NCCC-134
APPLIED COMMODITY PRICE ANALYSIS, FORECASTING AND MARKET RISK MANAGEMENT

How Large Is the Agricultural Swaps Market?

by

Paul E. Peterson

Suggested citation format:

Peterson., P. E. 2014. "How Large Is the Agricultural Swaps Market?" Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management. St. Louis, MO. [http://www.farmdoc.illinois.edu/nccc134].

How Large Is the Agricultural Swaps Market? [†]

Paul E. Peterson*

Paper presented at the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management
St. Louis, Missouri, April 21-22, 2014

[†]This research was supported in part by USDA-NIFA Hatch project #ILLU-470-359

*Paul E. Peterson pepeters@illinois.edu is The Clearing Corporation Charitable Foundation Clinical Professor of Derivatives Trading at the University of Illinois, Urbana, Illinois

How Large Is the Agricultural Swaps Market?

Abstract: *This study is the first detailed examination of trading activity in the agricultural swaps market, covering 22 major agricultural commodities during the first 13 months of reporting under the Dodd-Frank Act. It is also the first to quantify the size of the agricultural swaps market using actual transaction data and three different metrics. The notional value of U.S. agricultural swaps traded during this period was $51 billion, or approximately 22% of the gross market value for "other commodities" reported by the Bank for International Settlements. However, the volume of agricultural swaps trading is equivalent to a small fraction of the volume for exchange-traded futures and options on the same commodities.*

Key Words: agricultural commodity, swap, notional quantity, notional value, OTC

Introduction

Swaps are over-the-counter (OTC) financial instruments used for the exchange of cash flows, and can be viewed as off-exchange futures or options contracts. Unlike exchange-traded futures and options, for which the terms and conditions are standardized, swaps allow the user to customize various specifications to more closely reflect those encountered in the cash market. This allows the user to reduce the basis risk commonly associated with exchange-traded contracts. Swaps are traded on a wide variety of financial and physical commodities, including agricultural products.

Because swaps have been traded off-exchange and until very recently had no formal reporting or clearing mechanisms, the exact size and nature of the swaps market, including agricultural swaps, has been largely unknown. Consequently there has been little research into the usage of agricultural swaps. Adjemian and Plato (2010) is the only study to date that focuses on agricultural swaps and their impact on agricultural producers.

The Bank for International Settlements (BIS) conducts quarterly surveys and publishes data from 13 participating countries on gross market values of OTC derivatives traded – analogous to volume – and notional values of OTC derivatives outstanding – analogous to open interest (Bank for International Settlements 2014a, 2014b).[1] BIS uses just three categories when reporting swaps activity related to physical commodities: gold, other precious metals, and other commodities. For this "other commodity" category, reported volume in calendar year 2013 was $210 billion, and the year-end notional value outstanding was $1.803 trillion. However, it is

[1] In swaps terminology, "notional" is used to indicate the "face value" amount specified in the swap agreement. In commodities the notional value is typically the same as the amount actually transacted, but for bonds and other financial instruments the notional value may differ substantially from the market value. For example, a bond with a $1,000 principal amount seldom has a market value of $1,000.

impossible to determine how much of this value is contributed by agricultural commodities, either individually or as a group.[2]

Agricultural Swaps Data

The Dodd-Frank Wall Street Reform and Consumer Protection Act mandated the reporting of specific details on all swaps to Swaps Data Repositories (SDRs). These reporting requirements apply to newly-created swaps, existing swaps, and any changes such as adjustments, amendments, cancellations, and terminations. Mandatory reporting began on a limited basis on December 31, 2012, and was expanded to include agricultural swaps beginning February 28, 2013. (Commodity Futures Trading Commission 2011, 2012, 2013; Nazareth and Rosenberg 2013). Three U.S. SDRs have been in operation for the entire period: CME Swaps Repository (CME), operated by CME Group; ICE Trade Vault (ICE), operated by Intercontinental Exchange; and DTCC Data Repository (DTCC), operated by The Depository Trust & Clearing Corporation.[3]

All three SDRs publish selected data on individual swaps, but are not required to publicly release complete details due to confidentiality issues. As a result, each SDR has its own practices regarding the details it releases to the public and the manner in which it categorizes individual swaps. For example, CME both include agricultural swaps as part of a broad "commodity swap" category, while ICE places agricultural swaps in its own "financial agriculture" category.

Data were downloaded from the three SDRs, consisting of 61,396 individual transactions in CME's commodity swap category, 11,106 individual transactions in ICE's financial agriculture category, and 743,634 individual transactions in DTCC's commodity swap category, all for the period March 1, 2013-March 31, 2014 inclusive. These data included all agricultural swap transactions reported to SDRs during this 13-month period.

Next, transactions involving non-agricultural commodities including underlying commodities that could not be identified, and all transactions involving modification or cancellation of a swap, were eliminated.[4] The result was a dataset on 22 major agricultural commodities for which there are futures contracts traded on U.S. exchanges.[5] This dataset was further edited by eliminating all transactions that were not dollar denominated, all transactions for which the units of measurement differed from those used in the corresponding futures contract, and all transactions which contained questionable price or quantity values. From the initial group of 816,136 transactions, 39,622 transactions remained and were used as the basis for this study.

[2] In addition, the Commodity Futures Trading Commission (CFTC) publishes a weekly *CFTC Swaps Report*, but has not yet begun coverage of agricultural commodities.
[3] A fourth SDR, Bloomberg Swap Data Repository, operated by Bloomberg LLC, opened for business on May 12, 2014.
[4] Swaps on canola/rapeseed, pulp/paper, rubber, sorghum, and commodity indexes also were eliminated.
[5] Due to differences in the level of detail across SDRs, all classes of wheat were combined and treated as a single commodity, and all classes of milk were combined and treated as a single commodity.

Measurements of Market Size

Three methods were used to measure the size of the agricultural swaps market: transaction volume, notional quantity, and notional value.

Transaction Volume

Table 1 shows the number of swap transactions by agricultural commodity, and whether the swap was futures-like or option-like. Agricultural swaps are predominantly futures-like instruments, accounting for nearly three-fourths of the total number of transactions. Soybean swaps and corn swaps were the most actively-traded commodities and together accounted for approximately one-half of the futures-like, options-like, and total trading activity. Notice that transaction volume simply measures the number of deals made, and provides no indication of the quantity or dollar value of the underlying commodity that was transacted.

Notional Quantity

Table 2 shows the notional quantities of the underlying commodities and units of measurement. Some reported swap transactions did not include the underlying quantity, so the percentage of transactions with nonzero quantities is used to indicate the degree to which notional quantity might be influenced by missing values; a larger percentage of nonzero values suggests a better measure of notional quantity, all else the same. Only three of the 22 commodities for futures-like swaps (lumber, nonfat dry milk, soybean oil) and only three of the commodities for options-like swaps (cocoa, palm oil, wheat) had notional quantities that were based on less than 75% of the corresponding swap transactions. In addition, there were no transactions for option-like swaps on four commodities, so percentages could not be calculated. Taken together, these results suggest that the notional quantities presented in Table 2 generally are representative of the reported swaps transactions for these commodities.

Notional quantity also can be expressed in terms of futures contract equivalents. This approach, which divides notional quantity of the swap by the number of units (i.e., bushels, pounds, etc.) in the corresponding exchange-traded futures contract, has the added benefit of expressing swaps volumes in a manner comparable to futures and options volumes. Table 3 presents notional quantities in futures contract equivalents. When measured in this manner, corn, wheat, and soybeans accounted for more than one-half of the total swaps trading volume in the 22 agricultural commodities; this was the case for futures-like instruments, options-like instruments, and futures- and options-like instruments combined. Total futures equivalent volumes across all commodities for the 13-month period were slightly more than 1.5 million contracts, indicating that swaps trading activity is a small fraction of the corresponding exchange-traded futures and options volume.

To further examine swaps volumes relative to exchange-traded contract volumes, notional quantities in futures contract equivalents were divided by the 13-month total volumes for the

corresponding exchange-traded contracts.[6] As shown in Table 4, with the exception of palm oil which has a thinly-traded futures contract[7] and no exchange-traded options contract, swaps volume was consistently less than 10%, and typically less than 1%, of the volume for the comparable exchange-traded instrument. This measure provides further confirmation that the amount of swaps trading activity, at least for the dollar-denominated swaps with standard units of measurement examined in this study, is a small fraction of the corresponding exchange-traded futures and options volume.

Notional Value

Notional value is the final method used to measure the size of the agricultural swaps market, and this method allows direct comparison with the BIS data described in the introduction to this paper. As noted earlier, some reported swap transactions did not include the underlying quantity. Similarly, some reported swap transactions did not include the notional price, either as a reference price in a futures-like swap or a strike price in an options-like swap. Missing prices occurred with or without missing quantities, but in any case the notional value for a swap can be calculated only when both the price and quantity are provided.

Table 5 shows that soybeans, corn, and wheat accounted for more than one-half of all agricultural swaps trading activity, expressed in dollar terms; this was the case for futures-like instruments, options-like instruments, and futures- and options-like instruments combined. The percentage of transactions with nonzero notional values is used to indicate the degree to which notional value might be influenced by missing values; a larger percentage of nonzero values suggests a better measure of notional value, all else the same. All but three of the 22 commodities for futures-like swaps (lumber, nonfat dry milk, soybean oil) had notional values that were based on at least 75% of the corresponding swap transactions, but only 10 of the 22 commodities for options-like swaps did so. This suggests that the notional values for futures-like swaps in Table 5 generally are representative of all reported swaps transactions for these commodities, but for options-like swaps the notional values presented here likely under-report the actual notional values.

Table 5 also shows that the total dollar value of agricultural swaps activity for the 13-month period covered by this study was valued at more than $51 billion. On an annualized basis, this is approximately 22% of the $210 billion gross market value of “other commodities” for calendar year 2013 that was reported by BIS. Since “other commodities” in the BIS report includes various agricultural swaps not included in this study, plus swaps on energy and industrial metals and commodity swaps traded outside the U.S., this 22% estimate is both reasonable and consistent with BIS reported values.

[6] Exchange-traded volumes for wheat are for the Chicago Board of Trade contract only.
[7] Total futures volume for crude palm oil futures from March 2013 through March 2014 was 1,040 contracts.

Discussion

Some readers may be surprised that only 39,622 (4.8%) of the initial 816,136 swap transactions were used in this study. However, recall from above that only ICE has a specific category for agricultural swaps. In contrast, both CME and DTCC use a broadly-defined "commodity swap" category that includes not only agricultural swaps, but also swaps on energy and metals that accounted for the majority of the "commodity swap" transactions at these two SDRs. Similarly, eliminating swaps that were denominated in other currencies or which used other units of measurement might seem to be a problem, until one realizes that this process eliminated fewer than 5,000 transactions.

Of greater concern, from a data integrity standpoint, are the transactions that were eliminated because the underlying commodities could not be identified or because the reported data contained various errors. For example, two soybean swaps were deleted from this study because the reported notional quantity for each transaction was roughly equal to the size of the entire U.S. soybean crop. These types of reporting errors are not uncommon, both in the context of this study and for the swaps market in general. According to CFTC Commissioner Scott O'Malia, "Our data is a mess. It is not reliable, it is not clean, in many cases we suffer from over-compliance, duplication of reporting, and inconsistencies of standards. This has really compromised our ability to effectively use this data." (John Lothian News 2013). Problems include lack of coordination among the SDRs and inconsistent data formats (Miedema 2014). These issues were factors in two separate incidents in which CFTC published inaccurate data on certain financial-product swaps (Ackerman 2013; Ackerman and Burne 2014).

Summary and Conclusions

This study is the first detailed examination of trading activity in the agricultural swaps market, covering 22 major agricultural commodities during the first 13 months of reporting under the Dodd-Frank Act. This study is also the first to quantify the size of the agricultural swaps market using actual transaction data and three different metrics.

The dollar value for agricultural swaps reported here is consistent with the valuation reported by the Bank for International Settlements for "other commodities." The BIS valuation is based on survey data and includes swaps on all commodities except precious metals. In contrast, the valuation calculated in this study is obtained from actual transactions. Finally, this study found that the volume of swaps trading is equivalent to a small fraction of the volume in actively-traded exchange-traded futures and options for the same commodities.

References

Ackerman, A. 2013. "CFTC Misreporting Size of Swaps Market, Agency Says." *The Wall Street Journal*, December 18, 2013. Available at http://online.wsj.com/news/articles/SB10001424052702304866904579266851056302512

---------- and K. Burne. "Acknowledging Mistake, U.S. Regulators Still Struggle to Oversee Derivatives Market." *The Wall Street Journal*, May 1, 2014. Available at http://online.wsj.com/news/articles/SB10001424052702303948104579536251048387342

Adjemian, M.K. and G.E. Plato. 2010. *The Dodd-Frank Wall Street Reform and Consumer Protection Act: Changes to the Regulation of Derivatives and Their Impact on Agribusiness*. AIS-89, Economic Research Service, U.S. Department of Agriculture. Available at http://www.ers.usda.gov/publications/ais-agricultural-income-and-finance-outlook/ais89.aspx

Bank for International Settlements. 2014a. *Statistical release: OTC derivatives statistics at end-December 2013*. Available at http://www.bis.org/publ/otc_hy1405.pdf

----------. 2014b. *Detailed Tables on Semiannual OTC Derivatives Statistics at End-December 2013*. Available at http://www.bis.org/statistics/derdetailed.htm

Commodity Futures Trading Commission. 2011. *Q&A – Final Rulemaking on Swap Data Recordkeeping and Reporting*. Available at http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/sdrr_qa_final.pdf

----------. 2012. *Q&A – On Start of Swap Data Reporting*. Available at http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/startreporting_qa_final.pdf

----------. 2013. *Division of Market Oversight Advisory, March 8, 2013*. Available at http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/dmoadvisory030813.pdf

John Lothian News. 2013. *CFTC's Scott O'Malia Calls for a Plan of Action on Swap Data*. Interview December 3, 2013. Available at http://www.johnlothiannews.com/2013/12/scott-omalia-cftc-swap-data/#.U5TA1o1OWP9

Miedema, D. "Market Operators Hinder CFTC As It Seeks to Monitor Swaps – Sources." *Reuters*, March 25, 2014. Available at http://www.reuters.com/article/2014/03/25/us-derivatives-policing-idUSBREA2O1YT20140325

Nazareth, A.L. and G.D. Rosenberg. 2013. "Swap Reporting: Who and When?" *Futures Industry*, 23:50-53. Available at http://www.futuresindustry.org/fi-magazine-home.asp?a=1558&iss=210

Table 1. Number of Swaps Transactions by Commodity and Swap Type

Commodity	Futures-Like	Options-Like	Combined
Butter	155	18	173
Cheese	127	31	158
Cocoa	301	147	448
Coffee	2,110	1,021	3,131
Corn	5,837	2,178	8,015
Cotton	615	332	947
Feeder Cattle	220	50	270
Hogs	2,139	145	2,284
Live Cattle	1,556	185	1,741
Lumber	107	1	108
Milk	942	125	1,067
Nonfat Dry Milk	36	0	36
Oats	9	1	10
Orange Juice	9	0	9
Palm Oil	252	1	253
Rice	4	0	4
Soybeans	7,811	2,481	10,292
Soybean Meal	2,366	289	2,655
Soybean Oil	828	299	1,127
Sugar	2,616	385	3,001
Wheat	2,520	1,143	3,663
Whey	230	0	230
Total	30,790	8,832	39,622

Table 2. Notional Quantities of Swaps by Commodity and Swap Type with Percent of Nonzero Quantity Transactions

Commodity	Futures-Like	% Nonzero	Options-Like	% Nonzero
Butter (lbs)	54,418,000	87.7%	4,224,000	100.0%
Cheese (lbs)	77,130,000	98.4%	17,144,000	100.0%
Cocoa (mt)	72,405	75.1%	9,640	53.7%
Coffee (lbs)	1,022,424,900	78.0%	2,382,930,000	81.5%
Corn (bu)	1,059,970,945	84.7%	789,740,700	81.3%
Cotton (lbs)	907,494,700	84.9%	1,636,320,000	77.7%
Feeder Cattle (lbs)	133,005,200	96.8%	14,850,000	78.0%
Hogs (lbs)	3,221,682,300	85.6%	39,120,000	82.8%
Live Cattle (lbs)	2,383,263,400	82.1%	109,660,000	88.6%
Lumber (Mbdft)	27,650	68.2%	220	100.0%
Milk (lbs)	1,179,969,000	98.1%	469,600,000	94.4%
Nonfat Dry Milk (lbs)	10,792,000	47.2%	0	n/a
Oats (bu)	220,000	100.0%	12,000	100.0%
Orange Juice (lbs)	6,190,000	100.0%	0	n/a
Palm Oil (mt)	350,900	98.4%	0	0.0%
Rice (cwt)	132,000	100.0%	0	n/a
Soybeans (bu)	732,023,430	77.9%	608,601,000	82.2%
Soybean Meal (t)	10,400,880	85.7%	2,596,435	94.1%
Soybean Oil (lbs)	7,990,142,300	68.0%	945,820,000	95.0%
Sugar (lbs)	7,378,954,060	78.5%	1,479,500,000	79.2%
Wheat (bu)	992,545,545	90.1%	127,865,750	45.7%
Whey (lbs)	7,535,000	100.0%	0	n/a

Table 3. Notional Quantities of Swaps by Commodity and Swap Type Expressed in Futures Contract Equivalents

Commodity	Futures-Like	Options-Like	Combined
Butter	2,721	211	2,932
Cheese	3,857	857	4,714
Cocoa	7,241	964	8,205
Coffee	27,265	63,545	90,809
Corn	211,994	157,948	369,942
Cotton	18,150	32,726	50,876
Feeder Cattle	2,660	297	2,957
Hogs	80,542	978	81,520
Live Cattle	59,582	2,742	62,323
Lumber	0	0	0
Milk	5,900	2,348	8,248
Nonfat Dry Milk	245	0	245
Oats	44	2	46
Orange Juice	413	0	413
Palm Oil	14,036	0	14,036
Rice	66	0	66
Soybeans	146,405	121,720	268,125
Soybean Meal	104,009	25,964	129,973
Soybean Oil	133,169	15,764	148,933
Sugar	65,884	13,210	79,093
Wheat	198,509	25,573	224,082
Whey	171	0	171
Total	1,082,861	464,850	1,547,711

Table 4. Notional Quantities of Swaps in Contract Equivalents As Percent of Exchange-Traded Volumes

Commodity	Futures-Like	Options-Like	Combined
Butter	7.9%	1.5%	6.0%
Cheese	9.1%	2.9%	6.6%
Cocoa	0.1%	0.1%	0.1%
Coffee	0.3%	2.9%	0.9%
Corn	0.3%	0.6%	0.4%
Cotton	0.3%	1.3%	0.6%
Feeder Cattle	0.1%	0.1%	0.1%
Hogs	0.6%	0.0%	0.5%
Live Cattle	0.4%	0.1%	0.4%
Lumber	0.0%	0.0%	0.0%
Milk	1.6%	0.7%	1.2%
Nonfat Dry Milk	1.3%	0.0%	0.9%
Oats	0.0%	0.0%	0.0%
Orange Juice	0.1%	0.0%	0.1%
Palm Oil	1349.6%	n/a	1349.6%
Rice	0.0%	0.0%	0.0%
Soybeans	0.3%	0.8%	0.4%
Soybean Meal	0.5%	1.2%	0.5%
Soybean Oil	0.5%	1.0%	0.6%
Sugar	0.2%	0.2%	0.2%
Wheat	0.7%	0.5%	0.7%
Whey	1.4%	0.0%	1.1%
Total	0.4%	0.7%	0.4%

Table 5. Notional Values of Swaps by Commodity and Swap Type with Percent of Nonzero Quantity and Price Transactions

Commodity	Futures-Like	% Nonzero	Options-Like	% Nonzero	Combined
Butter	$88,083,690	87.7%	$6,852,080	100.0%	$94,935,770
Cheese	$138,023,614	98.4%	$29,899,800	100.0%	$167,923,414
Cocoa	$192,041,685	75.1%	$25,856,700	53.7%	$217,898,385
Coffee	$1,298,868,494	77.9%	$3,017,797,200	81.5%	$4,316,665,694
Corn	$5,388,888,785	84.1%	$2,140,708,113	71.8%	$7,529,596,897
Cotton	$738,163,996	83.7%	$749,163,750	61.7%	$1,487,327,746
Feeder Cattle	$200,987,897	96.8%	$9,790,000	40.0%	$210,777,897
Hogs	$3,104,613,242	85.5%	$1,061,248,800	82.8%	$4,165,862,042
Live Cattle	$3,190,715,885	82.1%	$29,051,600	22.7%	$3,219,767,485
Lumber	$11,034,701	68.2%	$82,500	100.0%	$11,117,201
Milk	$215,925,896	97.1%	$79,797,700	62.4%	$295,723,596
Nonfat Dry Milk	$21,319,823	47.2%	$0	n/a	$21,319,823
Oats	$805,013	100.0%	$48,000	100.0%	$853,013
Orange Juice	$8,828,148	100.0%	$0	n/a	$8,828,148
Palm Oil	$272,546,829	98.4%	$0	0.0%	$272,546,829
Rice	$2,037,640	100.0%	$0	n/a	$2,037,640
Soybeans	$7,423,334,930	75.3%	$7,082,645,130	79.2%	$14,505,980,060
Soybean Meal	$2,630,634,534	85.0%	$1,040,016,803	93.4%	$3,670,651,336
Soybean Oil	$3,361,695,769	62.0%	$397,677,700	94.6%	$3,759,373,469
Sugar	$1,262,900,215	78.4%	$273,598,072	79.2%	$1,536,498,287
Wheat	$5,053,198,808	87.7%	$621,859,274	39.3%	$5,675,058,082
Whey	$251,006,752	100.0%	$0	n/a	$251,006,752
Total	$34,855,656,344		$16,566,093,221		$51,421,749,565