cases, lower oil prices may not reduce supply. In an opposite manner, a high oil price may not necessarily be enough to stimulate production if low meal prices keep the crusher from seeing much benefit to boosting their activity. At times this factor may keep the soybean oil/palm oil spread from behaving as expected.

Finally, exchange rate exposure has become a key factor in the demand for both soybean oil and palm oil. With today's commodity markets becoming more and more globally conscious, traders look for the most economical products to purchase. If the currency of an exporting country strengthens, demand can shift to other exporters with cheaper currencies. Conversely, if an importing country has a strong currency they will likely import more from other countries because they can buy these products at a lower cost.

Spread Pricing

The respective edible oil market fundamentals and currency exchange rates drive the price spread, with soybean oil prices historically at a premium to palm oil. Palm oil typically sets a price floor.

The supply and demand dynamics between soybean oil and palm oil can vary substantially over time, driving the spread wider or narrower based upon which is more scarce or abundant. Factors such as production expectations, usually associated with weather, may directly affect the spread over time. Product substitution due to nutritional factors can also surface. A recent example of this is the incorporation of palm versus soybean oil in U.S. food product formulations in response to a move away from higher trans-fat oils (soybean oil is often hydrogenated for processed food production). USDA Supply and Demand reports and Malaysian Palm Oil Board (MPOB) production and trade reports provide periodic information that traders watch closely for any impacts on the markets.

Trading the Spread

Spread trades between the CBOT Soybean Oil contract and the BMD Palm Oil contracts are often "legged," which is a method that involves taking positions in the CBOT Soybean Oil futures contract during its regular trading hours and in the BMD Palm Oil futures contract during the Malaysian trading hours. Traders should be aware that inter-market spreads, like the CBOT Soybean Oil/BMD Palm Oils spread carry considerable risk, as the two markets could move in opposite directions at any time.

In summary, the combination of the BMD Crude Palm Oil futures and the CBOT Soybean Oil futures creates a tremendous amount of market opportunities for traders. A number of spreading and arbitrage opportunities exist as a result of different contract sizes, pricing units (currencies), as well as a different but related set of supply and demand factors. The availability of these products on CME Globex, the premier electronic trading platform, provides the liquidity, financial integrity and transparency required by our Global customers.

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