Commodity Market Monthly

Research Department, Commodities Unit



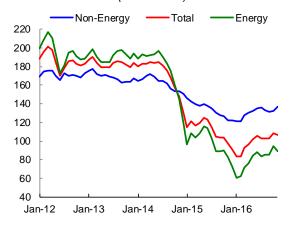
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Commodity prices increased by 7.6 percent in December 2016. This substantial increase in the IMF's commodity price index comes on account of a jump in energy prices, by 13 percent, and more moderate price increases for metals, food and agricultural raw materials by 3.8 percent, 1.5 percent and 0.5 percent respectively. The price index of beverages constitutes a noteworthy exception, as it fell by 6.7 percent in December 2016. Throughout 2016, commodity prices climbed 26 percent, led by a 44 percent surge in crude oil prices, followed by increases in metals agricultural prices of 34 and 7 percent, respectively. Global nominal investment in renewable energies fell by 18 percent in 2016.

Figure 1
IMF Commodity Price Indices
(2005 = 100)



Energy

Monthly average crude oil prices increased 16.2 percent in December 2016 to \$52.61/bbl. During the month of December 2016 (from the end of November to the end of December 2016), Average Petroleum Spot Price (simple average of U.K. Brent, Dubai Fateh, and West Texas Intermediate; APSP) increased 12.5 percent, but dropped 2.2 percent since then as of January 23, 2017.

On November 30, 2016, the Organization of Petroleum Exporting Countries (OPEC) agreed to reduce crude oil output by 1.2 million barrels per day (mbd) from its October 2016 production level. In addition, Russia and other non-OPEC countries have committed to production by 558 thousand barrels per day (kbd) on December 10, 2016 although Russia will reduce its production only gradually by 0.3 mbd suspending production in temperature can damage oil wells. OPEC's change in strategy has been supporting oil prices so far, although the degree of compliance will be key. Initial reports indicate that Saudi Arabia is complying with the deal. In mid-January 2017, OPEC said that members were complying with the production cuts they agreed to.

While OPEC's production cuts may have put upward pressure on oil prices, shale production is set to increase this year as rig count has been increasing since last May 2016. Oil rig count has increased to 529 as of January 6, 2017 from 316 as of May 27, 2016 by 67 percent. In addition, rig efficiency and improved well productivity contributed to production growth. The Energy Information Administration (EIA) estimates that US crude oil production averaged an estimated 8.9 mbd in 2016 and forecasts production to average 9.0 mbd in 2017 and 9.3 mbd in 2018. In addition, the oil production of Libya (exempted from the OPEC production agreement) is expected to hit a three-year high in January 2017.

On the demand side, the International Energy Agency (IEA) revised its oil demand growth projection for 2016 upwards to 1.5 mbd due to a methodological change by the Chinese authorities in computing China's GDP and strong demand in Europe in the fourth quarter. The IEA forecasts that growth will slow down to 1.3 mbd in 2017. A slowdown in China or India may have significant effects on oil demand as they account for roughly a quarter of demand growth. The Fund has kept its economic growth forecast for the world at 3.4 percent for 2017 and 3.6 percent for 2018 in the World Economic Outlook (WEO) January 2017 Update.

After hitting record low prices at \$42.84 a barrel in 2016, futures contracts point to oil prices (APSP) increasing very gradually to \$54.92 in 2017 and \$55.66 in 2018. Futures curves are almost flat for the next 5 years.

Average monthly natural gas price in the U.S. increased by 43.2 percent in December 2016, averaging \$3.58/MMBtu compared to November 2016 \$2.50/MMBtu (or \$3.68 at the end of December 2016 from \$3.30 at the end of November 2016 due to cold weather). However, as near term forecast revised to milder weather, natural gas prices have eased back to \$3.37. In Europe, long term contract prices (Russian Natural Gas border price in Germany) have increased 13.6 percent to \$5.16/MMBtu; however,

spot prices have increased only 4.6 percent during December 2016 due to ample supply from Gazprom. However, cold weather in January 2017 has pushed spot prices higher. Long term contract prices follow moving averages of oil prices with a lag of a few quarters. If oil prices stabilize as futures prices seem to indicate, then long term contract prices are expected to grow gradually. LNG spot prices in Asia have increased rapidly, although it is unclear how demand in the region will develop in the coming months.

Coal prices in Australia have decreased by 13.4 percent as some of the supply disruptions have resolved. Since the surge in coal prices was mostly a temporary phenomenon, coal prices are expected to decline sharply within a year. Coal prices have increased significantly in the second half of 2016.

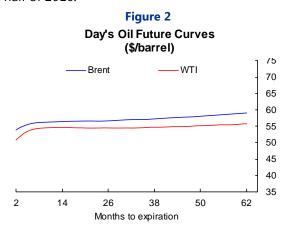


Figure 3 **Crude Oil Prices** (\$/barrel) Dubai Brent WTI 120 100 80 60 40 20 Jan-13

Figure 4 **IMF Commodity Price Indices** (2005 = 100)

Jan-15

Jan-16

Jan-14

Jan-12

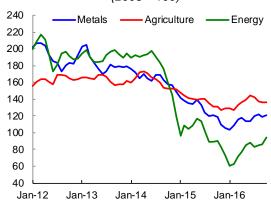
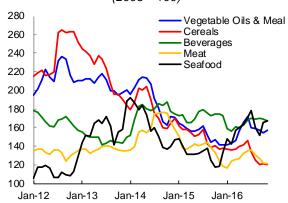


Figure 5 **IMF Commodity Price Indices** (2005 = 100)



Metals

Base Metal Market

The IMF's metal index (based on 8 base metals) increased 3.8 percent in December 2016. Except for aluminum and nickel which saw modest declines in price, month-on-month, all the base metals showed increases. This increase is driven by solid macroeconomic data from China together with the potential for increased US infrastructure spending. Between July and December 2016, China's manufacturing PMI has remained above 50, indicating continued expansion. In the aftermath of the US presidential election in November 2016, metal prices rallied following the then President-elect Trump's proposed infrastructure spending plan. details of this plan, which must first be approved by Congress, remain unclear. The ultimate impact of such a stimulus on metal prices is likely to be modest, considering that the US accounts for a relatively small share of global metal demand. In October 2016, the US accounted for 8 percent of global copper demand and 2 percent of global iron ore demand.

Iron ore was one of the best performing metals in 2016, its price soaring 83 percent (December 31, 2015 - December 31, 2016) after having hit a seven-year low in December 2015. Prices climbed 6.8 percent in December 2016, month-on-month. On a monthly basis, its price increased 7.4 percent between November 30 and December 31, 2016. China, which accounted for 60 percent of global iron ore demand in October 2016, is a significant driving force in the iron ore market. On the demand side of iron ore, mainland steel mills have increased the use of higher grade iron ore to reduce production costs after the price of coking coal (used to produce steel) surged. Importantly, China has started addressing issues of excess capacity by cutting production of outdated steel factories to reduce pollution and to respond to allegations of dumping steel into global markets.

The global crude steel capacity utilization ratio improved to 69.6 percent in November 2016, up from 67.1 percent a year ago. This trend is likely to continue as Hebei, China's top steel-making province, is set to double capacity cuts from 2016 to more than 30 million tons in 2017. At the same time, steel output is increasingly going towards domestic use, because of continued fiscal support to the construction sector. Chinese exports of steel products fell to 8.1 million tons in November 2016, a 16 percent drop compared to a year ago. Yet Chinese steel inventories as a proportion of production were also at a historic low of 8.2 percent in November 2016. Shanghai steel futures jumped 7 percent to their highest in nearly three weeks on January 10, 2017 following the announcement of upcoming massive production cuts.

Although the price of iron ore followed steel's rally, soaring 8 percent to its highest in three weeks, traders report plentiful inventories in China's ports. The IMF projects that the price of iron ore will fall in 2017-18 and reach \$ 49.2/MT in 2019, down from \$ 80/MT as of December 30, 2016.

Nickel (used to produce stainless steel), in contrast, fell in price by 1.5 percent in December 2016, month-on-month. The price fall was more impressive in monthly terms, dropping 11 percent (November 30-December 31, 2016). Since then, nickel prices have grown 1.6 percent, as of January 11, 2017. In early January 2017, Indonesia—one of the world's major nickel producers—relaxed its export ban on nickel ore and bauxite. This sent nickel prices tumbling 4 percent (January 10-11, 2017). The ban, which was imposed in 2014 and was intended to spur higher value smelting industries, has been a significant factor in pushing nickel prices upwards as Indonesia is a major nickel producer. Indonesia, which is facing a budget deficit, likely eased the ban to help fill this gap. The IMF projects that the nickel price will remain flat.

Table 1: Current Base Metal Prices and % changes

(as of December 30, 2016 closing)

Metal	Price (\$)	% change	
		Month-on- Month	Year- to- Date
Copper	5,523/MT	3.6	17.4
Aluminum	1,704/MT	-0.4	13.6
Tin	21,205/MT	0.4	45.3
Nickel	9,964/MT	-1.5	13.5
Zinc	2,558/MT	3.5	60.6
Lead	2,000/MT	0.7	11.3
Iron Ore	80.0/MT	6.8	82.6
Uranium	20.4/lb	3.6	8.1

Sources: London Metal Exchange (Copper, aluminum, tin, nickel, zinc, and lead); DataStream CIF China United States (FE63.5%, iron ore); and New York Mercantile Exchange (uranium).

Copper prices have continued their upward trajectory, increasing 3.6 percent, month-onmonth in December 2016. In contrast, the copper price dropped 5.0 percent between November 30-December 31, 2016. After lagging behind other base metals for much of 2016, it began to rebound and finished the year at \$5,523/MT. This late uptick in pricing was caused in part by better than expected Chinese economic data and its demand for copper wiring in its power grid. The fourth quarter also saw a number of mine disruptions which contributed to the tightening market. The IMF projects that copper prices are expected to increase modestly in 2017 and hold steady at 5,700 for the next five years.

Uranium prices have increased for the first time since October 2015, month-on-month, reaching \$ 20.4/lb. This might be a reversal of uranium's recent downward trend (declining 40.7 percent,

year-to-date). Uranium prices had hit a 12-year low in 2016, in part due to lack of buying by US nuclear utilities. More recently, the price of coal has been increasing, leading energy suppliers to substitute toward uranium as an alternative. In addition, the new Trump administration announced its intention to invest more in nuclear power generation.

Precious Metals Market

Precious metal prices declined in December 2016 as long-term yield continue to increase. Prices for gold, silver, and platinum declined 4, 6 and 7 percent respectively while palladium beat the trend, increasing 2 percent, month-on-month. The US Federal Reserve raised its key interest rate by 0.25 percent in December 2016, signaling confidence in the improving US economy. In the day following the announcement, the price of gold fell 3.0 percent from \$ 1,162 to 1,127 per troy ounce (December 14-15, 2016). The price of silver fell 5.7 percent the same day. Gold and silver prices turned around on December 28, 2016 and as of December 30, 2016 stand at \$ 1,146 and 16.2 per troy ounce, respectively.

Table 2: Current Precious Metal Prices and % changes
(as of December 30, 2016)

Metal	Price (\$)	% change			
		Month- on- Month	Year-to-Date		
Gold	1,146/toz	-7.0	8.10		
Silver	16.2/toz	-6.4	17.51		
Platinum	898/oz	-3.9	3.46		
Palladium	670/oz	1.9	20.72		

Sources: ICE Benchmark Administration (gold), London Bullion Metal Association (silver), and London Metal Exchange (platinum and palladium).

Agriculture

The IMF's price index of food, beverages and agricultural raw materials increased by 0.5 percent in the month of December 2016. While the indices of food and agricultural raw materials recorded modest gains, by 1.5 and 0.4 respectively, the index of beverages fell by 6.7 percent. This substantial reduction in the beverage price index comes on account of heavy losses for coffee Arabica and cocoa beans. Other soft commodities, including palm oil, pork and salmon, experienced substantial gains in the month of December 2016.

In the first half of 2016 food prices had been steadily increasing, mainly supported by a surge in prices of sugar and pork, as well as substantial increases for barley, oranges, palm oil and soybeans. In the third and fourth quarter of 2016, grains, pork, soybeans and cocoa have recorded sizeable losses, thereby putting downward pressure on the IMF's price index of food and beverages, and undoing some of the gains that were made in the first two quarters of 2016.

Annual food prices increased by roughly 2 percent in 2016, and are expected to increase at a somewhat slower pace, by 1 percent, in 2017. While current price levels are down by more than 20 percent since their record high in 2011, prices in 2016 were still up by more than 40 percent from their pre-crisis 2005 level. In 2017, prices of cereals, meats and beverages are expected to decline, while vegetable oils and sugar are expected to increase.

Higher energy prices and weather variability constitute upside risks to the price forecast. Downside risks include increased agricultural supplies from China, which is bringing its accumulated stocks to market now that the Chinese government is dismantling its price floor systems, and lower energy costs potentially

resulting from a weakening of regulation under a Trump administration.

While the price of wheat has stayed roughly constant in both November and December of 2016, it decreased by almost 23 percent, year-onyear, in 2016, making it the fifth consecutive year of falling prices. On January 12, 2017 the USDA announced that the winter wheat seeded area in the US is expected to fall by 10 percent in 2017 year-on-year, which should accelerate market rebalancing in 2017-2018. Nevertheless, on that same day the USDA also revised its estimate for 2016-2017 global wheat supplies upwards, now expected to total more than 993 million metric tons (mmt), with Argentina, Russia and the EU accounting for the largest increases. With total supplies increasing faster than consumption, the stock-to-use ratio, a measure of the abundance of supply relative to demand, is expected to reach 34 percent in 2016-2017, well above the 10-year average.

The price of corn rose by 0.9 percent in December 2016. Last year's crop of corn was the largest ever, exceeding 1 billion metric tons, culminating in a price decrease of 6.3 percent year-on-year, which makes 2016 the fourth consecutive year of falling prices. The USDA 2016-2017 global ending stock estimate is down from 222.3 mmt in December 2016 to 221 mmt in January 2017, mainly on account of lower than expected area harvested and yield in the US. While global demand has been growing at 3.3 percent over the last 10 years, the global stock-to-use ratio reached 21.8 percent by the end of 2016, similar to 2014 and 2015, and well above the 10-year average.

Prices of vegetable oils increased by 2.7 percent in December 2016. The price increase for palm oil was particularly large, that is, 6.2 percent, while soybean prices only rose by 1.9 percent. Throughout 2016, vegetable oils increased by 1.5 percent, with large gains for palm oil and

soybeans almost completely offset by substantial losses for fishmeal and olive oil. Palm oil has climbed almost 37 percent in 2016 after one of the strongest El Nino events on record damaged plantations and reduced stockpiles in top producer countries Indonesia and Malaysia, reaching price levels not seen in more than three years. The 2017 outlook for palm oil may continue to be bullish, as supply remains tight and a weak Malaysian ringgit boosts demand. According to the USDA, ongoing strength in the demand for animal protein in China and elsewhere will probably increase global exports of soybeans by as much as 5.8 percent in 2016-2017, the highest growth rate for major grains and oilseeds, which would provide support to prices next year. In 2017 prices of soybean are expected to increase by 2.6 percent.

Lean hog prices increased by 14.7 percent in December 2016, making it one of the strongest performing agricultural commodities. This price hike comes on account of strong seasonal demand and weaker supply due to holiday-shortened work weeks in slaughterhouses. Environmental regulations have reduced Chinese pork production by as much as 5-6 percent in 2016, and US prices were up by almost 60 percent last summer. Looking ahead to 2017, anticipated capacity expansion in the US and other producer countries will be important in overcoming additional pressure on hog prices.

The price of cocoa decreased again in December 2016, by 7.9 percent. The price of cocoa has fallen by 7.8 percent year-on-year in 2016, the first annual decline in five years. The sharp decline in prices comes on account of weak global demand and (the prospects of) strong harvests in West Africa, which grows more than two-thirds of the world's cocoa supply. Excess supplies could last into 2017-2018, but recovery of demand may support prices this year.

The price of coffee Arabica decreased by 12.4 percent in December 2016. Weather conditions in Brazil have been favorable lately, raising the prospects of a strong 2017 Arabica crop. Expectations of next year's Columbian harvest are also good. Amid these easing concerns over a supply deficit, hedge funds in New York have cut their net long in Arabica futures and options throughout December 2016, indicative of a more bearish positioning. While coffee futures soared for much of 2016, they fell back later in the year, limiting gains to 2.5 percent on a year-to-year basis. Earlier in 2016, potential setbacks to harvests in top producers Columbia and Vietnam, as well as concerns over Brazil's supply in 2017-2018, had put upward pressure on prices. The stocks-to-use ratio, a measure of the abundance of supply relative to demand, is expected to equal 20.9 throughout 2016, which is below the 10-year average. Rabobank forecasts a fourth consecutive global deficit in 2017-2018, which implies that the supply side of the market continues to lead price upwards. According to IMF projections, the price of coffee is expected to increase with 6.6 percent in 2017.

Renewable Energy

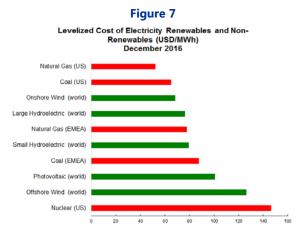
One of the most remarkable trends in the energy sector in recent history is the substantial decline in the cost of renewable energy. Figure 6 displays the evolution of the levelized cost of electricity (LCOE), which measures the dollar cost per MWh of electricity generated by technology, for solar, wind and hydropower. Figure 6 shows, for example, that between 2009-2016, the cost of solar PV was reduced by 66 percent.

As a direct result of these cost reductions, renewables are now competing head-to-head with coal and gas in Europe, Middle East and Africa (EMEA) and, to a lesser extent, in the US. According to December 2016 estimates from Bloomberg, the cost of coal (\$88/MWh) and gas

(\$78/MWh) in EMEA exceed the cost of onshore wind (\$68/MWh). As shown in Figure 7, coal and gas are still cheaper than onshore wind in the US, but the cost difference is small.

While the LCOE is an important factor driving investment, it is most certainly not the only determinant. This explains why solar PV (\$100/MWh) and offshore wind (\$126/MWh) have been popular investment choices in the US and Europe during recent years.

Sources: Bloomberg; and IMF staff calculations



Sources: Bloomberg; and IMF staff calculations

According to figures from Bloomberg New Energy Finance (BNEF), nominal investment in renewable energy in 2016 fell for the first time in three years. Whereas global investment in renewable energy equaled \$315 billion (bn) and

\$348.5 bn in 2014 and 2015 respectively, it fell to \$287.5 bn in 2016, down by 18 percent year-onyear, mostly on account of reductions in China, Japan and the United States. This reduction partially reflected a decrease in the costs of wind and solar energy. Over the last twelve months alone, solar PV fell by 17.5, while onshore and offshore wind recorded cost reductions of 17.0 and 27.5 percent, respectively. As a result, the annual growth in renewable capacity was still slightly higher last year than in previous years. Moving forward, the IEA predicts the share of renewables in world electricity production to increase to 43 percent by 2040 under their current policies scenario. The BNEF New Energy Outlook 2016 forecast, which assumes a similar set of policies, is more optimistic and predicts a share of 67 percent.

Over the next few years, higher risk free interest rates constitute a global risk to the clean energy investment outlook. To understand this risk, note that in contrast to coal and gas, renewable energies are characterized by large upfront investment costs, but fewer or no costs related to operations, maintenance and fuel inputs. Hence, a rise in interest rates favors investment in coal and gas relative to renewables. The January 2017 update of the IMF's World Economic Outlook (WEO) noted that long-term interest rates have risen substantially since August (the reference period for the October 2016 WEO), particularly in the United Kingdom and in the United States since the November election. Looking forward, greater government commitment to support renewables and to tax carbon-intensive energy may drive down the risk premium for renewable energy investment, thereby countering higher risk-free interest rates.

Figure 8 **December Commodity Prices Changes** (percent from previous month) Iron Ore Copper Natural gas, EU Rubber Zinc Nickel Tea Lead Coal, Australia Orange Tin Aluminum Coffee, Arabica Hides Lamb Olive Oil Palm Oil Soybeans Barley Sovbean Meal Sovbeans Oil Fish (Salmon) Reef Sawnwood Hard Cotton Sunflower Oil Wool, Fine Wheat Poultry Rapeseed Oil Coffee, Robustas Wool, Coarse Corn Fish Meal Bananas Shrimp Rice Groundnuts Swine Cocoa Crude Oil Sugar Gasoline

Uranium Natural Gas. US

8

	Units	2013	2014	2015	2015Q4	2016Q1	2016Q2	2016Q3	Oct-16	Nov-16
Food										
Cereals										
Wheat	\$/MT	265.8	242 5	185.6	460.0	162.6	159.2	128.2	122.5	122.5
			242.5		162.3					
Maize Rice	\$/MT	259.0	192.9	169.8	167.1	159.9	171.1	153.4	152.6 367.7	151.3 360.8
	\$/MT \$/MT	518.8 206.4	426.5 146.1	380.0 127.9	357.7 123.2	367.7 119.7	401.8 137.4	418.2 131.1	128.1	131.5
Barley	⊅/WH	200.4	140.1	127.9	123.2	119.7	137.4	131.1	120.1	131.5
Vegetable oils and protein meals	¢/nnT	E47.0	457.0	347.4	323.3	323.4	207.0	372.2	250.4	368.4
Soybeans Soybean mool	\$/MT \$/MT	517.2 477.3	457.8 467.0	352.7	323.3	294.9	387.8 392.9	370.0	358.4 337.1	345.7
Soybean meal	\$/MT	1011.1	812.7	672.2	638.6	686.9	719.7	701.4	757.3	772.4
Soybean oil					!					
Palm oil	\$/MT	764.2	739.4	565.1	518.0	586.9	647.8	647.0	651.4	670.0
Fish meal	\$/MT	1710.5	1921.5	1759.2	1701.9	1466.4	1511.5	1409.7	1296.3	1280.6
Sunflower Oil	\$/MT	1341.1	1080.3	1022.2	1042.1	1024.5	1028.6	982.0	998.4	1000.5
Olive oil	\$/MT	3816.7	3911.8	4927.1	4658.3	4418.8	4125.3	3903.4	3660.6	3776.3
Groundnuts	\$/MT	2314.5	2148.3	1946.2	1731.8	1821.3	1855.4	1804.7	1727.3	1665.0
Rapeseed oil	\$/MT	1081.2	904.4	774.6	798.1	774.7	797.7	810.6	900.4	896.4
Meat	-4- III-	400.0	0044	000.5	470.0	400.0	470.0	405.4	400.0	400.4
Beef	cts/lb	183.6	224.1	200.5	176.2	168.9	179.3	185.4	180.8	183.1
Lamb	cts/lb	106.7	130.6	107.9	95.3	95.5	100.6	110.8	118.2	122.0
Swine Meat	cts/lb	86.5	102.8	67.9	60.5	60.3	72.6	66.6	50.2	46.6
Poultry	cts/lb	103.8	110.1	114.7	113.6	112.1	111.8	110.9	110.1	109.8
Seafood										
Fish	\$/kg	6.8	6.6	5.3	5.3	6.5	7.3	7.2	7.2	7.3
Shrimp	\$/kg	14.0	16.6	14.1	10.0	11.0	10.6	10.7	12.3	12.1
Sugar										
Free market	cts/lb	17.7	17.1	13.2	14.6	14.8	17.6	20.8	22.9	20.9
United States	cts/lb	21.2	24.9	24.8	25.4	25.6	26.4	27.2	28.6	28.8
EU	cts/lb	26.0	27.4	25.4	25.2	23.8	23.9	21.8	20.5	20.7
Bananas	\$/MT	926.4	931.9	958.7	932.7	1028.2	993.0	1023.2	976.4	959.9
Oranges	\$/MT	967.3	782.5	675.0	732.6	686.2	784.7	992.5	1064.7	1137.8
Beverages										
Coffee										
Other milds	cts/lb	141.1	202.8	160.5	150.8	150.7	158.5	173.6	178.6	185.1
Robusta	cts/lb	100.5	105.6	94.2	87.9	82.1	90.4	98.5	107.5	106.9
Cocoa Beans	\$/MT	2439.1	3062.8	3135.2	3301.3	2980.8	3099.9	2987.9	2711.4	2492.0
Tea	cts/kg	266.0	237.9	340.4	363.0	290.3	251.4	284.7	304.9	328.6
Agricultural raw materials										
Timber										
Hardwood										
Logs 1/	\$/M3	305.4	282.0	246.0	245.2	258.2	275.7	290.7	286.9	275.1
Sawnwood 1/	\$/M3	852.8	897.9	833.3	827.1	780.3	782.3	716.2	672.9	677.3
Softwood	\$/WJ	002.0	091.9	033.3	027.1	100.3	102.3	110.2	072.9	011.5
	¢/nno	464 E	474.2	160.0	450.2	460.4	142 5	454.7	455.0	155.0
Logs 1/ Sawnwood 1/	\$/M3 \$/M3	164.5 301.4	174.3 307.3	162.0 308.7	159.3 319.6	168.4 267.2	143.5 309.2	151.7 307.6	155.0 315.3	315.4
					!					78.9
Cotton Wool	cts/lb	90.4	83.1	70.4	69.5	66.9	71.2	79.7	78.5	76.9
	etelles	1107.7	1074.4	1005.0	005.0	1000.4	1000.0	1140.3	1100.1	1100.0
Fine	cts/kg	1197.7	1074.4	1005.8	995.8	1023.4	1092.8	1140.3	1188.1	1189.3
Coarse	cts/kg	1128.1	1030.4	925.4	909.3	960.5	1009.4	1082.6	1033.3	1027.4
Rubber	cts/lb	126.8	88.8	70.7	57.0	59.3	75.2	76.1	75.6	85.3
Hides 1/ Provisional.	cts/lb	94.7	110.2	87.7	72.2	72.8	73.5	74.2	74.6	77.3

^{1/} Provisional.
2/ Average Petroleum Spot Price (APSP). Average of U.K. Brent, Dubai, and West Texas Intermediate, equally weighted.

Table 1. Market Prices for Non-Fuel and Fuel Commodities (Continued)										
	Units	2013	2014	2015	2015Q4	2016Q1	2016Q2	2016Q3	Oct-16	Nov-16
Metals										
Copper	\$/MT	7331.5	6863.4	5510.5	4884.9	4674.7	4736.4	4779.6	4731.3	5450.9
Aluminum	\$/MT	1846.7	1867.4	1664.7	1493.9	1514.5	1571.8	1620.2	1665.9	1737.1
Iron Ore	\$/MT	135.4	97.4	56.0	46.7	47.7	55.3	57.9	58.0	72.3
Tin	\$/MT	22281.6	21898.9	16066.6	15077.2	15438.6	16902.1	18584.3	20099.8	21126.1
Nickel	\$/MT	15030.0	16893.4	11862.6	9423.0	8507.7	8822.5	10263.5	10259.7	11128.9
Zinc	\$/MT	1910.2	2161.0	1931.7	1611.8	1677.3	1916.9	2251.6	2311.5	2566.2
Lead	\$/MT	2139.7	2095.5	1787.8	1681.7	1738.0	1717.6	1872.7	2024.5	2180.6
Uranium	\$/lb	38.5	33.5	36.7	35.9	32.6	27.5	25.5	21.2	18.5
Energy										
Spot Crude 2/	\$/bbl	104.1	96.2	50.8	42.2	32.8	44.8	44.7	49.3	45.3
U.K. Brent	\$/bbl	108.8	98.9	52.4	43.4	34.4	46.0	45.8	49.7	46.4
Dubai	\$/bbl	105.4	96.7	51.2	41.2	30.7	42.9	43.4	48.3	43.8
West Texas Intermediate	\$/bbl	97.9	93.1	48.7	42.0	33.3	45.5	44.9	49.9	45.6
Natural Gas										
Russian in Germany	\$/mmbtu	11.2	10.5	7.3	5.9	4.7	4.0	4.2	4.0	4.5
Indonesian in Japan (LNG)	\$/mmbtu	17.3	17.0	11.0	10.0	8.2	6.9	7.4	7.5	8.5
US, domestic market	\$/mmbtu	3.7	4.4	2.6	2.1	2.0	2.1	2.8	2.9	2.5
Coal										
Australian, export markets	\$/MT	90.6	75.1	61.6	56.1	54.5	55.6	72.3	99.8	107.1

^{1/} Provisional.

Table 2. Indices of Market Prices for Non-Fuel and Fuel Commodities, 2013-2016 (2005=100, in terms of U.S. dollars) 1/

	(weights) 1/	2013	2014	2015	2015Q4	2016Q1	2016Q2	2016Q3	Oct-16	Nov-16
All Primary Commodities 2/	100.0	183.3	171.9	111.2	97.3	86.5	101.4	102.7	108.2	106.7
Non-Fuel Commodities	36.9	169.0	162.3	134.0	123.7	123.7	132.7	133.3	132.1	136.8
Agriculture	26.2	163.3	161.5	137.1	128.8	129.5	139.8	138.6	136.6	137.2
Food	16.7	177.5	170.2	141.0	132.2	136.4	149.3	145.9	142.9	143.1
Cereals	3.6	218.2	180.2	149.0	138.2	136.5	142.0	126.4	120.8	120.2
Vegetable oils and protein meals	4.4	206.4	190.7	153.6	143.3	143.5	164.1	158.5	154.6	157.3
Meat	3.7	136.8	160.5	137.4	125.2	122.3	131.4	130.9	122.0	121.2
Seafood	3.2	160.1	162.0	131.7	123.0	149.1	164.8	163.0	165.6	167.2
Beverages	1.8	147.4	178.0	172.6	173.7	158.7	163.5	169.8	168.8	166.8
Agricultural raw materials 3/	7.7	136.2	138.8	120.1	110.9	107.6	113.7	115.5	115.2	117.4
Timber	3.4	107.3	109.3	104.5	105.8	96.7	103.0	101.6	101.2	100.7
Metals	10.7	182.9	164.4	126.5	110.9	109.5	115.1	120.3	121.0	135.7
Edibles 4/	18.5	174.6	171.0	144.1	136.2	138.6	150.7	148.2	145.5	145.4
Industrial Inputs 5/	18.4	163.3	153.6	123.8	110.9	108.7	114.5	118.3	118.6	128.0
Energy 6/	63.1	191.7	177.4	97.9	81.8	64.7	83.0	84.8	94.2	89.1
Petroleum 7/	53.6	195.9	181.1	95.6	79.3	61.5	84.1	84.0	92.6	85.0
Natural Gas	6.9	164.9	159.9	106.8	90.6	73.5	64.1	69.3	69.0	75.6
Coal	2.6	176.8	149.1	121.3	110.0	107.8	110.8	141.7	192.7	206.7

^{1/}Weights based on 2002-2004 average world export earnings.

^{2/} Average Petroleum Spot Price (APSP). Average of U.K. Brent, Dubai, and West Texas Intermediate, equally weighted.

^{2/} Non-Fuel Primary Commodities and Energy Index.

^{3/} Includes Forestry Products.

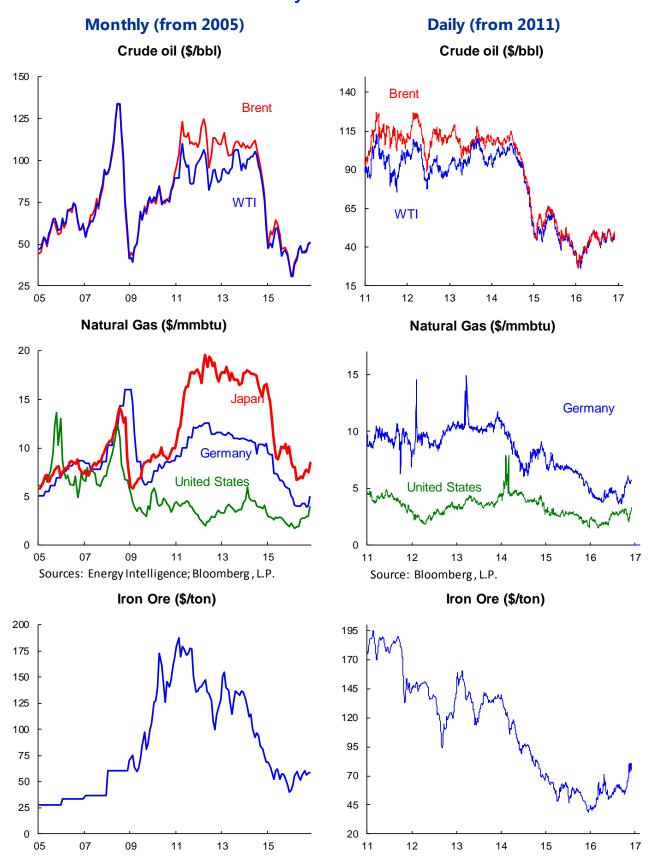
^{4/} Edibles comprised of Food and Beverages

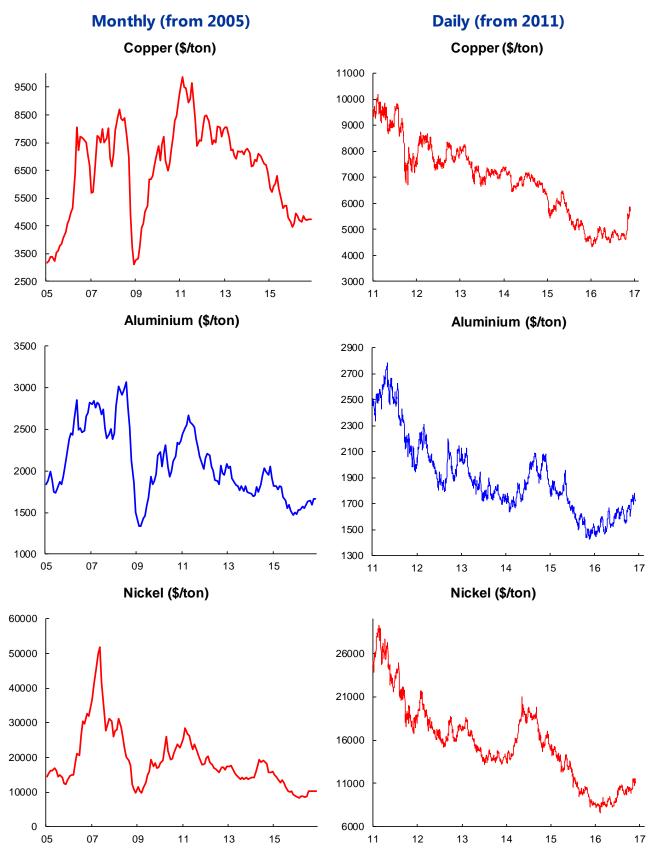
^{5/} Industrial (Non-Fuel) Inputs comprised of Agriculture and Metals

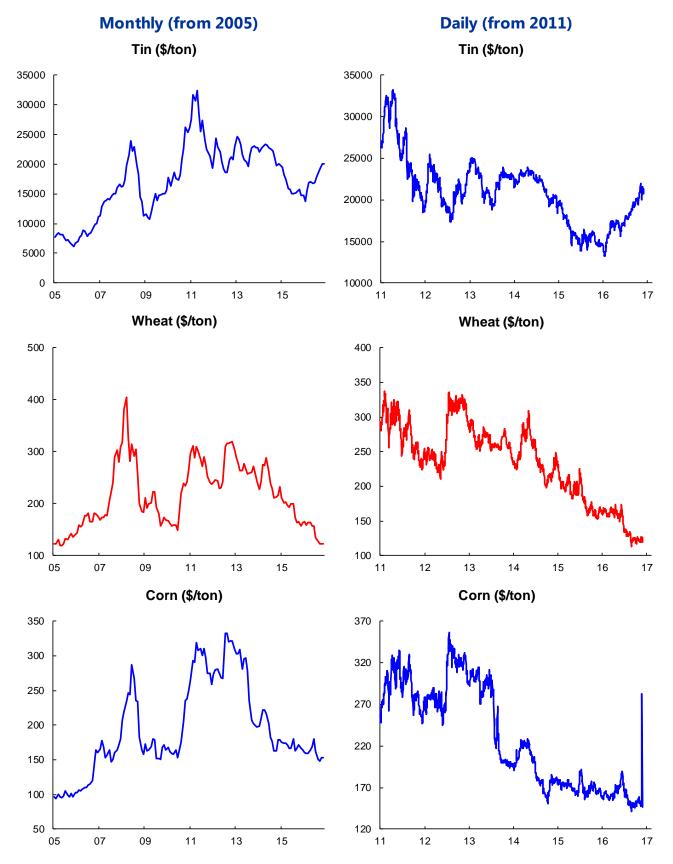
^{6/} Includes Petroleum, Natural Gas and Coal

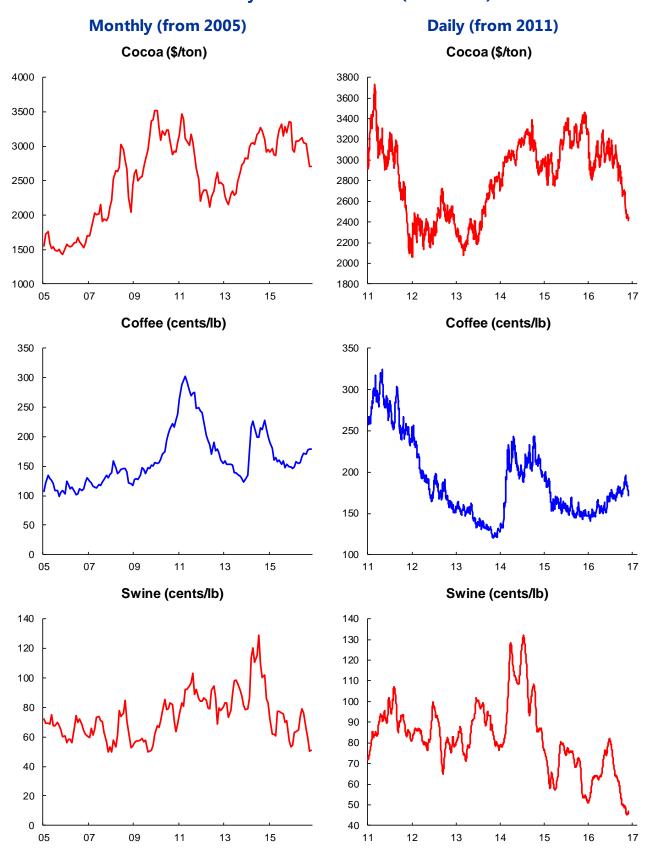
^{7/} Average Petroleum Spot Price (APSP). Average of U.K. Brent, Dubai, and West Texas Intermediate, equally weighted.

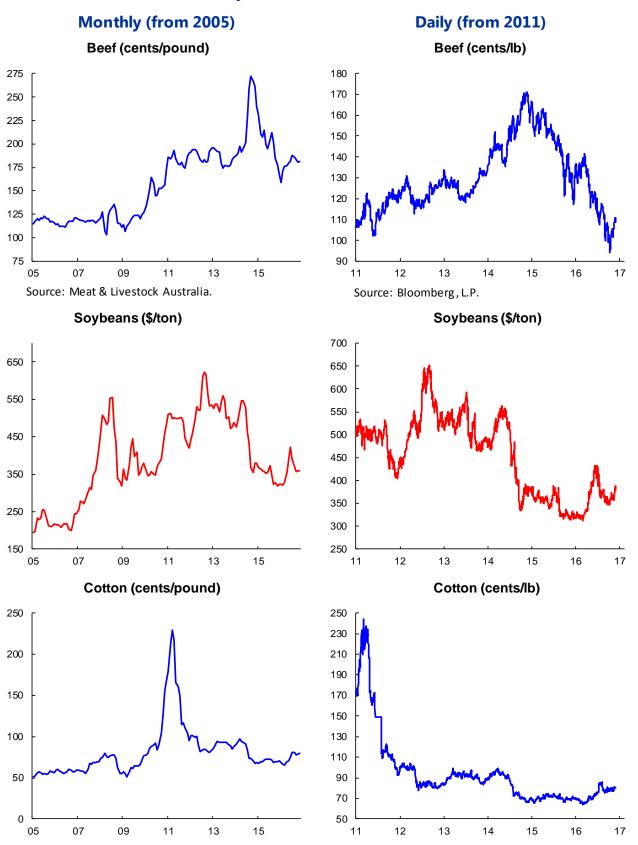
Commodity Prices Movements



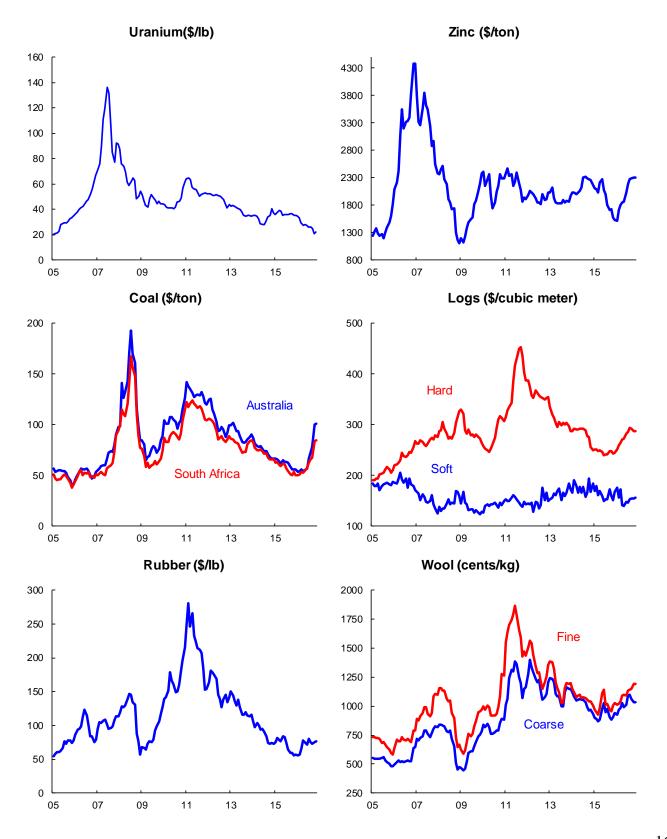




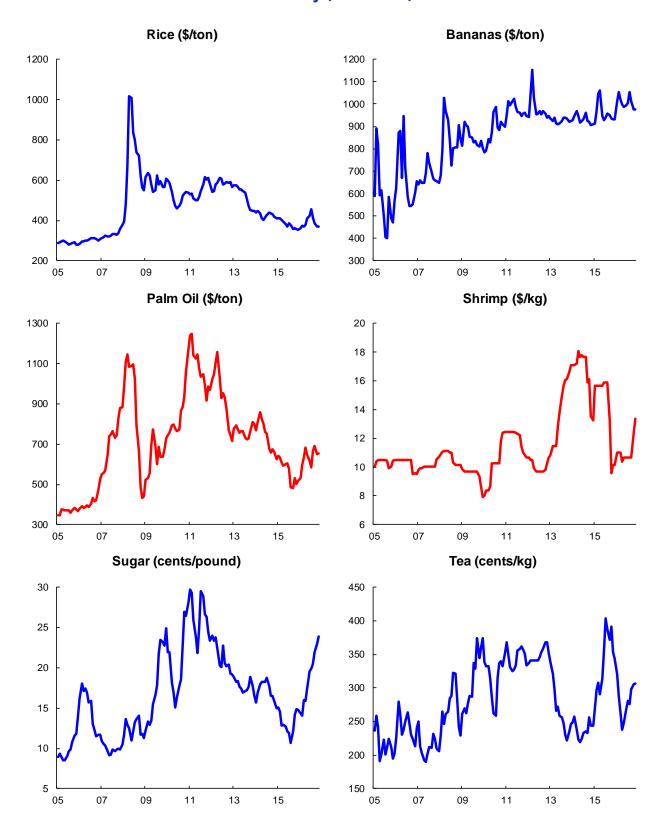




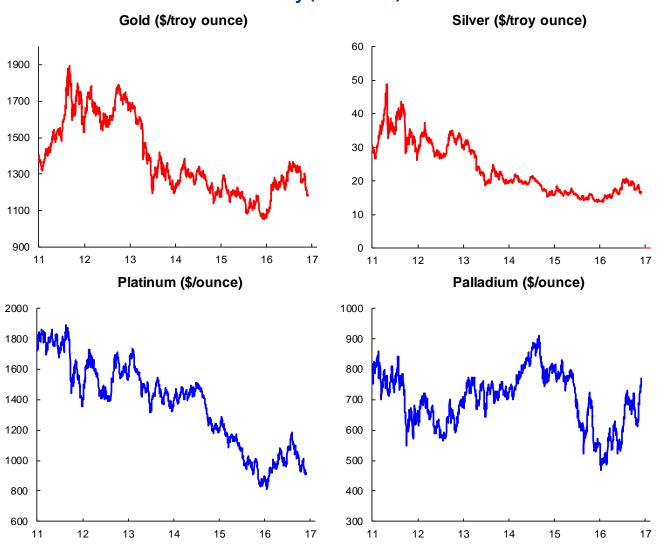
Commodity Prices Movements (Continued) Monthly (from 2005)



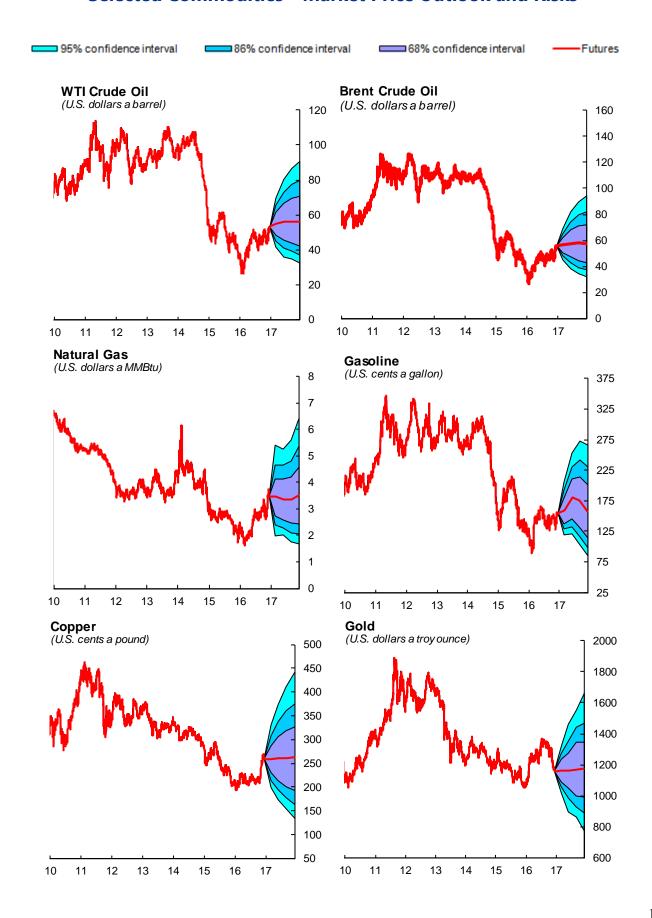
Commodity Prices Movements (Continued) Monthly (from 2005)



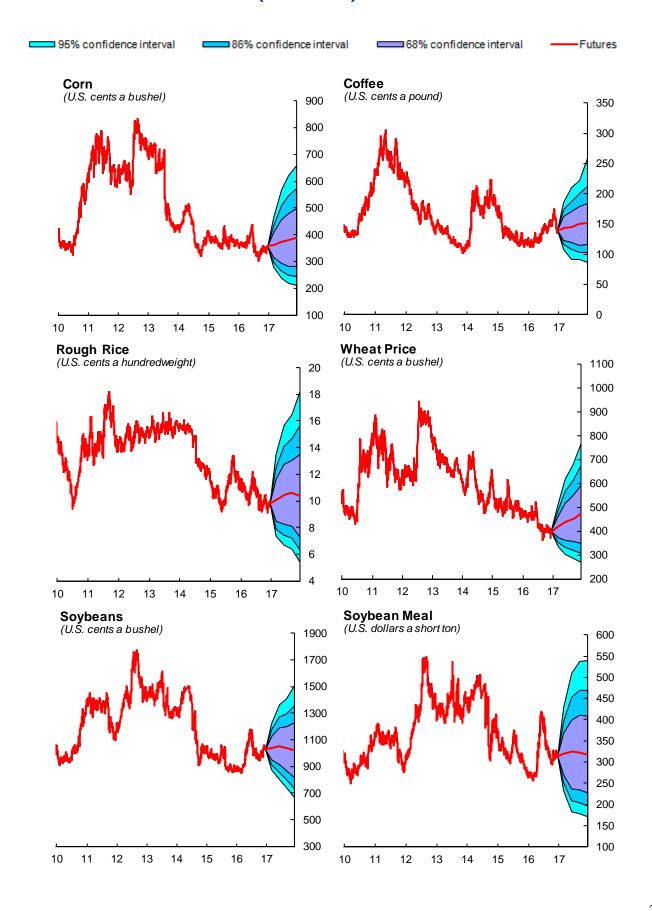
Commodity Prices Movements (Continued) Daily (from 2011)



Selected Commodities—Market Price Outlook and Risks



Selected Commodities—Market Price Outlook and Risks (concluded)



Options-based Price Thresholds

WTI Crude Oil

(probabilities in percent; prices in U.S. dollars a barrel)

Brent	Crude	Oil
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(probabilities in percent; prices in U.S. dollars a barrel)

Threshold	Months Forward						
Prices	3	6	9	12			
< 20	0.0	0.0	0.0	0.0			
< 25	0.0	0.0	0.0	0.1			
< 30	0.0	0.4	0.4	1.0			
< 35	0.3	2.1	2.9	4.9			
< 40	1.9	6.9	10.4	14.2			
< 45	8.5	17.6	24.1	28.7			
> 50	72.0	64.7	58.1	54.1			
> 55	41.8	43.7	40.2	37.8			
> 60	17.2	25.5	25.6	24.7			
> 65	5.3	13.0	15.0	15.1			
> 70	1.4	6.0	8.3	8.8			

Threshold				
Prices	3	6	9	12
< 20	0.0	0.0	0.0	0.0
< 25	0.0	0.0	0.1	0.2
< 30	0.0	0.2	0.6	1.3
< 35	0.1	1.1	2.9	4.7
< 40	0.5	4.5	9.0	12.1
< 45	2.4	13.0	20.3	24.2
> 50	85.3	71.3	63.7	60.1
> 55	54.0	50.8	46.3	43.9
> 60	21.6	30.9	30.5	29.6
> 65	5.7	16.5	18.6	18.7
> 70	1.2	7.9	10.5	11.2

U.S. Natural Gas

(probabilities in percent; prices in U.S. dollars an MMBtu)

••					
Threshold					
Prices	3	6	9	12	
< 1.00	0.0	0.0	0.0	0.0	-
< 1.50	0.1	0.1	0.4	0.6	
< 2.00	2.0	2.1	4.1	5.1	
< 2.50	9.8	14.2	17.8	19.2	
< 3.00	32.0	40.4	43.0	42.3	
> 3.50	35.8	31.7	31.2	34.6	
> 4.00	13.8	13.5	14.2	18.2	
> 4.50	4.7	5.0	5.8	8.7	
> 5.00	1.7	1.6	2.2	4.0	
> 5.50	0.7	0.5	0.9	1.8	
> 6.00	0.3	0.2	0.3	8.0	

Gasoline

(probabilities in percent; prices in U.S. dollars a gallon)

		•		,
Threshold				
Prices	3	6	9	12
< 0.25	0.0	0.0	0.0	0.0
< 0.50	0.0	0.0	0.0	0.0
< 0.75	0.0	0.0	0.0	0.6
< 1.00	0.1	0.2	2.1	7.6
< 1.25	5.7	4.9	15.2	29.1
> 1.50	60.6	73.2	58.2	42.5
> 1.75	17.4	39.7	31.2	20.6
> 2.00	2.5	15.3	13.8	8.6
> 2.25	0.3	4.5	5.2	3.3
> 2.50	0.0	1.1	1.8	1.2
> 2.75	0.0	0.2	0.6	0.4

Copper

(probabilities in percent; prices in U.S. dollars a pound)

		•		, ,
Threshold				
Prices	3	6	9	12
< 0.75	0.0	0.0	0.0	0.0
< 1.00	0.0	0.0	0.0	0.2
< 1.25	0.0	0.0	0.2	1.0
< 1.50	0.0	0.3	1.8	3.5
< 1.75	0.2	2.7	6.7	9.3
< 2.00	3.0	10.6	17.2	20.5
> 2.25	85.9	73.3	66.3	63.0
> 2.50	58.2	50.1	46.4	44.5
> 2.75	23.0	27.9	28.5	28.3
> 3.00	7.2	13.3	15.8	16.6
> 3.25	2.2	5.9	8.3	9.2

Gold

(probabilities in percent; prices in U.S. dollars a troy ounce)

.,				
Threshold				
Prices	3	6	9	12
< 700	0.0	0.1	0.0	1.1
< 800	0.0	0.7	8.0	3.4
< 900	0.1	2.9	5.4	8.3
< 1000	1.6	9.6	19.2	19.5
< 1100	22.3	32.3	41.8	40.6
< 1200	72.6	68.2	65.4	65.2
> 1300	3.2	9.6	16.9	16.5
> 1400	0.3	2.9	7.1	7.2
> 1500	0.1	1.1	2.6	3.2
> 1600	0.0	0.4	8.0	1.6
> 1700	0.0	0.2	0.2	8.0

Options-based Price Thresholds (concluded)

Cori

(probabilities in percent; prices in U.S. dollars a bushel)

Threshold	Months Forward			
Prices	3	6	9	12
< 2.0	0.0	0.3	1.0	1.3
< 2.5	0.3	5.1	8.2	9.3
< 3.0	10.2	22.6	26.8	27.7
> 3.5	52.1	49.8	48.4	49.0
> 4.0	16.0	25.6	27.2	28.8
> 4.5	2.7	10.9	13.3	15.2
> 5.0	0.3	4.0	5.9	7.3
> 5.5	0.0	1.3	2.5	3.3
> 6.0	0.0	0.4	1.0	1.5
> 6.5	0.0	0.1	0.4	0.6

Coffee

(probabilities in percent; prices in U.S. dollars a pound)

Threshold	Months Forward			
Prices	3	6	9	12
< 0.6	0.0	0.1	0.0	0.1
< 0.8	0.0	0.9	0.5	1.3
< 1.0	0.7	4.4	6.3	6.2
< 1.2	13.7	19.1	25.9	22.7
> 1.4	47.9	48.6	45.9	49.3
> 1.6	14.8	19.3	22.7	24.3
> 1.8	2.7	5.8	9.3	10.1
> 2.0	0.3	1.7	3.3	4.0
> 2.2	0.0	0.6	1.1	1.7
> 2.4	0.0	0.2	0.3	8.0
> 2.6	0.0	0.1	0.1	0.4

Rough Rice

0.0

0.1

0.3

0.0

> 7.0

(probabilities in percent; prices in U.S. dollars a hundredweight)

	Threshold	Months Forward				
ļ	Prices	3	6	9	12	
	< 0.05	0.0	0.0	0.1	1.0	
	< 0.06	0.1	0.7	1.4	5.1	
	< 0.07	1.4	4.8	6.7	14.8	
	< 0.08	9.6	16.0	18.9	29.5	
	< 0.09	30.5	34.3	36.6	46.4	
	> 0.10	41.9	45.1	44.4	37.8	
	> 0.11	19.9	27.5	28.2	25.1	
	> 0.12	7.6	15.0	16.4	15.8	
	> 0.13	2.4	7.6	9.0	9.6	
	> 0.14	0.7	3.6	4.6	5.6	
	> 0.15	0.2	1.6	2.3	3.2	

Wheat

(probabilities in percent; prices in U.S. dollars a bushel)

Threshold	Months Forward			
Prices	3	6	9	12
< 2.5	0.0	0.1	0.5	1.4
< 3.0	0.1	2.6	4.7	7.6
< 3.5	6.4	15.0	18.1	21.8
< 4.0	40.8	40.0	40.4	41.6
< 4.5	81.7	66.9	63.3	61.3
> 5.0	2.8	14.6	19.4	23.1
> 5.5	0.2	5.3	9.0	12.7
> 6.0	0.0	1.7	3.8	6.6
> 6.5	0.0	0.5	1.5	3.2
> 7.0	0.0	0.1	0.6	1.5
> 7.5	0.0	0.0	0.2	0.7

Soybeans

(probabilities in percent; prices in U.S. dollars a bushel)

Threshold		Months I	Forward	
Prices	3	6	9	12
< 5	0.0	0.0	0.0	0.0
< 6	0.0	0.0	0.1	0.6
< 7	0.0	0.2	1.1	4.6
< 8	0.1	2.8	7.8	16.2
< 9	5.3	15.9	25.5	35.4
> 10	63.1	57.5	49.2	43.0
> 11	20.6	29.4	26.3	25.0
> 12	3.1	11.3	11.6	13.0
> 13	0.2	3.4	4.4	6.2
> 14	0.0	8.0	1.4	2.7
> 15	0.0	0.2	0.4	1.1

Soybean Meal

(probabilities in percent; prices in U.S. dollars a short ton)

Threshold	Months Forward			
Prices	3	6	9	12
< 100	0.0	0.0	0.0	0.0
< 150	0.0	0.2	0.3	0.5
< 200	0.2	5.2	6.1	7.5
< 250	7.7	24.9	26.2	28.9
> 300	57.8	46.0	45.8	43.5
> 350	20.0	22.5	23.3	22.0
> 400	4.1	9.2	10.1	9.7
> 450	0.6	3.4	4.0	3.9
> 500	0.1	1.1	1.5	1.5
> 550	0.0	0.4	0.5	0.5
> 600	0.0	0.1	0.2	0.2

Options-based Probabilities of Price Changes

(in percent)

WTI Crude Oil

Brent Crude Oil

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.1	0.1	0.2
-30%	0.6	3.6	5.3	8.1
-10%	17.0	26.3	33.4	37.8
+10%	24.2	31.1	30.1	28.8
+30%	1.9	7.1	9.5	10.0
+50%	0.1	1.2	2.3	2.9
+100%	0.0	0.0	0.0	0.1

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.2	0.5
-30%	0.3	2.7	6.0	8.7
-10%	10.4	24.7	32.6	36.3
+10%	22.5	31.6	31.0	30.1
+30%	0.9	7.1	9.7	10.4
+50%	0.1	1.1	2.4	3.0
+100%	0.0	0.0	0.1	0.1

U.S. Natural Gas

Gasoline

Price	Months Forward			
changes	3	6	9	12
-50%	0.6	0.4	1.4	1.9
-30%	8.1	11.6	15.1	16.6
-10%	40.1	48.0	50.0	48.5
+10%	19.9	18.7	19.2	23.2
+30%	4.6	4.8	5.6	8.5
+50%	1.2	1.0	1.5	2.9
+100%	0.1	0.0	0.1	0.2

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.1	0.9
-30%	0.6	0.7	4.8	13.3
-10%	21.1	15.2	29.7	45.8
+10%	23.2	45.4	35.5	23.7
+30%	2.2	14.3	13.0	8.1
+50%	0.2	3.0	3.8	2.4
+100%	0.0	0.0	0.1	0.1

Copper

Gold

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.4	1.3
-30%	0.5	4.1	8.8	11.6
-10%	21.1	34.0	40.3	43.2
+10%	14.3	20.9	22.6	22.9
+30%	1.1	3.9	6.0	6.9
+50%	0.0	0.6	1.5	1.9
+100%	0.0	0.0	0.0	0.1

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.0	0.1
-30%	0.0	8.0	1.0	3.7
-10%	5.4	16.2	27.7	27.0
+10%	6.4	13.7	21.0	20.6
+30%	0.1	1.0	2.5	3.1
+50%	0.0	0.1	0.2	0.7
+100%	0.0	0.0	0.0	0.0

Options-based Probabilities of Price Changes (concluded)

(in percent)

Corn

Coffee

Price	Months Forward				
changes	3	6	9	12	
-50%	0.0	0.0	0.2	0.4	
-30%	0.3	4.9	8.0	9.2	
-10%	22.9	33.6	37.0	37.3	
+10%	20.2	28.9	30.1	31.7	
+30%	1.6	8.5	10.9	12.6	
+50%	0.1	1.9	3.3	4.3	
+100%	0.0	0.0	0.1	0.2	

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.3	0.1	0.5
-30%	0.4	3.5	4.8	5.0
-10%	21.5	25.9	32.7	29.1
+10%	24.1	28.1	30.0	32.1
+30%	2.6	5.6	9.1	9.9
+50%	0.1	1.0	2.1	2.8
+100%	0.0	0.0	0.0	0.2

Rough Rice

Wheat

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.1	0.8
-30%	0.9	3.8	5.6	13.0
-10%	25.6	30.4	32.9	43.1
+10%	24.3	31.2	31.7	27.8
+30%	3.4	9.2	10.7	11.0
+50%	0.3	2.1	2.9	3.9
+100%	0.0	0.0	0.1	0.2

Price	Months Forward				
changes	3	6	9	12	
-50%	0.0	0.0	0.0	0.1	
-30%	0.0	0.9	2.1	4.0	
-10%	9.7	18.3	21.3	24.8	
+10%	26.3	39.2	42.0	43.3	
+30%	1.2	10.5	15.1	19.0	
+50%	0.0	1.8	4.0	6.8	
+100%	0.0	0.0	0.1	0.3	

Soybeans

Soybean Meal

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.0	0.0	0.0
-30%	0.0	0.3	1.8	6.2
-10%	10.1	21.5	31.5	40.9
+10%	12.5	22.6	20.9	20.7
+30%	0.1	2.1	3.0	4.6
+50%	0.0	0.1	0.3	8.0
+100%	0.0	0.0	0.0	0.0

Price	Months Forward			
changes	3	6	9	12
-50%	0.0	0.4	0.6	0.8
-30%	1.1	10.9	12.2	14.2
-10%	27.0	43.5	44.2	46.8
+10%	22.9	24.4	25.1	23.8
+30%	3.1	8.0	8.8	8.5
+50%	0.2	2.2	2.7	2.6
+100%	0.0	0.1	0.1	0.1

Commodity Derivative Contract Specifications

Commodity	Exchange	Contract	Physical Characteristics	Contract Size	Pricing Unit	Months Traded
		Futures	Light sweet crude oil	1,000 barrels	U.S. dollars per barrel	
Brent crude ICE Europe oil	Options		One crude oil futures contract of 1,000 barrels		Consecutive months up to and including February 2020	
	New York Mercantile	Futures	Light sweet crude oil	1,000 barrels	U.S. dollars per barrel	Consecutive months are listed for the current year and the next five years; in
WTI crude oil	Exchange	Options		One crude oil futures contract of 1,000 barrels		addition, the Jun and Dec contract months are listed beyond the sixth year.
Natural Gas	New York Mercantile	Futures	Natural gas delivered at Henry Hub, LA	10,000 MMBtu	U.S. dollars per MMBtu	Consecutive months for the current year plus the next
	Exchange	Options		One natural gas futures contract of 10,000 MMBtu		twelve full calendar years.
	New York	Futures	New York Harbor RBOB	42,000 gallons	U.S. cents per gallon	Consecutive months for 36
Gasoline	Mercantile Exchange	Options		One gasoline futures contract of 42,000 gallons		months
-	Chicago Mercantile	Futures	Gold (a minimum of 995 fineness)	100 troy ounces	U.S. dollars per troy ounce	Current calendar month; the next two calendar months; any Feb, Apr, Aug, and Oct falling within a 23-month
	Exchange	Options		One COMEX Gold futures contract		period; and any Jun and Dec falling within a 72-month period beginning with the current month.
	Chicago	Futures	Yellow corn grade #2	5,000 bushels (127 MT)	U.S. cents per bushel	Mar, May, Jul, Sep, Dec. The
Corn	Mercantile Exchange	Options		One corn futures contract (of a specified month) of 5,000 bushels		monthly option contract exercises into the nearby futures contract.
,		Futures	Arabica coffee from 19 countries of origin	37,500 lbs	U.S. cents per pound	Mar, May, Jul, Sep, Dec. The
Coffee	ICE	Options	countries of origin	One coffee futures contract (of a specified month) of 37,500 lbs		monthly option contract exercises into the nearby futures contract.
Dough viso	Chicago	Futures	U.S. #2 long grain rough rice with a total milling yield of 65%+	2,000 hundredweights (CWT)	U.S. cents per hundredweight	Jan, Mar, May, Jul, Sep, Nov. The monthly option contract
Rough rice	Mercantile Exchange	Options		One rough rice futures contract of 2,000 hundredweights (CWT)		exercises into the nearby futures contract.
	Chicago	Futures	#2 soft red winter wheat	5,000 bushels (136 MT)	U.S. cents per bushel	Mar, May, July, Sep, Dec. The
Wheat	Mercantile Exchange	Options		One Wheat futures contract (of a specified month) of 5,000 bushels		monthly option contract exercises into the nearby futures contract.
Soybean meal	Chicago Mercantile Exchange	Futures	Meal with minimum protein of 48%	100 short tons	U.S. dollars per ton	Jan, Mar, May, Jul, Aug, Sep,
		Options		One soybean meal futures contract (of a specified month) of 100 short tons		Oct, Dec. The monthly option contract exercises into the nearby futures contract.
		Futures	Yellow soybean grade #2	5,000 bushels (136 MT)	U.S. cents per bushel	Jan, Mar, May, Jul, Aug, Sep,
Soybeans	Chicago Mercantile Exchange	Options		One soybean futures contract (of a specified month) of 5,000 bushels		Nov. The monthly option contract exercises into the nearby futures contract.

Sources: Chicago Board of Trade, ICE, Bloomberg, L.P.

