Globální ekonomický výhled - srpen 2016

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GLOBAL ECONOMIC OUTLOOK - AUGUST

Monetary Department
External Economic Relations Division

2016

CNB CZECH
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Cut-off date for data
12 August 2016

CF survey date
8 August 2016

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19 August 2016

Notes to charts
ECB and Fed: midpoint of the range of forecasts.
The arrows in the GDP and inflation outlooks indicate the direction of revisions compared to the last GEO. If no arrow is shown, no new forecast is available. Asterisks indicate first published forecasts for given year. Historical data are taken from CF.
Forecasts for EURIBOR and LIBOR rates are based on implied rates from interbank market yield curve (FRA rates are used from 4M to 15M and adjusted IRS rates for longer horizons). Forecasts for German and US government bond yields (10Y Bund and 10Y Treasury) are taken from CF.

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Editor-in-chief I. Summary	Editor III.3 Russia III.4 Brazil	Editor IV. Outlook of exchange rates	II.1 Euro area	II.2 United States II.4 Japan

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I. SUMMARY

The August issue of Global Economic Outlook presents the regular monthly overview of recent and expected developments in selected territories, focusing on key economic variables: inflation, GDP growth, leading indicators, interest rates, exchange rates and commodity prices. In this issue, we also focus on seasonal price movements of selected agricultural commodities (corn, wheat and soy), which are then compared with the price changes observed so far this year. Our analysis includes predictions until the end of this year.

The annual economic growth outlooks for the euro area and Germany for this year were unchanged from the previous month, but those for 2017 were lowered slightly. Although the rate of GDP growth in Germany slowed in the last quarter, leading indicators (see the chart below) suggest that it will increase again in this quarter. Overall, this also brings hope to other economies tied to the German one. By contrast, the world's strongest economy – the USA – is expected to show rather lower economic growth this year than previously predicted, but its rate of growth will increase slightly in 2017. The outlooks for the Japanese economy were unchanged in the past month. The inflation outlooks for the advanced countries under review for next year also saw no changes, although – unlike in the previous outlooks – inflation is predicted to be slightly lower in the USA and the euro area at the end of this year. The US economy is thus expected to remain one of the few advanced economies to achieve consumer price inflation above the "magic" level of 2% next year.

The GDP growth outlooks for the BRIC countries remained mixed in August as usual. On the one hand, the fast-growing Indian economy is expected to maintain growth of about 7.5% until the end of next year despite a current moderate slowdown. Despite all the risks, the Chinese economy is maintaining robust economic growth, gradually slowing below 6.5% at the end of next year. Inflation in both countries saw no changes in the past month, i.e. it is flat at 2.0% in China and is about 4 pp higher in India until the end of 2017. On the other hand, the economies of Russia and particularly Brazil are certain to see slumpflation (an economic slump accompanied by relatively high inflation) this year. However, the outlooks for next year bring hope of renewed economic growth amid inflation close to 5.5% for both countries. The Brazilian economy is also expected to reap the rewards of the demand stimulus generated by its organisation of the currently ongoing Summer Olympic Games.

The outlooks for euro area interest rates remain very low, staying in negative territory at the shorter end of the yield curve and still with no sign of growth until the end of 2017. In the case of the USA, the Fed can be expected to increase interest rates once more this year. According to CF, however, this will probably not happen at the next meeting. According to CF, the US dollar will appreciate with varying intensity at the one-year horizon against all the monitored currencies except the Russian rouble, against which it will remain relatively stable. The market outlook for oil prices indicates that, in contrast to last month, prices will not exceed USD 50/bbl until the end of 2017. Natural gas prices based on long-term contracts, which are indexed to oil prices usually with a lag of 6 to 9 months, are expected to rise in the rest of this year. The outlooks for prices of food commodities at the end of 2017 decreased compared to the previous month, while the outlooks for industrial metal prices rose.

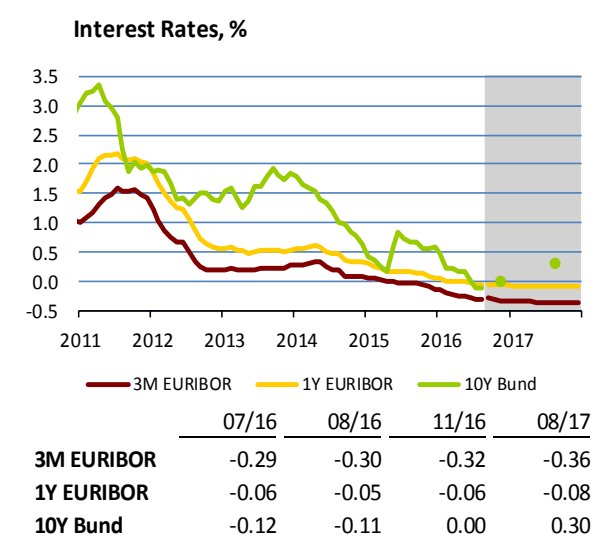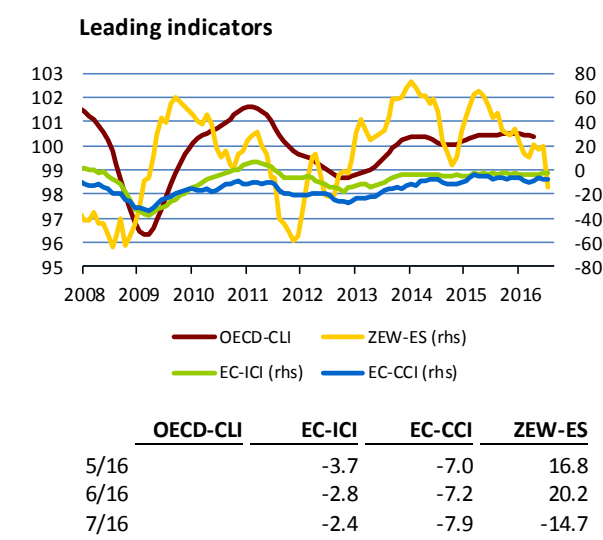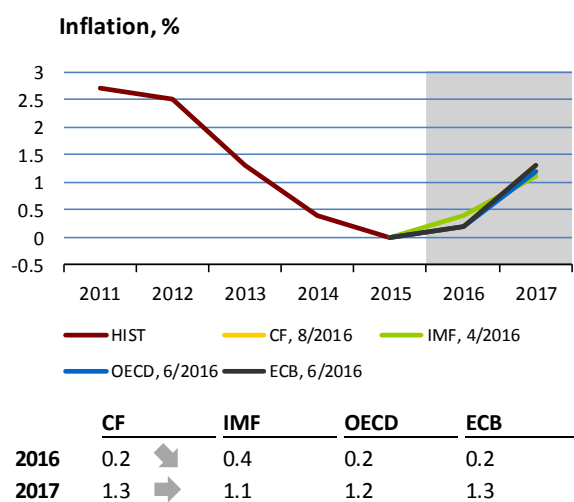## Leading indicators for countries monitored in the GEO

PMI in manufacturing - advanced countries
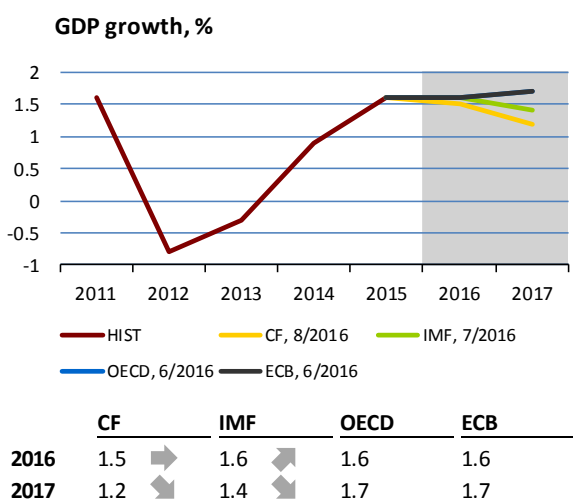
OECD CLI - BRIC countries
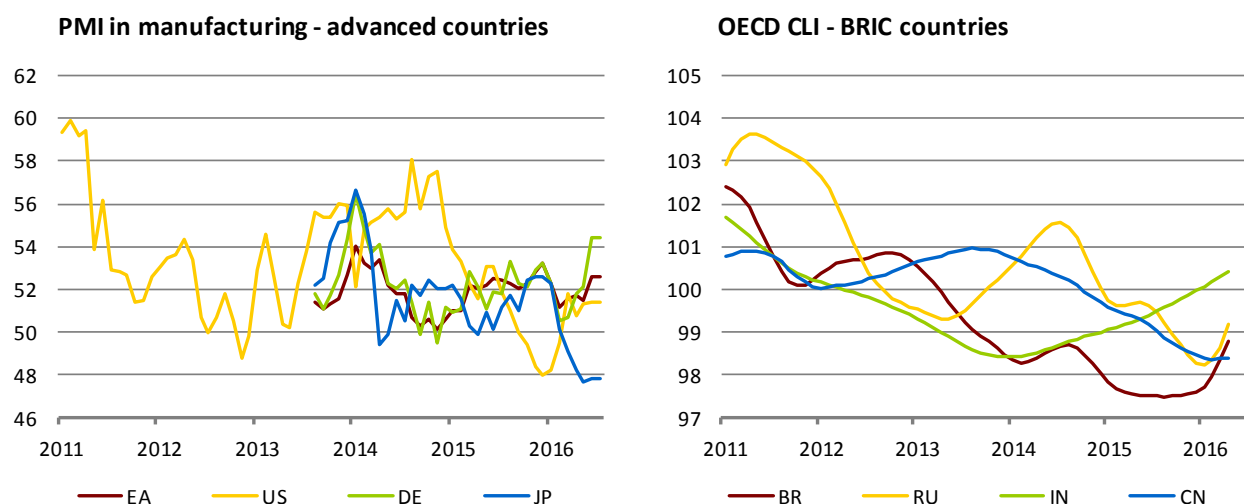
Zdroj: Bloomberg, Datastream

II.1 Euro area

Annual and quarterly GDP growth slowed in Q2 compared to the previous quarter. The euro area grew by 1.6% year-on-year and 0.3% quarter-on-quarter. It was negatively affected by a halt in economic growth in France, which accounts for 21% of total euro area GDP. Industrial production improved slightly in June compared to the previous month's revised figure; its year-on-year growth increased to 0.4%. The PMI in manufacturing dropped by 0.8 point to 52 points in July due to a slight weakening of output, growth in new orders and exports and slower growth in employment. Along with France, Greece has also had a PMI below 50 since July. Sentiment improved in most sectors in July, above all in industry and trade, whereas consumer confidence and the ZEW indicator deteriorated in response to the outcome of the UK referendum. Unemployment stayed at 10.1% in June. According to the ECB Survey of Professional Forecasters, however, unemployment should fall until the end of this year. On the basis of this survey, the euro area GDP growth estimate for 2017 was lowered by 0.2 pp (to 1.4%) due to the possible impacts of the UK's decision to leave the EU. Nonetheless, the IMF increased its GDP growth outlook for 2016 by 0.1 pp to 1.6%. By contrast, it lowered its outlook for 2017 by 0.2 pp in response to the UK referendum result. The August CF also cut its outlook for 2017 – to 1.2%.

Headline inflation edged up to 0.2% in July according to preliminary data. Prices of food and services continue to have an inflationary effect, while energy prices remain anti-inflationary. Core inflation was unchanged at 0.9%. The year-on-year decline in producer prices slowed again in June (to 3.1%), mainly due to prices in the energy sector. The August CF lowered its inflation outlook for this year by 0.1 pp to 0.2%. The ECB left interest rates unchanged at its July monetary policy meeting. Annual M3 growth stood at 5% in June. The German ten-year government bond yield remains negative. At the one-year horizon, it is expected to increase to 0.3%. Short-term interest rates are projected to decrease by less at the one-year horizon than was suggested by the previous month's estimates.

GDP growth, %

	CF		IMF		OECD	ECB
2016	1.5	→	1.6	↗	1.6	1.6
2017	1.2	↘	1.4	↘	1.7	1.7

Inflation, %

	CF		IMF	OECD	ECB
2016	0.2	↘	0.4	0.2	0.2
2017	1.3	→	1.1	1.2	1.3

Leading indicators

	OECD-CLI	EC-ICI	EC-CCI	ZEW-ES
5/16		-3.7	-7.0	16.8
6/16		-2.8	-7.2	20.2
7/16		-2.4	-7.9	-14.7

Interest Rates, %

|	07/16	08/16	11/16	08/17
3M EURIBOR	-0.29	-0.30	-0.32	-0.36
1Y EURIBOR	-0.06	-0.05	-0.06	-0.08
10Y Bund	-0.12	-0.11	0.00	0.30

II.2 United States

The US economy accelerated only slightly in Q2, with quarter-on-quarter annualised GDP growth reaching 1.2%. Growth of about 1% for three quarters in a row suggests a significant loss of momentum. According to the financial markets, however, the economy will pick up markedly in H2. The lower-than-expected result in Q2 was due mainly to a drop in inventories, whereas domestic consumption remains the main driver of growth. However, the decline in inventories should be only temporary, as companies are expected to increase their inventories again at the end of the year.

New labour market data support the optimistic outlook for Q3. Growth in non-farm payrolls in July was very high again (255,000) and the data for the previous two months were also revised upwards. The unemployment rate remained unchanged at 4.9% and the participation rate rose to 62.8%. According to the Conference Board survey, consumer confidence remains high, and a recovery is apparent in the housing market, with sales of new homes in July reaching their highest level in eight and a half years. The year-on-year decline in industrial production moderated to 0.7% in June.
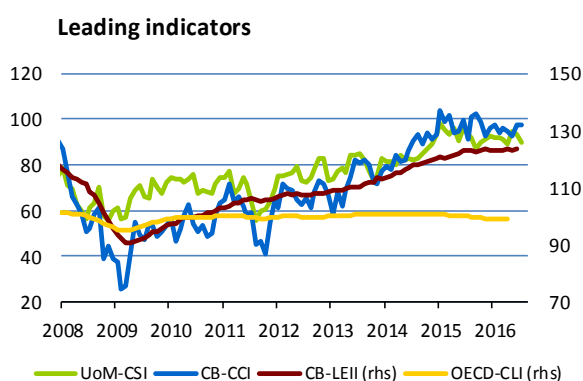
Annual consumer price inflation has been flat at 1.1% since April and core inflation rose only slightly to 2.3% in June. According to the Fed's Beige Book, the US economy is continuing to expand amid a lack of major inflationary pressures. Labour market developments support the view that monetary policy will be tightened before the end of this year. In the August CF survey, however, 77% of the panellists expect this not to happen at the September meeting. The dollar weakened in response to the lower-than-expected GDP growth in Q2 and the implied short-term rate path shifted upwards. The August CF revised both its growth and inflation outlooks for this year downwards. The GDP growth prediction for 2017 was increased. The IMF also expects lower growth of the US economy in 2016.

GDP growth, %
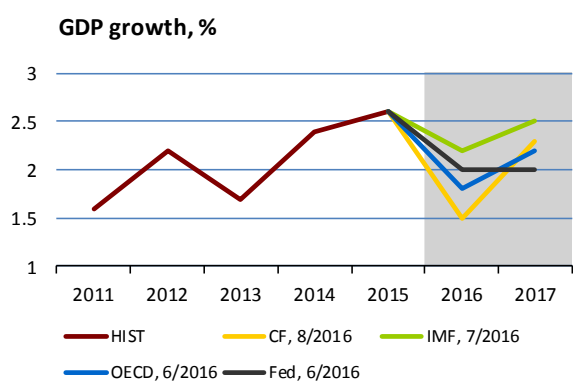
	CF		IMF		OECD	Fed
2016	1.5	↘	2.2	↘	1.8	2.0
2017	2.3	↗	2.5	→	2.2	2.0

Inflation, %
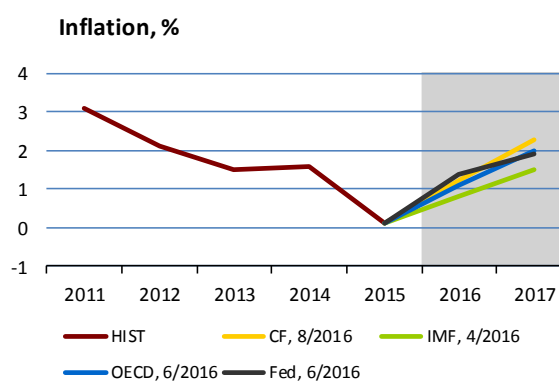
	CF		IMF	OECD	Fed
2016	1.2	↘	0.8	1.1	1.4
2017	2.3	→	1.5	2.0	1.9

Leading indicators

	CB-LEII	OECD-CLI	UoM-CSI	CB-CCI
5/16	123.3		94.7	92.4
6/16	123.7		93.5	97.4
7/16			90.0	97.3

Interest Rates, %

	07/16	08/16	11/16	08/17
USD LIBOR 3M	0.70	0.79	0.91	1.04
USD LIBOR 1R	1.32	1.32	1.57	1.67
Treasury 10R	1.50	1.58	1.70	2.20
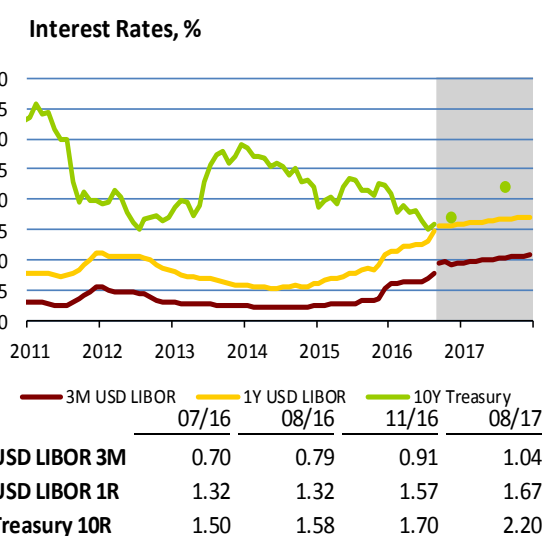
II.3 Germany

According to a preliminary estimate, economic growth in Germany slowed in 2016 Q2. The quarterly growth rate fell from 0.7% to 0.4%. The growth was fostered by an increase in net exports and in domestic and government consumption, while a drop in investments acted in the opposite direction. By contrast, annual growth accelerated from 1.5% to 3.1% in Q2, the highest level since 2011 Q2. For the second half of the year, the Bundesbank expects the economy to return to strong quarterly growth. This is suggested by a high PMI in manufacturing (54.4 in both June and July). On the other hand, economic sentiment indicators declined. The August CF left its growth forecast for this year as a whole (released before the GDP growth data for Q2 were published) at 1.6%. It lowered its forecast for 2017 to 1.2%, like the IMF. German inflation increased by 0.1 pp to 0.4% in July on the back of faster growth in food and services prices, which outweighed a drop in energy prices.
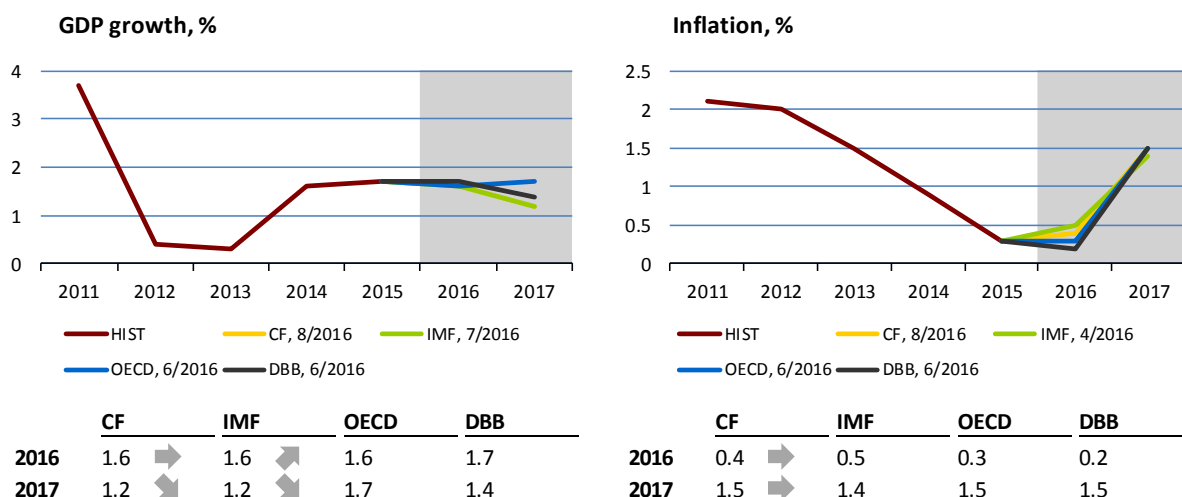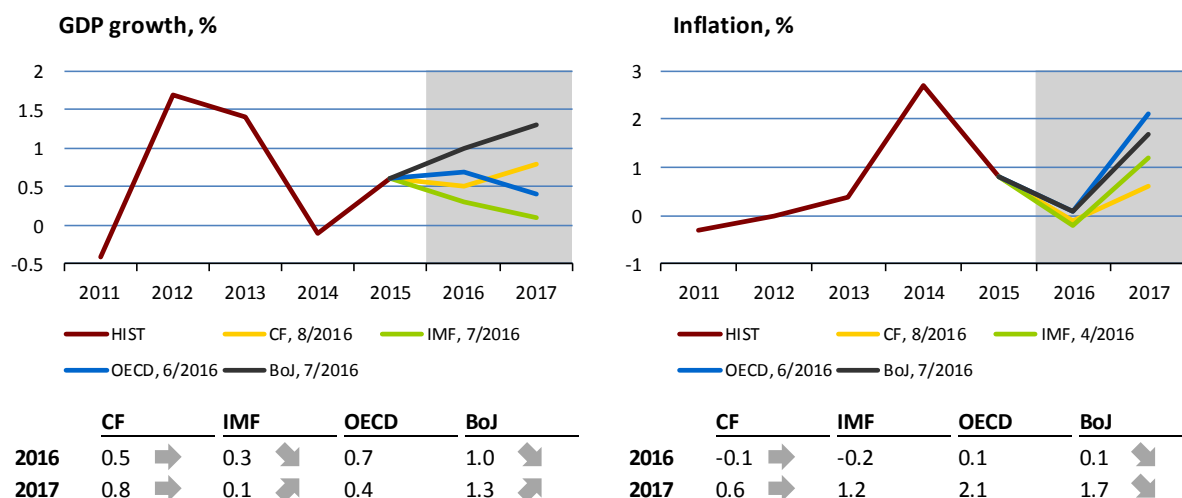

GDP growth, %

Inflation, %

	CF		IMF		OECD	DBB
2016	1.6	➡	1.6	↗	1.6	1.7
2017	1.2	↘	1.2	↘	1.7	1.4

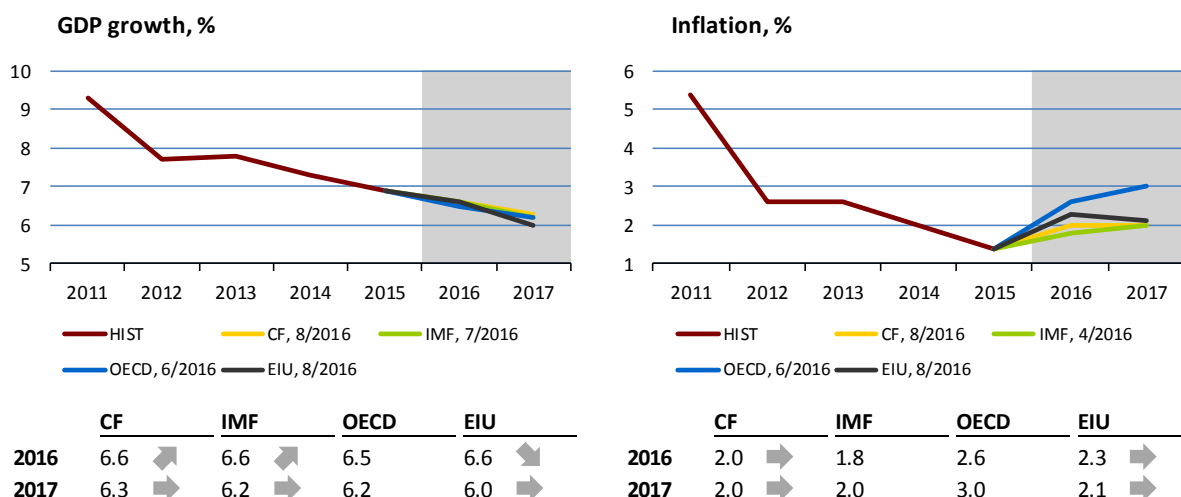|	CF		IMF	OECD	DBB
2016	0.4	➡	0.5	0.3	0.2
2017	1.5	➡	1.4	1.5	1.5

II.4 Japan

The Japanese economy's weak performance fuelled speculation that further measures might be adopted to boost growth and hit the inflation target. Concerns about foreign exchange interventions or a further significant monetary policy easing were apparent in financial markets. However, the central bank merely expanded its programme of asset purchases from financial institutions (exchange-traded funds, ETFs) to double the previous amount and announced that an in-depth assessment of the effects of negative rates and other unconventional instruments would be made in September. The Japanese government approved another stimulus package of JPY 13.5 billion in early August, including investment in infrastructure and financial contributions for low earners. No improvement can be expected in Q3. The year-on-year changes in retail sales and industrial output remain negative and the PMI in industry is still in the contraction band. Despite that, the new CF outlook was left unchanged for the time being. The BoJ cut its GDP growth outlook for 2016 and its inflation outlooks for both years, but raised its GDP growth forecast for 2017.

GDP growth, %

Inflation, %

	CF		IMF		OECD	BoJ	
2016	0.5	➡	0.3	↘	0.7	1.0	↗
2017	0.8	➡	0.1	↗	0.4	1.3	↗

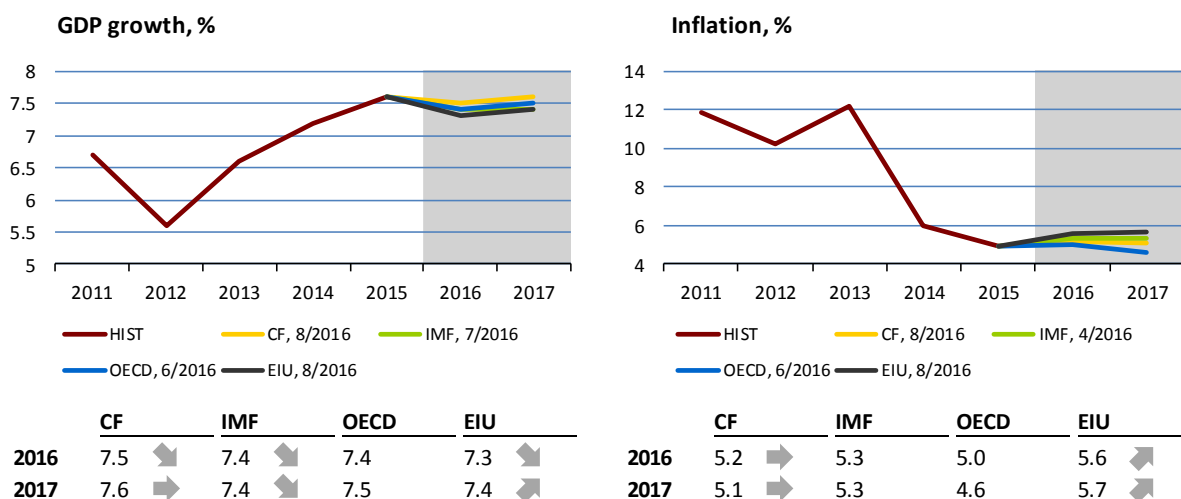|	CF		IMF	OECD	BoJ	
2016	-0.1	➡	-0.2	0.1	0.1	↘
2017	0.6	➡	1.2	2.1	1.7	↘

III. ECONOMIC OUTLOOK IN BRIC COUNTRIES

III.1 China

Economic growth in China will continue to slow gradually in the coming years. In 2016 Q2, however, it reached 6.7%, which came as a positive surprise. The growth was bolstered mainly by supportive government and central bank measures (an increase in government expenditure and a reduction in bank reserve requirements and loan rates). The Chinese government is seeking economic growth of between 6.5% and 7.0% this year. Industrial production rose by 6% and retail sales by 10.2% year on year in July. Inflation slowed further to 1.8% in the same month. Consumer price inflation of about 2% is expected for both this year and the next. The depreciation of the renminbi eased slightly in July, but according to the CF outlook the Chinese currency will weaken further in the next two years. At the one-year horizon, it is expected to depreciate by 3.5%. The renminbi will be included in the SDR (the IMF's single currency and accounting unit) as from 1 October 2016. This could conversely boost demand for the Chinese currency.

GDP growth, %

Inflation, %

	CF		IMF		OECD	EIU	
2016	6.6	↗	6.6	↗	6.5	6.6	↘
2017	6.3	→	6.2	→	6.2	6.0	→

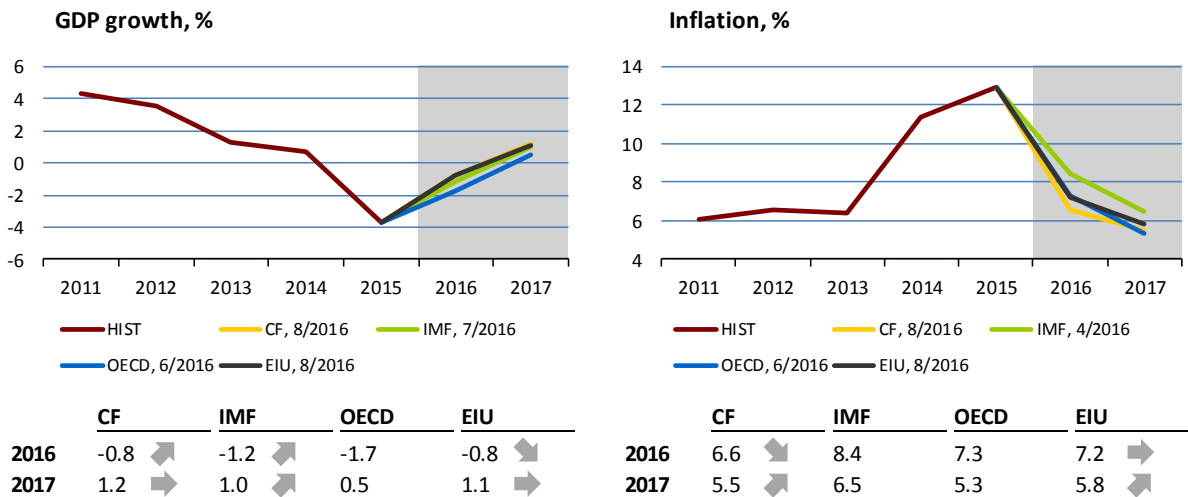|	CF		IMF	OECD	EIU	
2016	2.0	→	1.8	2.6	2.3	→
2017	2.0	→	2.0	3.0	2.1	→

III.2 India

India ranks among the world's fastest growing economies and will maintain GDP growth of more than 7% this year and the next. Despite such high growth, the Reserve Bank of India is managing to keep inflation close to the upper boundary of its target band of 2%–6%. Prices grew by 6.0% year on year in July. The inflation outlooks for this year and the next remain at between 5% and 6%. CF is still expecting consumer price inflation of only just above 5%, while the EIU has slightly increased its forecasts. The credibility of the inflation targeting regime thus should not be undermined by the departure of the current central bank governor Raghuram Rajan, who introduced inflation targeting in India. The CF outlook expects the rupee to continue depreciating gradually against the dollar.

GDP growth, %

Inflation, %

	CF		IMF		OECD	EIU	
2016	7.5	↘	7.4	↘	7.4	7.3	↘
2017	7.6	→	7.4	↘	7.5	7.4	↗

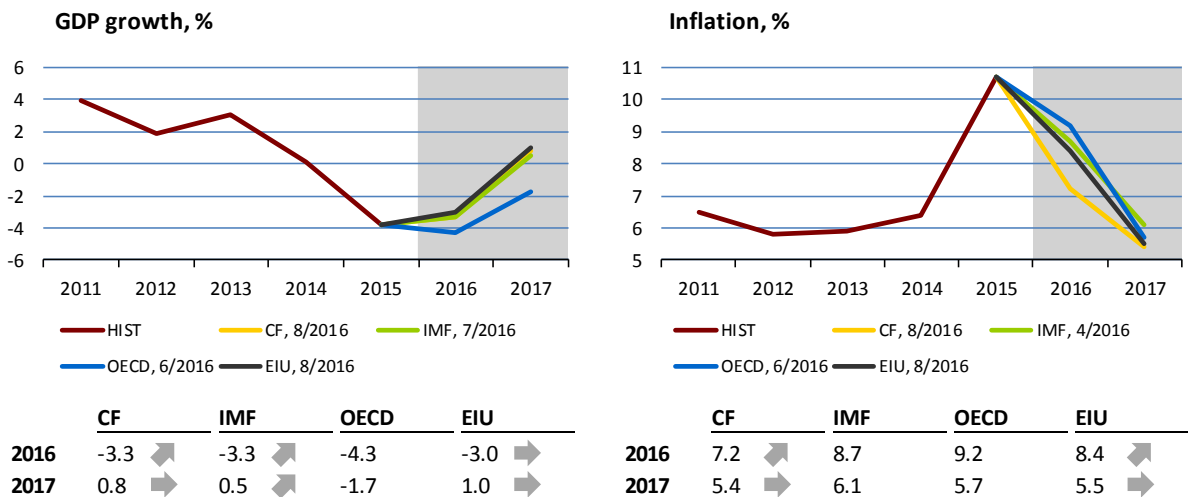|	CF		IMF	OECD	EIU	
2016	5.2	→	5.3	5.0	5.6	↗
2017	5.1	→	5.3	4.6	5.7	↗

III.3 Russia

The annual decline in Russian GDP moderated from 1.2% to 0.6% in Q2. According to the Russian Ministry of Economic Development, this was due to manufacturing, transport and agriculture, whereas retail turnover and construction had a negative impact. The ministry expects GDP to return to growth at the year-end, reducing the full-year contraction of the Russian economy to 0.2%. A return to positive figures is also forecasted by the Russian central bank. According to its estimate, quarterly growth will reach 0.4% in Q3 and 0.5% at the end of this year. The Markit PMI leading indicator also expects a recovery in economic activity. The overall index remained at 53.5 in July thanks to growth in new orders. In the same month, the PMI in services increased to 55, the highest level since February 2013. The new IMF outlook also expects the Russian economy to stabilise. Overall, the new CF, EIU and IMF outlooks expect a drop in GDP of 0.8%–1.2% this year. For 2017, they predict growth of 1.0%–1.2%. Inflation will gradually decline, but is still unlikely to hit the 4% target at the end of 2017.

GDP growth, %

Inflation, %

	CF		IMF		OECD		EIU	
2016	-0.8	↗	-1.2	↗	-1.7		-0.8	↗
2017	1.2	→	1.0	↗	0.5		1.1	→

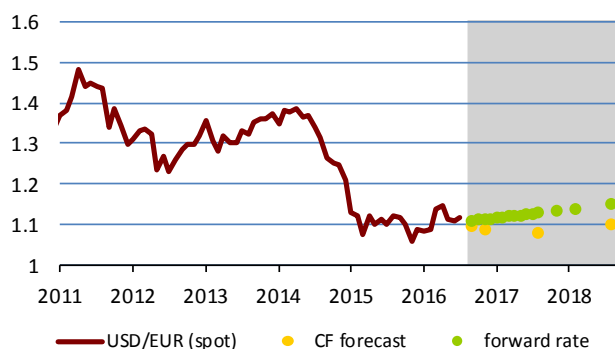|	CF		IMF		OECD		EIU	
2016	6.6	↘	8.4		7.3		7.2	→
2017	5.5	↗	6.5		5.3		5.8	↗

III.4 Brazil

Decline of the Brazilian economy has been moderating (q-o-q) for several quarters in a row now. The year-on-year decline in industrial production slowed to 6% in June and the productivity index rose by 4.8 points to 124.6 (June 1994 = 100). The decline in retail sales was also slower. Moreover, the July leading indicators – the PMI in manufacturing and the consumer and business sentiment indices – recorded better dynamics compared to June. However, the unemployment rate is still rising (11.3% in June). Nonetheless, the new IMF WEO also points to a slowing pace of deterioration of the economic situation and has therefore lowered the expected GDP contraction in 2016 from April's 3.8% to 3.3%. The other new outlooks (CF and the EIU) predict a decline of 3.3%–3.0%. The Brazilian central bank kept its policy rate unchanged at a 10-year high of 14.25% for the eighth consecutive meeting on concerns about high inflation and uncertainty surrounding the reform process. Still, the inflation outlook for 2016 remains above the target (4.5% ± 2 pp).
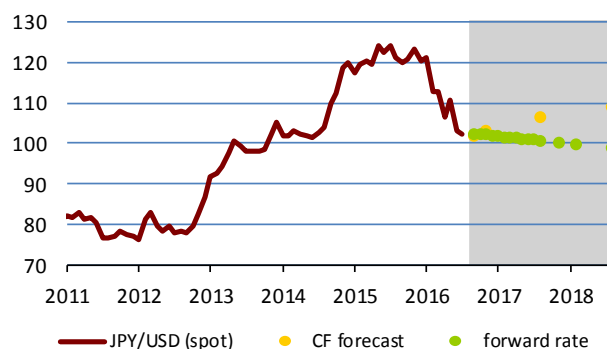
GDP growth, %

Inflation, %

	CF		IMF		OECD		EIU	
2016	-3.3	↗	-3.3	↗	-4.3		-3.0	→
2017	0.8	→	0.5	↗	-1.7		1.0	→

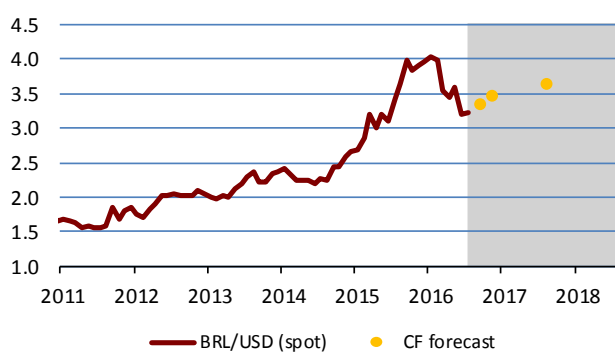|	CF		IMF		OECD		EIU	
2016	7.2	↗	8.7		9.2		8.4	↗
2017	5.4	→	6.1		5.7		5.5	→

IV. Outlook of exchange rates

The US dollar (USD/EUR)

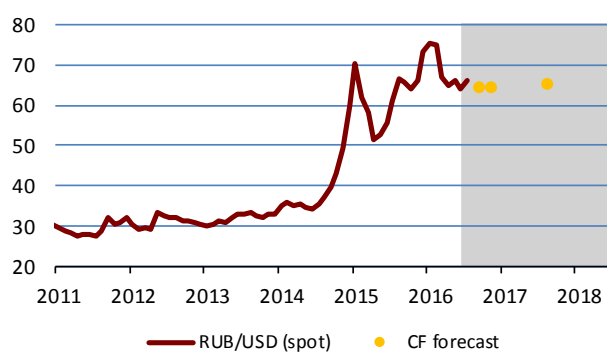|	8/8/16	09/16	11/16	08/17	08/18
spot rate	1.107				
CF forecast		1.095	1.087	1.081	1.100
forward rate		1.110	1.113	1.128	1.150

The Japanese yen (JPY/USD)

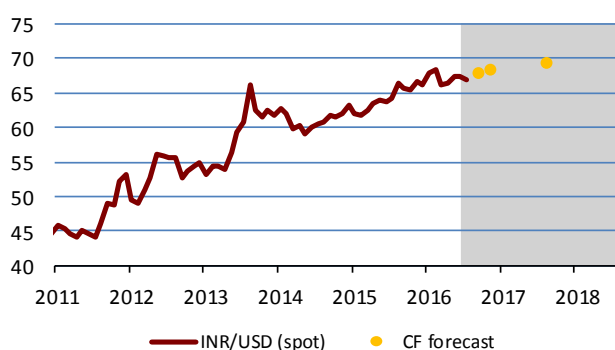|	8/8/16	09/16	11/16	08/17	08/18
spot rate	102.5				
CF forecast		101.9	102.9	106.4	108.8
forward rate		102.3	102.1	100.7	98.8

The Brazilian real (BRL/USD)

	8/8/16	09/16	11/16	08/17	08/18
spot rate	3.183				
CF forecast		3.347	3.463	3.635	3.917

The Russian rouble (RUB/USD)

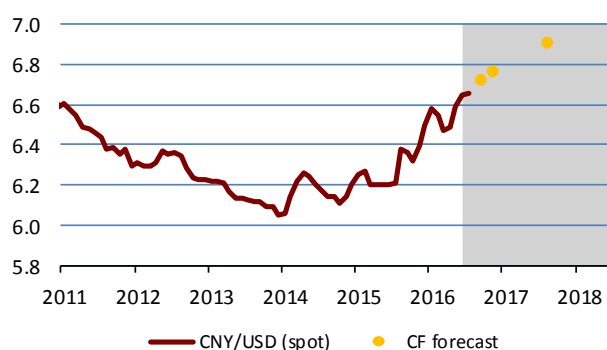|	8/8/16	09/16	11/16	08/17	08/18
spot rate	64.65				
CF forecast		64.34	64.52	65.42	68.67

The Indian rupie (INR/USD)

	8/8/16	09/16	11/16	08/17	08/18
spot rate	66.83				
CF forecast		67.75	68.27	69.28	69.23

The Chinese renminbi (CNY/USD)

	8/8/16	09/16	11/16	08/17	08/18
spot rate	6.662				
CF forecast		6.722	6.764	6.907	6.936

Exchange rates as of last day of month. Forward rate does not represent outlook; it is based on covered interest parity, i.e. currency of country with higher interest rate is depreciating. Forward rate represents current (as of cut-off date) possibility of hedging future exchange rate.
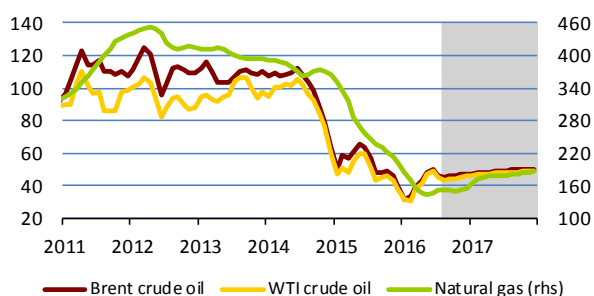
V.1 Oil and natural gas

The average monthly crude oil price dropped in July for the first time since January, when it hit a 12-year low. The drop was due mainly to lower-than-expected demand for petrol in the USA, high stocks of refined petroleum products during the main motoring season, increasing oil supply from OPEC and Russia and growth in the number of new shale oil rigs. In addition to fundamentals, the decline was driven by speculative investment funds, which continued to reduce their net long positions in both main oil markets. The rapid decline in oil prices halted in early August, and in the first half of the month prices partly erased their previous fall. In the short term, however, oil prices are expected to remain under pressure on concerns that refineries' petrol margins, which fell in both Europe and the USA in July (owing to high petrol stocks and despite the drop in oil prices), will result in refineries curbing oil processing still during the main motoring season.

The market futures curve of 8 August shifted downwards again compared to the previous month, implying an average Brent crude oil price of USD 43.7/bbl this year and USD 49.1/bbl next year. A bigger drop was recorded at the longer end of the curve. The EIA is expecting a lower average price for this year (USD 42/bbl), but faster growth in the price particularly in 2017 H2 (to an average of USD 52/bbl). The August CF forecast for the end of August 2017 (USD 51.9/bbl) is also higher than the market curve.

Prices of natural gas rose in July both at terminals in Europe, reflecting an outage at the UK's main storage site, and in the USA, where generation of electricity from gas increased due to above-average summer temperatures. Coal prices also went up.

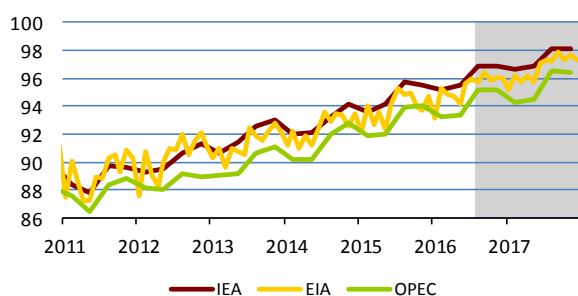**Outlook for prices of oil (USD/barrel) and natural gas (USD / 1000 m³)**

	Brent	WTI	Natural gas
2016	43.66	42.07	154.74
2017	49.10	47.97	178.73

Total stocks of oil and oil products in OECD (bil. barrel)
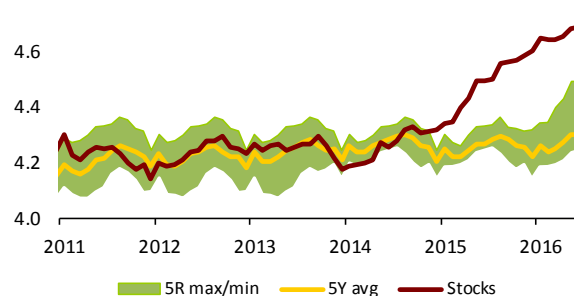
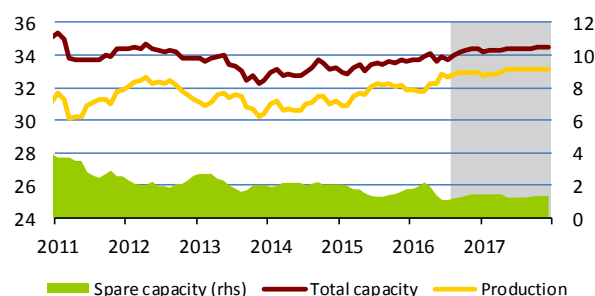**Global consumption of oil and oil products (mil. barrel / day)**

	IEA	EIA	OPEC
2016	96.13	95.31	94.25
2017	97.42	96.76	

Production, total and spare capacity in OPEC countries (mil. barrel / day)

	Production	Total capacity	Spare capacity
2016	32.47	33.98	1.51
2017	33.03	34.37	1.35

Note: Oil price in USD/barrel, price of Russian natural gas at German border in USD / 1,000 m³ (IMF data, smoothed by the HP filter). Future oil prices (grey area) are derived from futures and future gas prices are derived from oil prices using model. Total oil stocks (commercial and strategic) in OECD countries including average, maximum and minimum in past five years in billions of barrels. Global consumption of oil and oil products in millions of barrels a day. Production and extraction capacity of OPEC in million barrels a day (EIA estimate).
Source: Bloomberg, IEA, EIA, OPEC, CNB calculation

V. COMMODITY MARKET DEVELOPMENTS

V.2 Other commodities

The average monthly non-energy price index decreased in July and the first half of August, reflecting a similar trend in the food commodity price index. By contrast, the industrial metals price index rose to a 12-month high in July and was broadly flat in the first half of August.

Agricultural commodity prices fell in July and the first half of August due mainly to grain (only wheat prices were flat after a fall in June). Better weather in the USA fuelled expectations of bumper soy and corn harvests this year and the USDA raised its estimates of the area sown to corn, soy and wheat and of stocks of those grains in early June. The opposite was recorded for coffee prices, which rose due to a road hauliers' strike in Colombia and the risk of the harvest in Brazil being damaged by frost. Cotton prices went up in response to a drop in the expected harvest in India. Lean hog prices fell in line with the seasonal pattern.

Prices of most industrial metals rose in July due to a better outlook for manufacturing in China, where the July PMI moved out of the contraction band (48.6) into the expansion band (50.6) The PMI indicators for the USA and EU dropped in June, but continue to predict expansion of industrial output. In addition, metals prices continued to be supported by favourable trends in the Chinese property market. Prices of nickel rose by almost 15% as operations in seven mines in the Philippines were halted by the new government. Checks of compliance with environmental standards are expected in other mines. Nickel ore exports from the Philippines to China meanwhile grew in importance, as they are substituting for supplies from Indonesia, which are being restricted by the local government to support the construction of domestic nickel smelters. Iron ore prices also increased, as steel production in China went up by 1.7% year on year in June.

Non-energy commodities price indicies
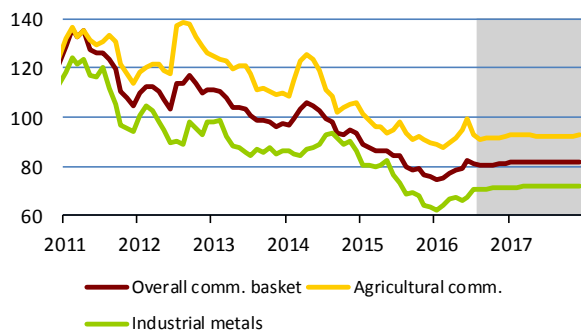
	Overall		Agricultural		Industrial	
2016	79.3	⬊	91.9	⬊	68.3	⬈
2017	81.8	⬊	92.5	⬊	72.0	⬈

Food commodities
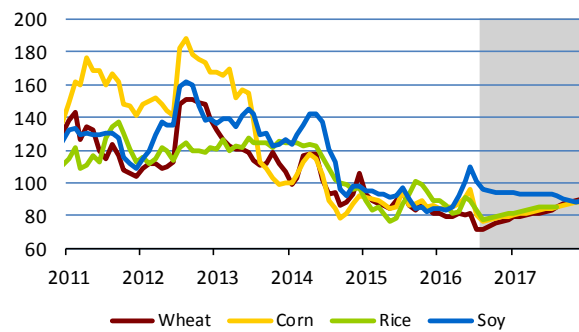
	Wheat		Corn		Rice		Soy	
2016	77.6	⬊	83.4	⬊	83.3	⬊	94.1	⬊
2017	84.2	⬊	84.5	⬊	84.1	⬊	91.8	⬊

Meat, non-food agricultural commodities
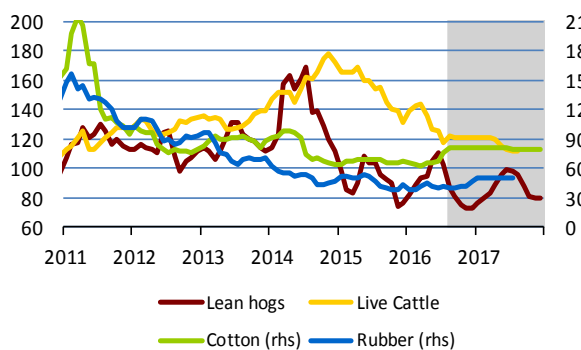
	Lean hogs		Live Cattle		Cotton		Rubber	
2016	88.9	⬊	128.3	⬈	72.7	⬈	41.7	⬈
2017	87.5	⬊	116.8	⬈	80.4	⬈	50.3	⬈

Basic metals and iron ore
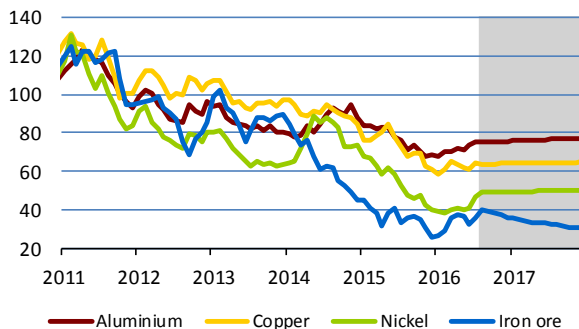
	Aluminium		Copper		Nickel		Iron ore	
2016	73.1	⬊	62.9	⬈	44.3	⬈	35.4	⬈
2017	76.5	⬊	64.7	⬈	49.8	⬈	32.9	⬈

Note: Structure of non-energy commodity price indices corresponds to composition of The Economist commodity indices. All prices are given as indices, 2010 = 100 (charts) and percentage changes (tables).
Source: Bloomberg, CNB calculations.

Seasonal agricultural commodity price movements[1]

Agricultural commodity prices are subject to very strong seasonal tendencies stemming from long-term fundamentals (in particular the planting and harvesting seasons). A seasonal movement is a tendency which, with some degree of probability, repeats every year. Knowledge of such price tendencies can serve as a good guide to forecasting how the price of a commodity will change in the future. Seasonal effects reflect certain seasons in the year when demand for a commodity is regularly higher or lower. This article sets out to identify long-term seasonal price patterns affecting the prices of selected agricultural commodities, to verify those cycles on the price movements observed so far this year and then to predict how commodity prices will change in the rest of the year given the long-term price cycles recorded in the past.

1   Seasonality

The seasonal component[2] of a time series describes periodic changes occurring over a single calendar year and repeating regularly every year. It is important to distinguish between seasonal effects and cyclical effects: the latter are either longer or shorter in length than one calendar year, i.e. the cycle length and intensity are variable. In the text below, seasonality will thus refer to the property of a time period (one calendar year) during which the price of an underlying asset (in this case a commodity) shows regular and predictable changes every year.

The general causes of seasonality include changes of season and related changes in the weather and the number of hours of sunlight and the associated planting and harvesting seasons. In this context, the analysis below focuses on seasonal tendencies in agricultural commodity prices, which are by nature very strongly affected by such phenomena.

2   Seasonal tendencies in commodity prices

The term "commodity" refers primarily to raw materials.[3] In the past, most commodities, grain in particular, were only traded in spot markets and in physical form. This has gradually been replaced by trading in derivatives that have physical commodities as their underlying assets. The most frequently used instrument through which commodities are traded today is the futures contract.[4] For this reason, the text below will analyse the evolution of commodity prices via the evolution of prices of futures contracts.

The concept of seasonality in the commodity market context involves the forecasting of future price movements based on long-term tendencies caused by repeating past price movements rather than on constant short-term reactions of prices to an infinite flow of often "contradictory" news about macroeconomic developments, expected stocks and so on. In addition, the commodity markets are affected by many factors which – in specific conditions and circumstances – repeat at regular annual intervals. In the case of agricultural commodities, the most visible influence is the climate type, i.e. the alternation of winter and summer seasons. For example, large post-harvest grain stocks dwindle over the rest of the year.

Seasonal price trends also reflect the ways in which a commodity is produced and distributed. In the case of grain, for example, a surge in supply at harvest time can lead to a decline in prices. Later, as the year progresses, prices can be expected to rise as the harvest is consumed. On some markets, therefore, there are periods during the year in which prices show substantial fluctuations – fluctuations that repeat every year. This implies that seasonal price tendencies are due mainly to fundamental factors, in this case production and consumption. Seasonal price patterns thus indicate specific times of year when prices are more likely to rise or fall. Analysis of seasonal tendencies in individual markets thus provides room for a better understanding of the main forces shaping the market for a particular commodity. The annual pattern of changing conditions can subsequently more or less pre-define the annual pattern of price behaviour. Seasonality can therefore be viewed as a *natural market rhythm*[5] based on the tendency of prices to move in the same direction in the same season each and every year. As such, it becomes a valid approach for objectively analysing any market. In a market that is strongly affected by annual cycles, seasonal price movement can become more than just a seasonality-based effect; over time it can become a fundamental condition of the market *per se*. Where producers and consumers identify a particular pattern of price behaviour, they tend to rely on it almost up to the point where they become dependent on it and

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[1] Author: Martin Motl (Martin.Motl@cnb.cz). The views expressed in this article are those of the author and do not necessarily reflect the official position of the Czech National Bank.
[2] See Anderson (1971).
[3] In addition to classic natural raw materials such as corn, cocoa, gold and oil, the commodity category includes currencies, bonds, stock indices and interest rates, i.e. financial commodities created by people.
[4] Futures are standardised contracts traded at a central location called a futures exchange. A commodity futures contract is an agreement to make or take delivery of a specific commodity on a specified future date. A futures contract thus means a commitment by one party (the seller) to deliver goods of specified amount and quality to the other party (the buyer) on a specified date (see Jones and Teweles, 1998).
[5] See Colley, Moore and Toepke (2006).

even amplify it with their trading in the commodity. For them, repeating price patterns thus represent some degree of predictability – they expect the price to change trend in the future and they subsequently adjust to such changes. As these changes repeat on a regular annual basis, this cycle of expectations and adjustment also constantly repeats.

On the other hand, the occurrence of the same regularly repeating price patterns would imply that each commodity is always produced and consumed under the same conditions. However, this may not be the case every year. Seasonal tendencies thus only give rise to a certain probability of how the price of a commodity may move in future. Otherwise, generally known seasonal tendencies would be smoothed out as soon as more and more traders started to participate in these regularly repeating movements through their trading activity. From this perspective, the life of a known annually repeating seasonal trend could be quite limited. However, as the next section shows, some seasonal patterns have remained almost unchanged over the years.

3 Calculation of seasonal price patterns of agricultural commodities

To assess the existence of long-term price patterns, we chose the three most traded agricultural commodities (corn, wheat and soy), for which the longest daily time series of futures prices is also available. Corn, soy and wheat futures are most traded on the Chicago Board of Trade (CBOT) futures exchange, which has been part of the Chicago Mercantile Exchange (CME)[6] since 2007. According to CME data on the average daily number of contracts traded, corn is the most traded agricultural commodity in the world. The number of corn contracts averaged 130,000 a day last year. By contrast, the average daily trading turnover in wheat and soy was about 70,000 contracts a day last year. One contract[7] for corn, wheat and soy represents 5,000 bushels, which is approximately 135 tonnes.

The available data history differs from commodity to commodity. Many commodity contracts started to be traded in the first half of the 1970s or in the early 1980s. Daily data on corn, wheat and soy futures prices have been available since 1959.

If seasonality means regularly repeating annual price patterns, two questions arise before we come to analysing it: (i) how many years to include in the seasonality calculation, and (ii) how to harmonise the time series for individual years, which can differ from year to year (due to leap years, to weekends and holidays falling on different days, etc.). To obtain the best possible estimate of the long-term seasonal price tendency, it is optimal to work with the longest possible data history available for the chosen commodity. To harmonise the data for each season of the year, it is best to compare data of daily frequency corresponding to the calendar year, which has 365 days. A seasonal price pattern can thus illustrate not only the four main phases of cyclical seasonal price movement, but also other fine characteristics accompanying the long-term seasonal trend.[8]

The identification of long-term fundamental trends, which are temporally intermixed with contrary short-term price fluctuations, thus provides a more robust and reliable view of the seasonal price pattern. On the other hand, there are situations where seasonal growth is interrupted by short-term price declines. For example, future growth trends are regularly interrupted by "artificial" selling pressures associated with the First Notice Day[9] for the closest contract months, or by selling pressures generated by the liquidation of positions to avoid delivery of the commodity, which may offer profit collection opportunities with subsequent re-entry and renewal of the trading position. As each commodity has a different number of contract months (i.e. months during which the commodity is delivered and no longer traded), the analysis of seasonality will also take into account the continuous time series created by connecting up the most liquid futures traded in a given time interval. In the case of corn and wheat, there are five contract months a one year. In the case of soy, contracts are rolled over to the next contract month seven times a year.

As prices show different degrees of volatility in different years, the absolute values of commodity prices will be converted into a normalised index to obtain the long-term seasonal price pattern. The normalised index will thus represent the converted absolute values of the commodity price in individual years on a scale of 0–100%. The converted data will then make it possible to identify significant long-term seasonal tendencies in the underlying asset, in this case the price of the chosen commodity.

3.1 Corn

The long-term seasonal tendencies in the corn market are plotted in Chart 1. The horizontal axis shows the calendar year, i.e. from 1 January to 31 December. The vertical axis depicts the 0–100 scale for the numerical normalised index describing when prices were close to their peak (index = 100) during the year

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[6] Movements of agricultural commodity prices on the Chicago exchange represent the global benchmark, so the following analysis will cover the market in the USA. Prices of these commodities show similar movements in other parts of the world owing to arbitrage.
[7] See Chicago Mercantile Exchange Group (2016) for more information.
[8] See Motl (2015).
[9] The notice given to futures holders by the commodity exchange that the date of delivery of the underlying asset (commodity) is approaching. This notice usually comes 1−3 days before the day on which the commodity is to be delivered.

and, conversely, when prices hit their low (index = 0). The longest seasonal tendency obtained for the corn price is the price pattern depicted by the blue line, which shows the average annual corn price cycle over the individual months of the year calculated from the normalised price indices for corn prices over the last 56 years (i.e. the maximum available data sample). To examine whether seasonal corn price tendencies change over time, the chart also shows a shorter period describing the 30-year average seasonal price pattern based on corn prices in 1986–2015 (the green line) and also the 10-year average seasonal price pattern based on corn prices in 2006–2015 (the grey line). The path of the price of corn so far this year, i.e. until the end of July, is depicted by the red line.

Corn price movements over the year primarily reflect the commodity's planting and harvesting seasons. Corn crops in the USA tend to be planted in April and May and harvested in October and November. This determines the seasonal pattern. The price is usually the lowest when supply is high during the harvest. The price tends to go up as soon as supply declines. In May, a drop in stocks may cause nervousness in the market in connection with estimates of future production. However, corn is planted at the same time, i.e. the market has some knowledge of how large the planted area will be and whether the conditions for growing the crop will be favourable during the year. The price tends to go up if the weather outlook for the year is favourable and hence the future crop estimate is higher, and tends to go down in the opposite case. The corn price this year has been characterised by growth in the first half of the year, which accelerated markedly as the planting season (April/May) approached. Prices hit their market peak in July and then fell sharply in line with the seasonal pattern. From the point of view of long-term seasonality, the corn price is not expected to increase before the end of the harvest season (October/November), when it tends to hit its annual low.
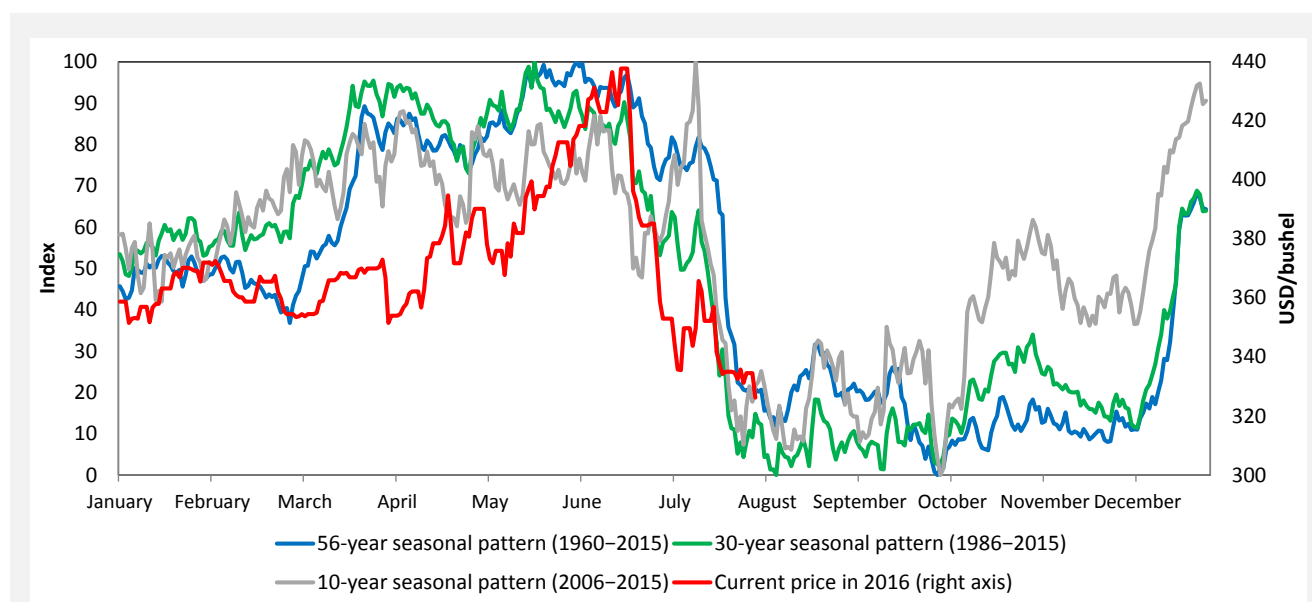

Chart 1 Seasonal corn price patterns
Source: Bloomberg, authors' calculations

3.2   Wheat

A different long-term seasonal cycle can be seen for wheat prices (see Chart 2). Unlike corn, wheat comes in two types: winter and spring. Winter wheat is planted in September and October. Long-term growth tendencies reflecting low wheat supply in the market can be observed in this period. As soon as winter wheat is planted, market participants start to estimate the size of future production. Young wheat shoots survive the winter in the ground until spring, with the snow blanket serving to insulate and protect the plants. Insufficient snow cover may, however, damage the roots of the wheat shoots if the soil alternately thaws and freezes during a mild winter. The future of the new winter wheat crop is therefore the most vulnerable at this time. The harvest season for winter wheat occurs in June and July, when the price tends to reach its seasonal low. Spring wheat is planted between April and June and harvested in August and September. The wheat price tends to reach its seasonal low in July/August, between the winter wheat and spring wheat harvests. This long-term seasonal trend is also shown by this year's wheat price, which dropped sharply in July (see the red line). The price then usually starts to rise as the main export season begins. Growth is therefore expected in the subsequent months of this year as well. The wheat price tends to hit its seasonal high in December, when winter wheat enters its dormancy period and before supply starts to increase due to wheat exports from the southern hemisphere. At the start of the new year, the wheat price tends to fall owing to rising supply, as producers delay the sale of production before the end of the previous year until the start of the new taxation period due to tax optimisation, as well as to further
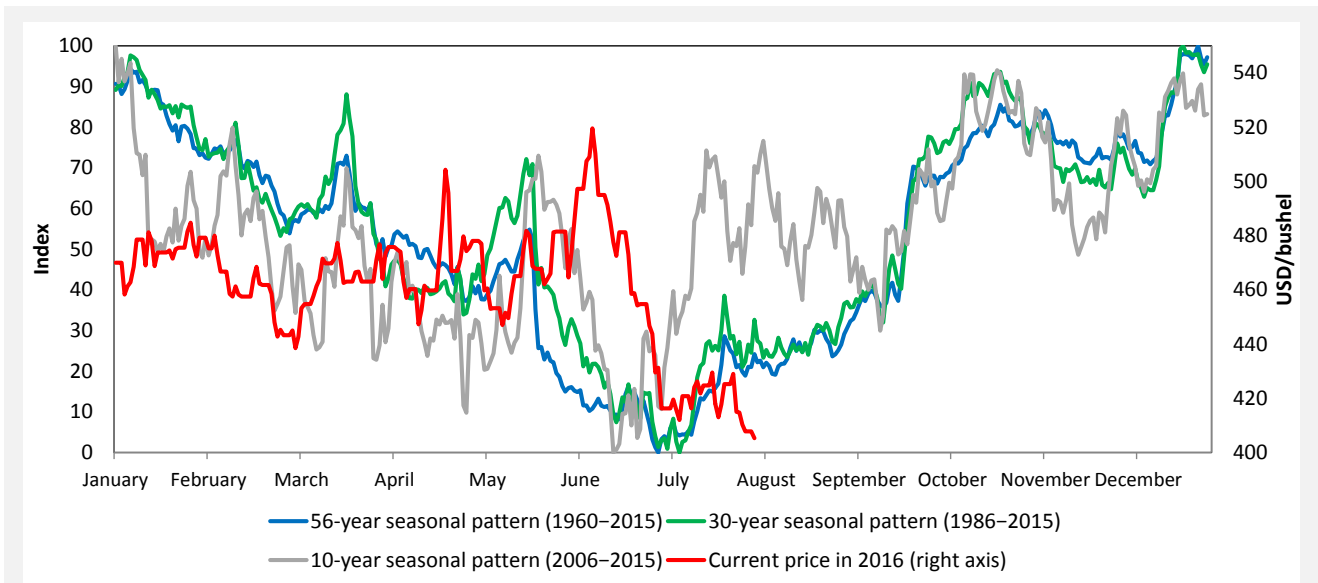
Chart 2 Seasonal wheat price patterns

Source: Bloomberg, authors' calculations

growth in wheat exports from the southern hemisphere and to the approaching harvest season in the northern hemisphere.

3.3   Soy

A very stable long-term seasonal cycle is observed for soy prices (see Chart 3). Soybeans are planted in the USA between late April and early June. The price tends to reach its seasonal peak in this period every year, a pattern also shown this year (see the red line). The soybean harvest starts in late September and ends in early November. The soybean price thus usually hits its low during October, when the harvest peaks and supply is at its highest.

As the start of November draws near, growth in stocks slackens while demand from commercial processors gradually picks up. Demand in the soybean market peaks during and immediately after the harvest. The market then starts to weaken in December as producers sell their stocks in an effort to optimise taxes before the year-end and as the supply of soybeans from South America increases. The price tends to rise again after the February price turnaround and keep increasing until the new planting season. As stocks are drawn down, supply reaches its annual low and the price usually remains at its seasonal maximum until mid-July. However, unless the weather worsens, the price drops in August due to falling demand, with
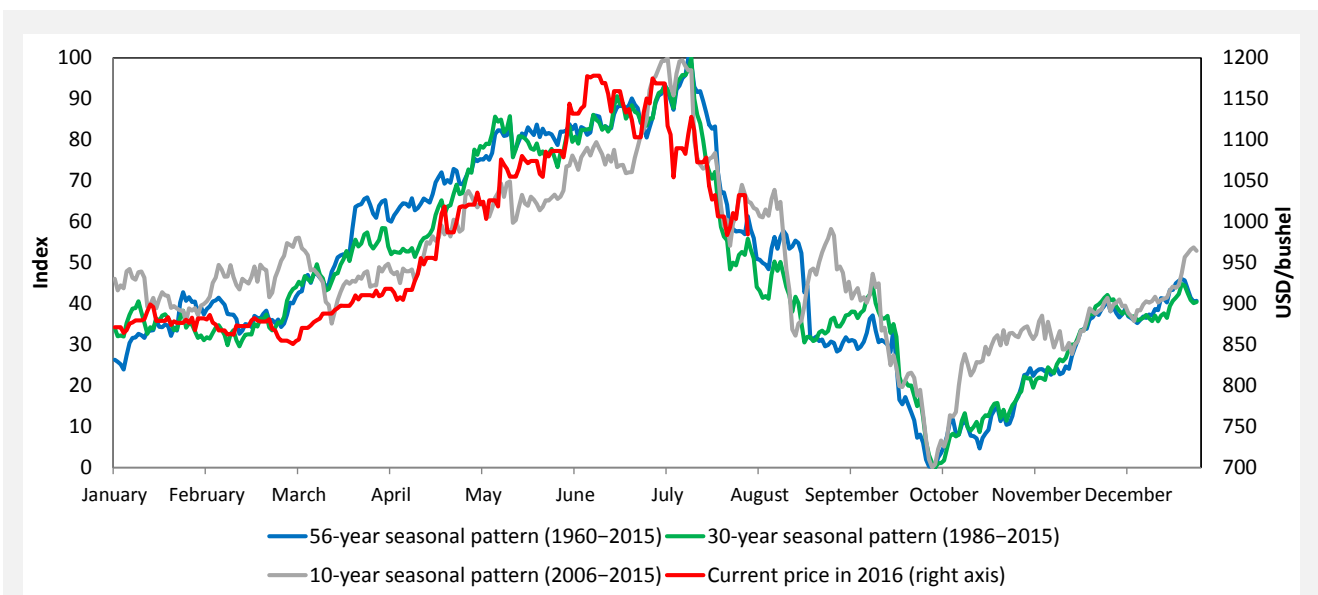

Chart 3 Seasonal soy price patterns

Source: Bloomberg, authors' calculations

processors reducing production capacity as they carry out maintenance work and prepare for the start of the harvest season. This short-lived drop is followed by a modest price recovery, which usually lasts until early September, when processors increase production capacity again after completing their maintenance work. The soybean price then tends to fall from September until the harvesting season.

4   Conclusion

The above analysis of seasonality using the example of the most traded agricultural commodities confirms the existence of long-term and marked seasonal tendencies that strongly affect the commodity price every year. However, although some of the typical seasonal tendencies identified in the past are very strong, it is never certain that they will repeat in exactly the same way every year. In the analysis, the long-term seasonal cycle was obtained by using the maximum sample of daily data since 1960 for each selected commodity. The seasonal cycle for the last 56 years was then compared with shorter data samples covering the last 30 and 10 years. The three seasonal cycles identified were subsequently confronted with prices of selected agricultural commodities in the first seven months of this year. This year's price developments largely copy the long-term seasonal cycle in all cases. The strongest correspondence was recorded for soybean and corn prices. As for wheat prices, a delay of about one month compared to the long-term seasonal cycle can be seen this year. However, the price profile remains almost identical.

From the point of view of the long-term seasonal cycle, the price of corn is expected to be subdued until the end of October. After the harvest season, demand starts to accelerate and the corn price tends to rise. By contrast, wheat prices are currently expected to increase, as they tend to hit their seasonal low in July/August, i.e. between the winter and spring wheat harvests. The price is expected to return to growth in September and keep increasing until the year-end, when it usually reaches its seasonal peak. In the case of soybean prices, a decline from the highs recorded in late July can also be observed this year. In line with the long-term seasonal cycle, the price is expected to continue to fall until the harvest in October, when it tends to reach an annual low as supply peaks.

Seasonality should thus be viewed generally as something that can help us understand the current evolution of the price of a commodity. Seasonal tendencies simply reflect what happened in the past. This allows us to see easily the significant price patterns caused by seasonal effects. Seasonal tendencies do not change from day to day, week to week, or year to year. They are very long-term and – with some probability – regularly repeating movements in the price of a commodity. Knowledge of these price tendencies thus can serve as a good guide to forecasting how the price of an underlying asset will change in the future. The fact that the price tendency can change over time may in general be due, for example, to changes in the ranking of the largest global producers of the commodity. Other possible reasons include technological progress in, say, storage, production or harvesting, the use of agricultural commodities for non-food purposes (biofuels, lubricants, pharmaceuticals, industrial use, etc.) or other factors, such as political instability in the countries of major commodity producers. The use of time periods of various lengths in the calculation of the seasonal price pattern (see, for example, the 56-, 30-and 10-year average price patterns used in the analysis) thus allows us to monitor stability and robustness by comparing individual results and to identify significant structural changes arising for the reasons given above. In recent years, particularly since 2000, the long-term seasonal tendencies in individual commodities may also have been "suppressed" by rising activity by non-commercial entities[10] trading in commodities based on technical analysis and mathematical models (algorithm trading), which can trade against seasonality or increase price volatility, i.e. by the financialisation of commodities.[11] However, the above examples of corn, wheat and soy prices show that the seasonal patterns have not changed significantly in the 56-year period under review – see, for example, the comparison of the 56-year and 10-year average seasonal price patterns.

However, the concept of analysing the seasonality of commodity price movements has its limits, the main ones being time misalignment of individual trends in given years and frequent stronger or weaker counter-seasonal movements. For example, some summers are warmer (extreme drought) and some are colder. In the case of agricultural commodities, producers and processors tend to try to push down prices of a commodity so that they can buy it more cheaply Governments can also affect seasonality in various commodity markets with their policies. In an effort to dampen seasonality, they try to smooth the supply of commodities by supporting massive storage programmes. Government subsidies and protection measures also alter the seasonality displayed by commodities. However, the primary factor affecting seasonality is still the weather. Climatic conditions can ultimately outweigh any efforts made by the biggest commercial interests, production cartels and governments.

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[10] According to the definition of the U.S. Commodity Futures Trading Commission (CFTC), these include, for example, hedge funds, indexed commodity funds and banks.
[11] See Motl (2013).

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A1. Change in GDP predictions for 2016

	CF		IMF		OECD		CB / EIU	
EA	0	2016/8 2016/7	+0.1	2016/7 2016/4	+0.2	2016/6 2016/2	+0.2	2016/6 2016/3
US	-0.4	2016/8 2016/7	-0.2	2016/7 2016/4	-0.2	2016/6 2016/2	-0.2	2016/6 2016/3
DE	0	2016/8 2016/7	+0.1	2016/7 2016/4	+0.3	2016/6 2016/2	-0.1	2016/6 2015/12
JP	0	2016/8 2016/7	-0.2	2016/7 2016/4	-0.1	2016/6 2016/2	-0.2	2016/7 2016/4
BR	+0.1	2016/8 2016/7	+0.5	2016/7 2016/4	-0.3	2016/6 2016/2	0	2016/8 2016/7
RU	+0.1	2016/8 2016/7	+0.6	2016/7 2016/4	-1.3	2016/6 2015/11	-0.1	2016/8 2016/7
IN	-0.1	2016/8 2016/7	-0.1	2016/7 2016/4	0	2016/6 2016/2	-0.1	2016/8 2016/7
CN	+0.1	2016/8 2016/7	+0.1	2016/7 2016/4	0	2016/6 2016/2	-0.1	2016/8 2016/7

A2. Change in inflation predictions for 2016

	CF		IMF		OECD		CB / EIU	
EA	-0.1	2016/8 2016/7	-0.6	2016/4 2015/9	-0.7	2016/6 2015/11	+0.1	2016/6 2016/3
US	-0.1	2016/8 2016/7	-0.3	2016/4 2015/9	+0.1	2016/6 2015/11	+0.2	2016/6 2016/3
DE	0	2016/8 2016/7	-0.7	2016/4 2015/9	-0.7	2016/6 2015/11	-0.9	2016/6 2015/12
JP	0	2016/8 2016/7	-0.6	2016/4 2015/9	-0.6	2016/6 2015/11	-0.4	2016/7 2016/4
BR	+0.1	2016/8 2016/7	+2.4	2016/4 2015/9	+3.4	2016/6 2015/11	+0.2	2016/8 2016/7
RU	-0.2	2016/8 2016/7	-0.2	2016/4 2015/9	-2.2	2016/6 2015/11	0	2016/8 2016/7
IN	0	2016/8 2016/7	-0.2	2016/4 2015/9	+0.1	2016/6 2015/11	+0.5	2016/8 2016/7
CN	0	2016/8 2016/7	0	2016/4 2015/9	+0.1	2016/6 2015/11	0	2016/8 2016/7

A3. List of abbreviations

ABS	asset-backed securities		**HICP**	harmonised index of consumer prices
bbl	barrel		**CHF**	Swiss franc
BoJ	Bank of Japan		**ICE**	Intercontinental Exchange
BR	Brazil		**IEA**	International Energy Agency
BRIC	countries of Brazil, Russia, India and China		**IFO**	Institute for Economic Research
BRL	Brazilian real		**IFO-BE**	IFO Business Expectations
			IMF	International Monetary Fund
CB	central bank		**IN**	India
CB-CCI	Conference Board Consumer Confidence Index		**INR**	Indian rupee
CB-LEII	Conference Board Leading Economic Indicator Index		**IRS**	Interest Rate swap
			ISM	Institute for Supply Management
CBOT	Chicago Board of Trade		**JP**	Japan
CBR	Central Bank of Russia		**JPY**	Japanese yen
CF	Consensus Forecasts		**LI**	leading indicators
CN	China		**LIBOR**	London Interbank Offered Rate
CNB	Czech National Bank		**MER**	Ministry of Economic Development (of Russia)
CNY	Chinese renminbi			
DBB	Deutsche Bundesbank		**MMBtu**	million of British Thermal Units
DE	Germany		**OECD**	Organisation for Economic Co-operation and Development
EA	euro area			
EBRD	European Bank for Reconstruction and Development		**OECD-CLI**	OECD Composite Leading Indicator
EC	European Commission		**PMI**	Purchasing Managers' Index
ECB	European Central Bank		**PPI**	producer price index
EC-CCI	European Commission Consumer Confidence Indicator		**QE**	quantitative easing
			RU	Russia
EC-ICI	European Commission Industrial Confidence Indicator		**RUB**	Russian rouble
EIA	Energy Information Administration		**TLTRO**	targeted longer-term refinancing operations
EIU	Economist Intelligence Unit		**UoM**	University of Michigan
EU	European Union		**UoM-CSI**	University of Michigan Consumer Sentiment Index
EUR	euro			
EURIBOR	Euro Interbank Offered Rate		**US**	United States
Fed	Federal Reserve System (the US central bank)		**USD**	US dollar
			USDA	United States Department of Agriculture
FOMC	Federal Open Market Committee		**WEO**	World Economic Outlook
FRA	forward rate agreement		**WTI**	West Texas Intermediate (crude oil used as a benchmark in oil pricing)
FY	fiscal year			
GBP	pound sterling		**ZEW-ES**	ZEW Economic Sentiment
GDP	gross domestic product			

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