GLOBAL ECONOMIC OUTLOOK - JUNE

Monetary Department
External Economic Relations Division

2015

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NATIONAL BANK

Cut-off date for data
8 - 12 June 2015

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08 June 2015

GEO publication date
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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.
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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I. SUMMARY

The June issue of Global Economic Outlook presents its regular overview of recent and expected developments in selected territories, focusing on economic fundamentals: inflation, GDP growth, leading indicators, interest rates, exchange rates and commodity prices. In this issue, we also analyse seasonal price patterns on commodity markets, primarily the WTI oil market. We conclude, among other things, that WTI oil prices display long-term and marked seasonal tendencies.
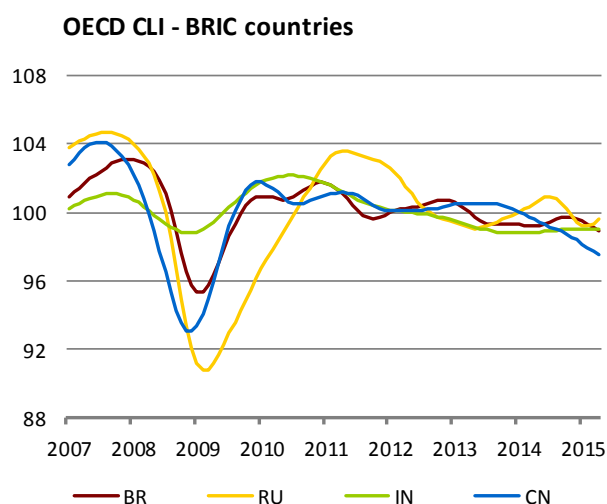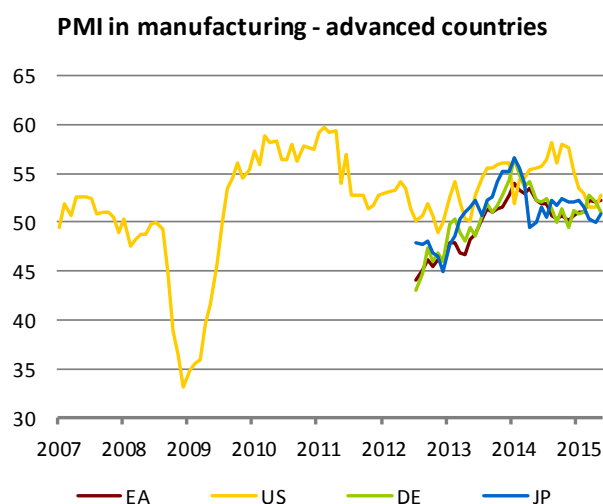
The growth and inflation outlooks for the monitored advanced economies in 2015 as a whole were left unchanged, or revised upwards in the case of Japan and the euro area. Continued quantitative easing by the ECB and a weaker euro contributed to the improvement in the euro area outlook. Running counter to these favourable trends are economic developments in Germany and the USA, whose GDP outlooks for this year were reduced slightly (although the PMI in industry is still in the expansionary band). However, the overall assessment of the economic growth outlooks for advanced countries is favourable, especially for 2016, when they will be close to 2% (and almost 1 pp higher for the USA). New data on prices continue to show that consumer price inflation in advanced countries will be very low this year. It will not rise towards 2% until 2016. However, inflation in the euro area will remain visibly distant from that level at this horizon.

The two-year outlooks for emerging BRIC countries remain mixed. The Indian economy replaced China, whose economic outlooks fell below 7% amid inflation of just under 2%, as the leader of this group. The growth rate of the Indian economy will gradually increase to just above 8% amid stable consumer price inflation just above 5%. By contrast, updated outlooks confirm that the Russian economy and the Brazilian economy will not avoid recession this year. Moreover, the two countries will face high inflation this year (double figures in the case of Russia). The outlooks for both countries for 2016 bring some optimism, as economic growth should rebound and inflation should drop visibly.

The outlook for euro area interest rates remains very low, but there are signs of possible growth at the end of 2016 owing to the ECB's quantitative easing. If the improving economic outlooks for the USA materialise, the chance of the first increase in Fed rates occurring in the second half of this year is also increasing. According to CF, the dollar will appreciate very slightly at the one-year horizon against the euro and is also expected to appreciate slightly against all the other monitored currencies except the Chinese renminbi and the Indian rupee, against which it should be broadly flat.

The oil price outlook remains slightly rising and oil prices should be close to USD 67 a barrel at the one-year horizon. Natural gas prices based on long-term contracts normally lag behind oil prices by 6 to 9 months and are therefore expected to decrease further in the next few months below USD 200 per 1000 m3 and to start rising again in late 2015. The non-energy commodity price index will rise somewhat at the one-year horizon, owing chiefly to the food commodity price index. The industrial metals index will record a downward correction following a recent short episode of growth.

Leading indicators for countries monitored in the GEO

PMI in manufacturing - advanced countries

OECD CLI - BRIC countries


Zdroj: Bloomberg, Datastream

II.1 Eurozone

The new CF, OECD and ECB forecasts remain unchanged or contain upward revisions of the GDP growth and inflation outlooks. Euro area economic growth will be favourably affected this year by lower oil prices and a weaker euro, owing largely to the ECB's very accommodative monetary policy. GDP growth in the euro area is expected to reach 1.5% this year and accelerate slightly further next year. Inflation is projected to increase only marginally in 2015 and exceed 1% in 2016. In the first quarter of 2015, GDP growth increased by 0.3 pp to 0.7% quarter on quarter. Annual GDP growth also picked up pace, reaching 1.4%. The biggest contributor to the year-on-year growth was household consumption, followed by government consumption and gross fixed capital formation. By contrast, the contribution of net exports was negative. Industrial production declined month on month in March, but its year-on-year growth rate rose to 1.8%. The PMI in manufacturing increased slightly in the expansionary band, so we expect good industrial production figures in the months ahead. Growth in retail sales improved quite significantly in April in both month-on-month and year-on-year terms. Together with improving consumer sentiment and a slight fall in the unemployment rate in April, this is signalling continuing growth in household consumption. The gradual growth in a surplus of euro area net exports is continuing and reached 3.9% of GDP in annual cumulative terms in 2014 Q4. A broad easing of the financing conditions, a recovery in inflation expectations and more favourable credit conditions for corporations and households have been fostered by the ECB's monetary policy measures. Annual M3 growth increased further to 5.3% in April. In the same month of last year, the growth rate had been just 0.8%. Euro area HICP inflation was 0.3% in May 2015, turning positive for the first time since it bottomed out (at -0.6%) in January 2015 and following stagnation in April 2015. Inflation excluding food and energy prices also went up – by 0.3 pp to 0.9%. The ECB left its key interest rates unchanged in June and confirmed its commitment to continue its asset purchases according to the plan presented earlier. The outlook for the 10Y Bund at the one-year horizon is therefore still below 1%.

GDP growth, %

Inflation, %
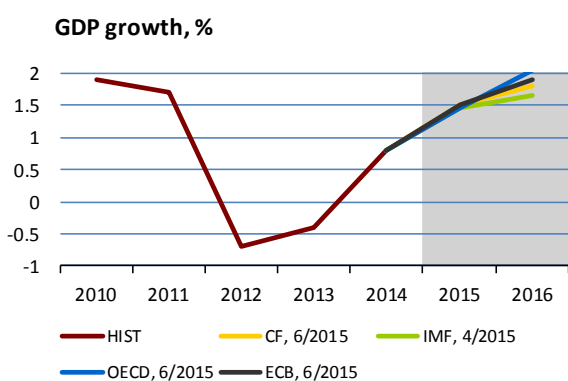
	CF	IMF	OECD	ECB
2015	1.5	1.5	1.4	1.5
2016	1.8	1.7	2.1	1.9
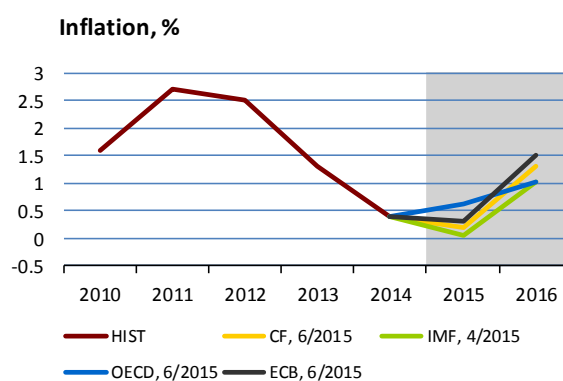
	CF	IMF	OECD	ECB
2015	0.2	0.1	0.6	0.3
2016	1.3	1.0	1.0	1.5

Leading indicators

Interest Rates
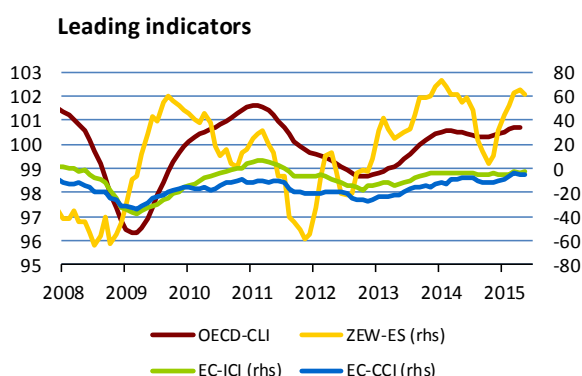
	OECD-CLI	EC-ICI	EC-CCI	ZEW-ES
3/15	100.7	-2.9	-3.7	62.4
4/15	100.7	-3.2	-4.6	64.8
5/15		-3.0	-5.5	61.2
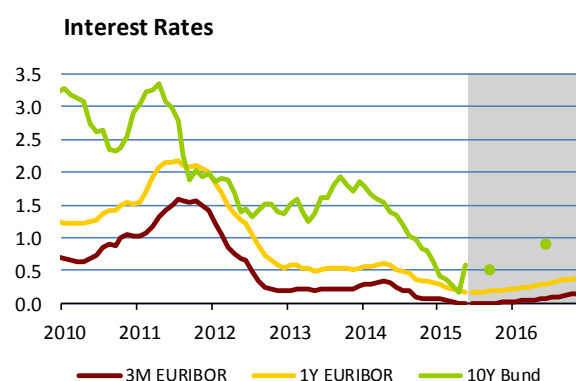
	05/15	06/15	12/15	06/16	12/16
3M EURIBOR	-0.01	-0.01	0.03	0.08	0.17
1Y EURIBOR	0.17	0.16	0.22	0.30	0.42

	05/15	09/15	06/16
10Y Bund	0.58	0.50	0.90

II. ECONOMIC OUTLOOK IN ADVANCED ECONOMIES

II.2 United States

According to the second estimate of GDP growth, the US economy contracted by 0.7% in annualised terms in 2015 Q1 (the first estimate had indicated growth of 0.2%). This fall partly reflects temporary factors (weather fluctuations during the winter and strikes in West Coast harbours) and lower investment in the extraction industry due to falling oil prices. At the same time, the economy is being adversely affected by a strong dollar, which is reducing the competitiveness of US exporters. However, the narrowing of the trade deficit by 20% in April is a source of hope that the impact of the strong dollar on GDP growth in Q2 may not be as large as expected. Other indicators for Q2 are also relatively favourable, suggesting that the economic contraction in Q1 was only temporary. The May labour market figures were particularly optimistic, with employment growth rising markedly (to 280,000 in May). The PMI in manufacturing increased in May for the first time since October (to 52.8); among its components, new orders and employment were particularly positive. The latest Conference Board leading indicator (LEI) and consumer sentiment index both improved slightly. The new growth outlooks (CF, OECD) for this year were revised downwards after taking into account the weak Q1. US economic growth is expected to be around 2% this year and to rise by roughly 0.5 pp next year.

CPI inflation remained negative in April (-0.1%), but core inflation edged up further (to 1.8%). Together with the improving economic growth, this increases the chance of the first increase in Fed rates occurring in the second half of this year. As in other countries, government bond yields rose due to sell-off in the period under review. The dollar was relatively stable against the euro last month (at around USD 1.1 to the euro) and the June CF expects further slight appreciation of the dollar at the one-year horizon.

GDP growth, %
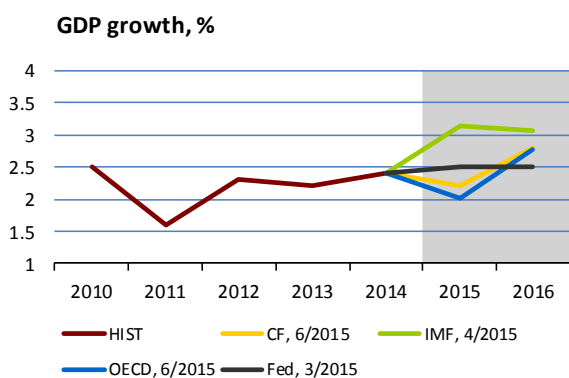
	CF		IMF	OECD		Fed
2015	2.2	↘	3.1	2.0	↗	2.5
2016	2.8	➡	3.1	2.8	↘	2.5

Inflation, %
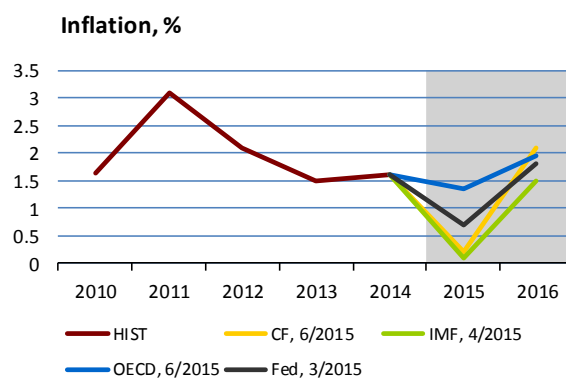
	CF		IMF	OECD		Fed
2015	0.2	➡	0.1	1.4	↘	0.7
2016	2.1	↘	1.5	2.0	↘	1.8

Leading indicators
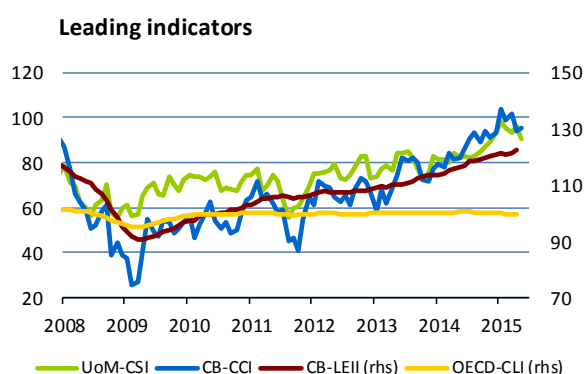
	CB-LEII	OECD-CLI	UoM-CSI	CB-CCI
3/15	121.5	99.7	93.0	101.4
4/15	122.3	99.6	95.9	94.3
5/15			90.7	95.4

Interest Rates
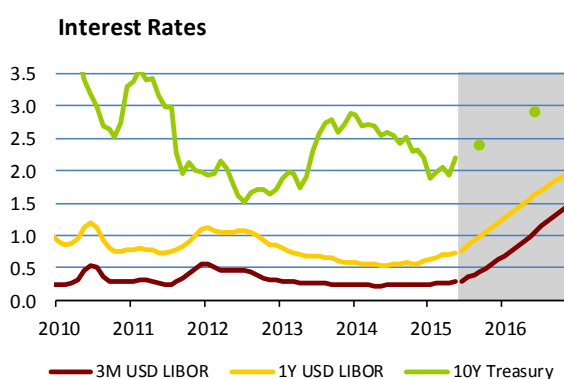
	05/15	06/15	12/15	06/16	12/16
3M USD LIBOR	0.28	0.28	0.63	1.06	1.50
1Y USD LIBOR	0.73	0.75	1.19	1.63	2.01
	05/15	09/15	06/16		
10Y Treasury	2.20	2.40	2.90		

II.3 Germany

Economic growth in Germany slowed in 2015 Q1. The quarterly growth rate fell from 0.7% to 0.3%, due mainly to a drop in inventories. Annual economic growth also weakened in Q1 (by 0.5 pp to 1%), owing to a slower rise in domestic demand. The June CF expects a return to stronger quarterly and annual growth in Q2. It predicts strong GDP growth of 1.9% for this year as a whole, driven by a substantial rise in household consumption, low energy prices and a weakened euro. The evolution of leading indicators is somewhat reducing the very favourable outlook seen at the start of this year. The June CF thus lowered expected economic growth by 0.1 pp to 1.9% compared to May. Inflation rose again by 0.2 pp to 0.7% in May. CF expects it to average 0.5% this year.

GDP growth, %

Inflation, %

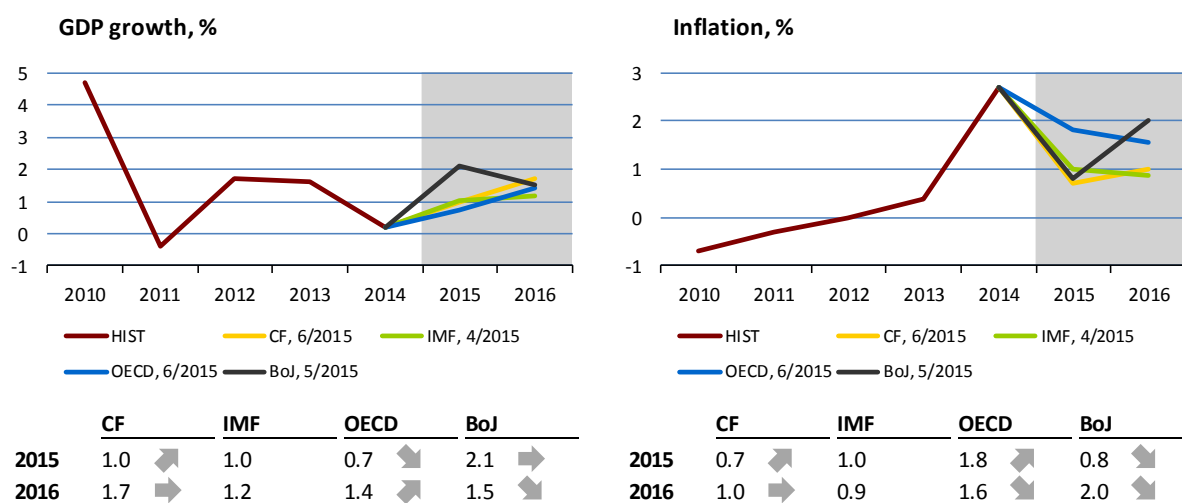|	CF		IMF	OECD		DBB	
2015	1.9	⬇	1.6	1.6	⬇	1.7	⬈
2016	2.0	➡	1.7	2.3	⬈	1.8	⬆

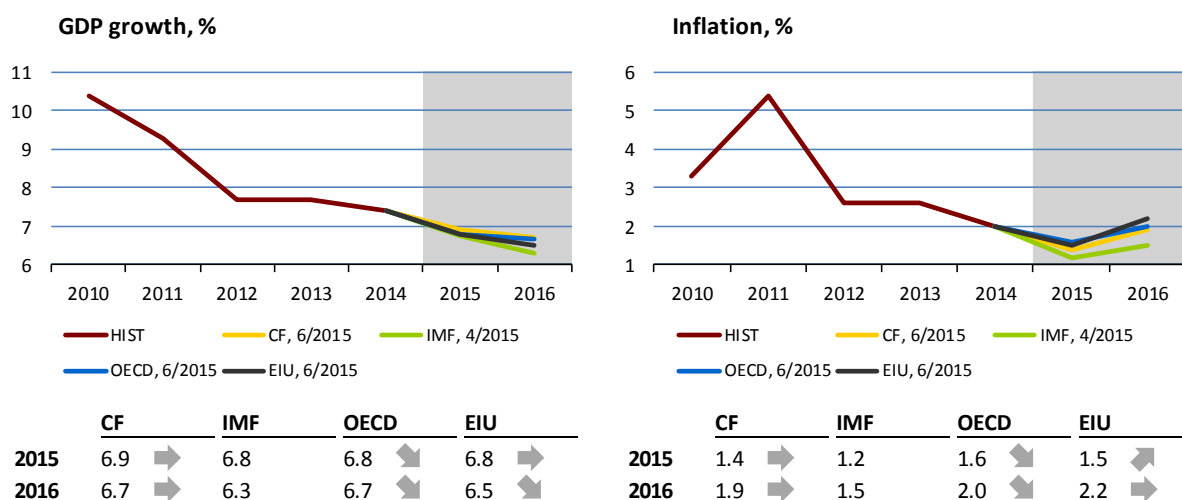|	CF		IMF	OECD		DBB	
2015	0.5	⬈	0.2	1.2	⬈	0.5	⬇
2016	1.7	⬈	1.3	1.7	⬈	1.8	➡
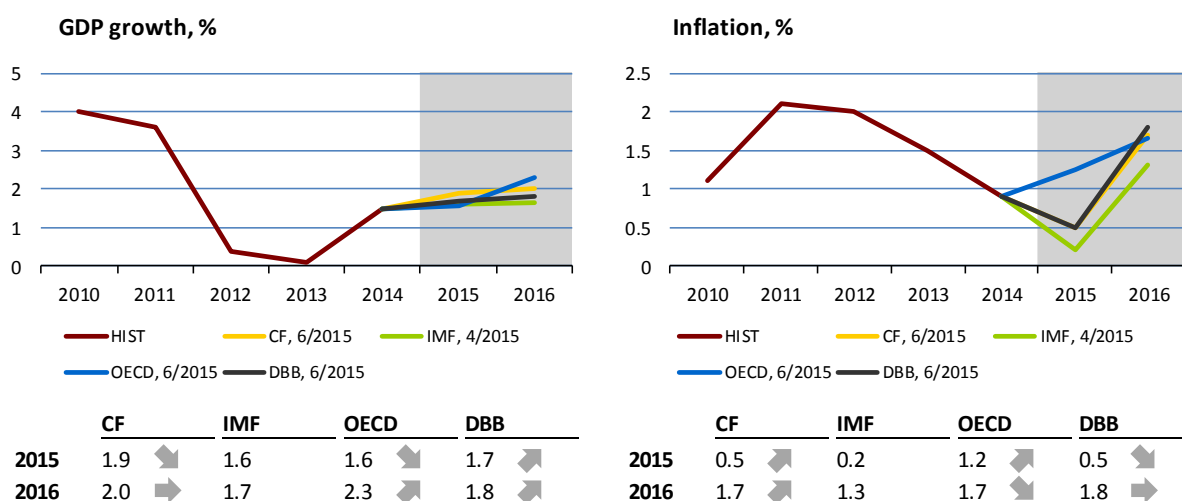
II.4 Japan

In 2015 Q1 the Japanese economy grew at the fastest pace in a year – by 1% compared to the previous quarter (3.9% on an annualised basis). The revised data significantly exceeded market expectations and the preliminary estimate. Capital expenditure growth was particularly surprising (at 1.6% quarter on quarter). Due to a weaker yen, some Japanese companies have now started to move production back into Japan. Private consumption made a positive contribution to the growth, whereas the contribution of net exports was negative, as Japan's foreign trade was affected by the slowdown in the USA and China. The central bank's scenario is therefore materialising and the recovery from last year's recession is accelerating. News from the economy supported optimism on the Japanese stock markets and the Nikkei index reached a 15-year high in May. The June CF revised its inflation and GDP outlooks for 2015 upwards, but left its forecast for 2016 unchanged. The new OECD forecast is much more optimistic than CF with regard to inflation in both 2015 and 2016, while the growth expected by the OECD is markedly lower.

GDP growth, %

Inflation, %

	CF		IMF	OECD		BoJ	
2015	1.0	⬈	1.0	0.7	➡	2.1	➡
2016	1.7	➡	1.2	1.4	⬈	1.5	⬇

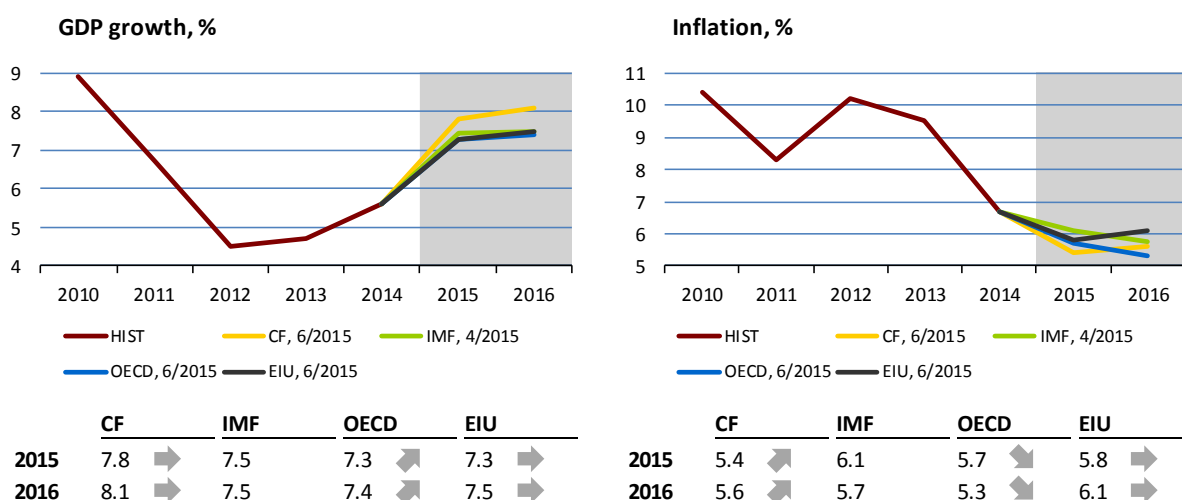|	CF		IMF	OECD		BoJ	
2015	0.7	⬈	1.0	1.8	⬇	0.8	⬇
2016	1.0	➡	0.9	1.6	⬇	2.0	⬇

III. ECONOMIC OUTLOOK IN BRIC COUNTRIES

III.1 China

The May data mostly confirm a slowdown in economic growth in China and a need for a government stimulus. Although annual growth of industrial production rose slightly (from 5.9% in April to 6.1%), as did the HSBC PMI in manufacturing and services, the overall macroeconomic data do not bring much optimism. Fixed investment growth slowed to a 15-month low in May and property investment growth was at its lowest level since 2009. Imports declined by more than 17%, while exports fell by 2.5%. According to Reuters, some analysts are expecting economic growth to slow by a further 0.2 pp to just 6.8% in Q2. Overall growth of less than 7% this year is also expected by the new CF, EIU and OECD outlooks. Inflation fell to 1.2% in May owing to a decrease in some food prices. The People's Bank of China lowered its inflation outlook for this year from 2.2% to 1.4%. The CF and EIU June predictions are in line with this, expecting inflation of around 1.5% this year.

GDP growth, %

Inflation, %

	CF	IMF	OECD	EIU
2015	6.9	6.8	6.8	6.8
2016	6.7	6.3	6.7	6.5

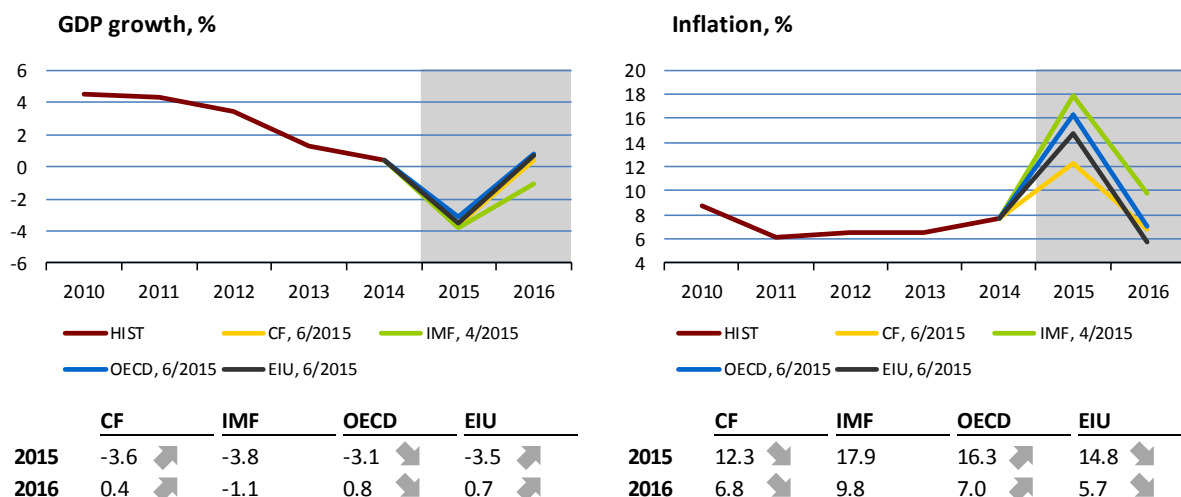|	CF	IMF	OECD	EIU
2015	1.4	1.2	1.6	1.5
2016	1.9	1.5	2.0	2.2

III.2 India

New data from the Indian economy confirm its leading position among the BRIC countries in terms of growth. GDP rose by 7.5% year on year in the last quarter of India's fiscal year 2014/2015 (i.e. 2015 Q1). The latest OECD forecast expects growth of 6.9% this year, while CF is much more optimistic (7.8%). The economy is expected to accelerate further in 2016. Industrial production was up by 4.1% year on year in April and the PMI in manufacturing is signalling a further improvement. In early June, the Indian central bank cut its interest rates for the third time this year (by 0.25 pp to 7.25%) on the back of favourable inflation figures in April and continuing transmission of the previous cuts. Consumer prices went up by 5.0% in May. Concerns of a below-average monsoon remain the main upside risk to inflation. CF therefore shifted its inflation outlook for this year and the next slightly upwards.

GDP growth, %

Inflation, %

	CF	IMF	OECD	EIU
2015	7.8	7.5	7.3	7.3
2016	8.1	7.5	7.4	7.5

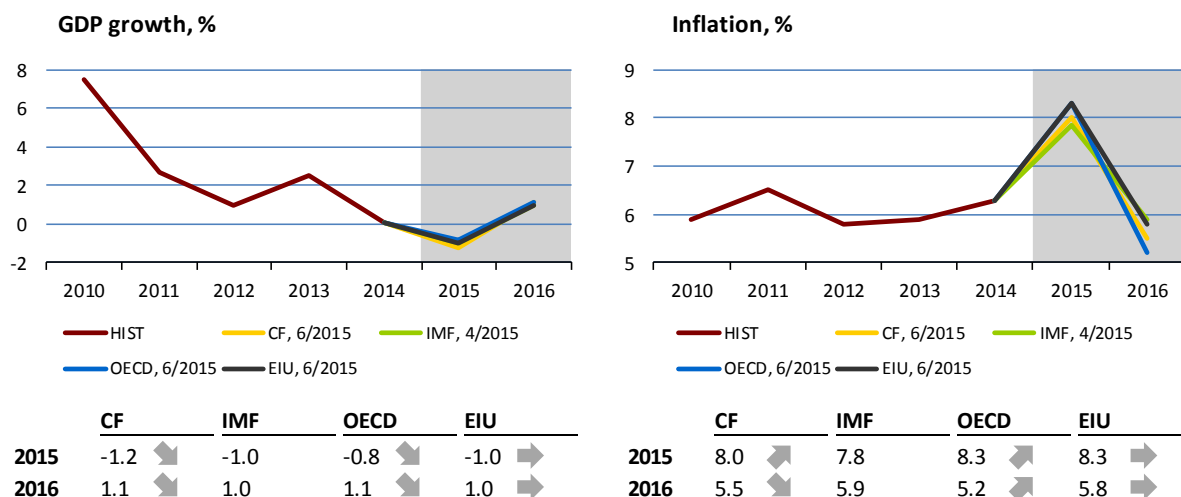|	CF	IMF	OECD	EIU
2015	5.4	6.1	5.7	5.8
2016	5.6	5.7	5.3	6.1

III.3 Russia

The new CF and OECD outlooks expect the economy to contract by 3.0%–3.6% this year and grow at a pace well below 1% next year. The return to growth will be supported by renewed growth in oil prices and by import substitution, which will partly offset the adverse effect of economic sanctions. According to the EBRD May outlook, GDP will decrease by as much as 4.5% this year. It also expects a decline in GDP next year (-1.8%). Running counter to this is the new outlook prepared by Russia's Ministry of Economic Development, according to which economic activity will rise by 2.3% in 2016. The Ministry also expects the net capital outflow to slow from USD 110 billion in 2015 to USD 55–70 billion in 2016–2018. It assumes that economic sanctions will remain in place over the entire outlook horizon. A potential tightening of sanctions against Russia, should the situation in Ukraine deteriorate, was agreed at the G7 summit at the beginning of June. A spokesman for the Russian president then officially threatened retaliation. An extension of the sectoral sanctions imposed last year will be discussed at the EU summit in late June.
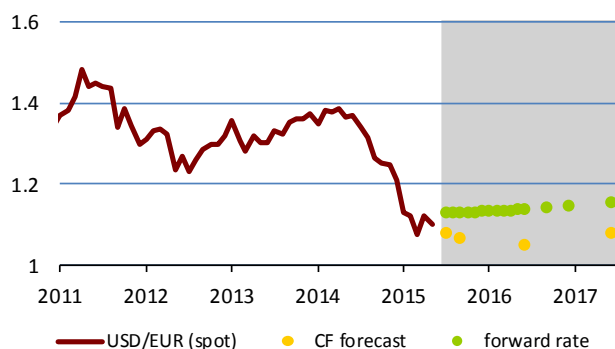
GDP growth, %

Inflation, %

	CF	IMF	OECD	EIU
2015	-3.6	-3.8	-3.1	-3.5
2016	0.4	-1.1	0.8	0.7

	CF	IMF	OECD	EIU
2015	12.3	17.9	16.3	14.8
2016	6.8	9.8	7.0	5.7

III.4 Brazil

In an effort to tame accelerating inflation, Brazil's central bank increased its key interest rate again (by 0.5 pp to 13.75%). This was the sixth consecutive rate increase, and the inflation figures suggest a further monetary policy tightening at the end of July. Prices rose by 8.5% year on year in May, i.e. again faster than a month earlier (8.2%). CF and the EIU predict inflation slightly above 8% this year, although they expect it to return to the tolerance band around the inflation target in 2016. The price level is being pushed up, among other things, by the Brazilian government, which is increasing administered prices as part of austerity measures. In Q1, the economy saw its deepest decline since 2009, with GDP falling by 1.6% year on year. This was due to a drop in capital formation and lower government spending and household consumption. Industrial production fell by 7.6% in April. The OECD estimates this year's contraction of the Brazilian economy at 0.8%, while CF and the EIU are rather more pessimistic. However, a return to growth of about 1% is expected in 2016.

GDP growth, %

Inflation, %

	CF	IMF	OECD	EIU
2015	-1.2	-1.0	-0.8	-1.0
2016	1.1	1.0	1.1	1.0

	CF	IMF	OECD	EIU
2015	8.0	7.8	8.3	8.3
2016	5.5	5.9	5.2	5.8

IV. IV. Outlook of exchange rates vis-à-vis the US dollar

The euro

	8/6/15	07/15	09/15	06/16	06/17
spot rate	1.120				
CF forecast		1.080	1.065	1.048	1.078
forward rate		1.130	1.130	1.138	1.155

The Japanese yen
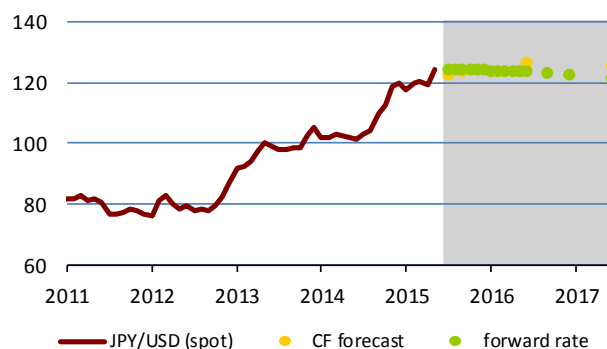
	8/6/15	07/15	09/15	06/16	06/17
spot rate	125.3				
CF forecast		122.6	123.9	126.5	125.2
forward rate		124.4	124.3	123.4	121.2

The Brazilian real
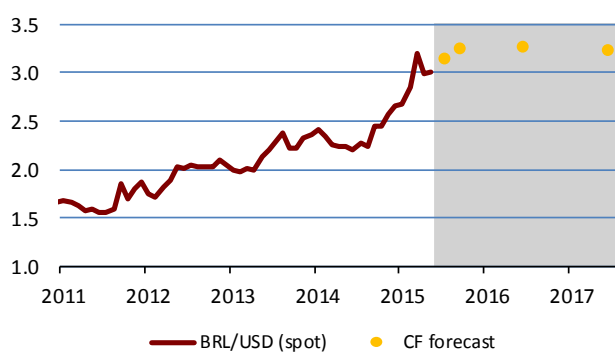
	8/6/15	07/15	09/15	06/16	06/17
spot rate	3.128				
CF forecast		3.146	3.256	3.262	3.236

The Russian rouble
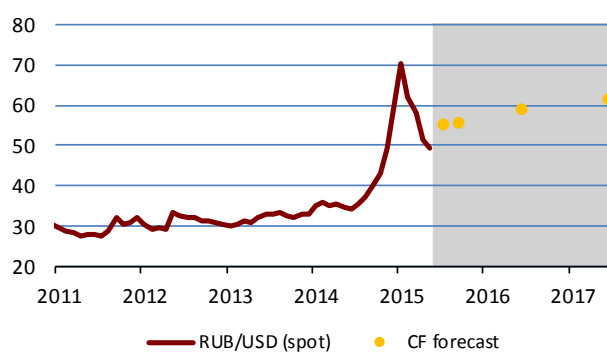
	8/6/15	07/15	09/15	06/16	06/17
spot rate	56.20				
CF forecast		55.14	55.81	58.91	61.29

The Indian rupie
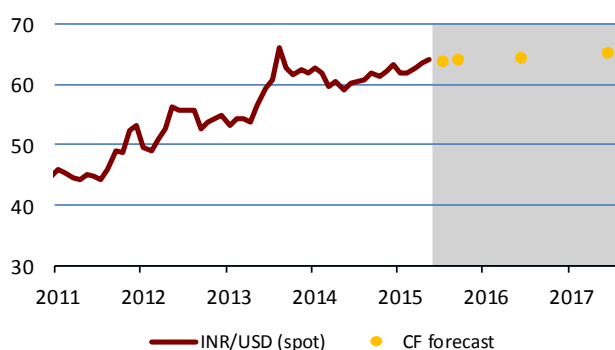
	8/6/15	07/15	09/15	06/16	06/17
spot rate	64.13				
CF forecast		63.77	64.01	64.29	65.07

The Chinese renminbi
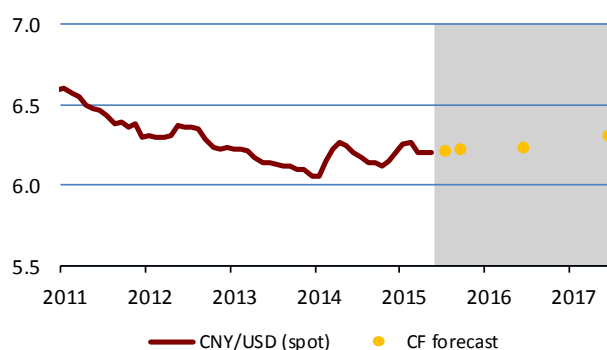
	8/6/15	07/15	09/15	06/16	06/17
spot rate	6.206				
CF forecast		6.215	6.221	6.233	6.304

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.
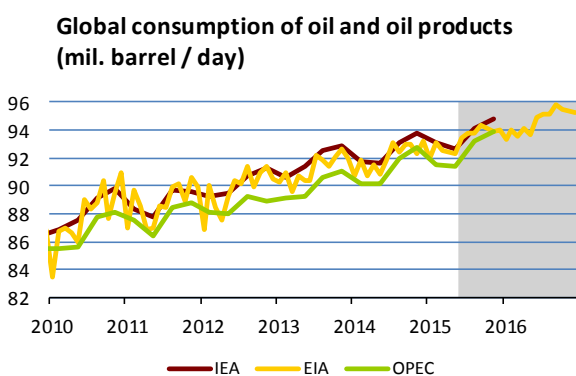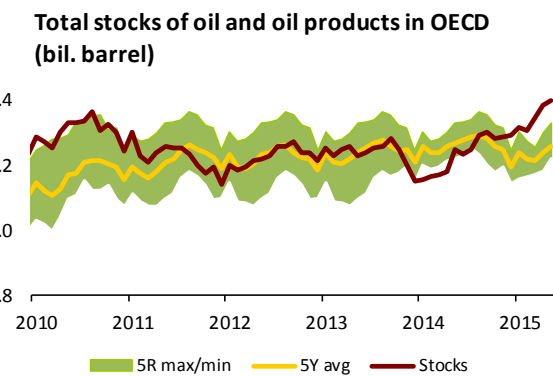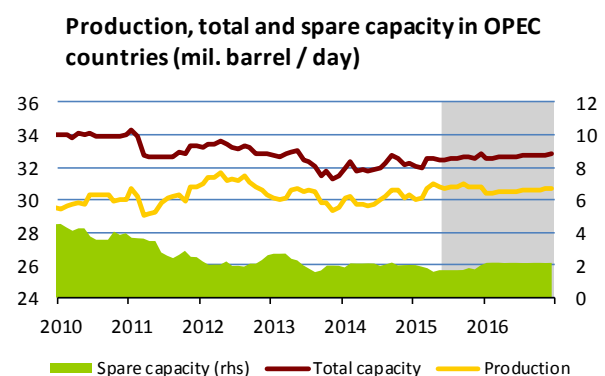
V.1 Oil and natural gas

Following strong growth in mid-April, the Brent crude oil price continued to rise more slowly until early May owing to a weakening dollar. The dollar exchange rate then saw a turnaround and oil prices fluctuated around a slightly downward trend, with the market reflecting a persisting excess of oil extraction over consumption. The average monthly Brent price therefore rose further in May to its highest level this year (USD 65.6 a barrel). In the first half of June it was around USD 2.5 lower. According to the IEA, oil consumption will surge by 1.7 million barrels a day (mb/d) in the first half of this year and growth of 1.4 mb/d is expected in 2015 as a whole. However, oil extraction responded more slowly than expected to the previous drop in the rig count in the USA. Although global extraction decreased in May, it was still 3 mb/d higher year on year. This led to a further rise in oil stocks in OECD countries. However, oil extraction in the USA is expected to fall between June and the start of 2016. Together with a seasonal rise in consumption in H2, this should result in slower growth in oil stocks. At the start of June, oil stocks dropped for the fifth consecutive week, partly because a moderation of the contango slope of the WTI oil futures curve is causing some speculative stocks to be resold on the market. The EIA predicts (practically in line with the market outlook based on the futures curve) an average Brent price of USD 61 a barrel (bbl) this year and USD 67/bbl the next, down by USD 3/bbl from the previous month's forecast. WTI prices should be USD 5/bbl lower in both years. The Brent price forecast in the June CF is slightly (around USD 2.5/bbl) above the market outlook at one year. As regards long-term natural gas contracts, a further sharp price decrease is expected as a lagged reaction to the earlier drop in oil prices.

Outlook for prices of oil and natural gas (USD/1000m3)
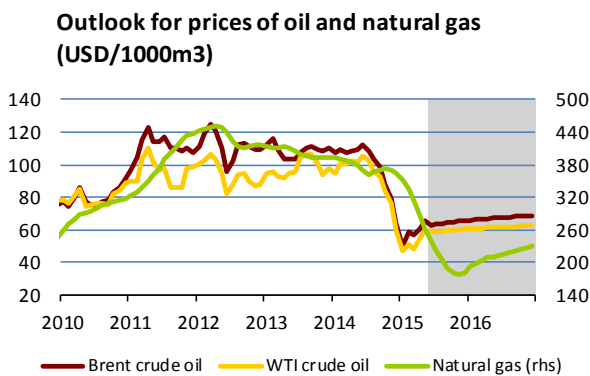
	Brent	WTI	Natural gas
2015	61.91	56.29	245.22
2016	67.52	61.73	213.39

Total stocks of oil and oil products in OECD (bil. barrel)

Global consumption of oil and oil products (mil. barrel / day)

	IEA	EIA	OPEC
2015	93.64	93.30	92.50
2016		94.65	

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

	Production	Total capacity	Spare capacity
2015	30.70	32.47	1.77
2016	30.55	32.68	2.13

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.2 Other commodities

The average monthly non-energy commodity price index was virtually flat at the March level in April and May and then declined slightly in the first half of June. The components of the overall index recorded mixed developments. The food commodity price index continued to fall in April and May (to its lowest level since July 2010) before rising in the first half of June. By contrast, the industrial metals index increased in April and May, but fell thereafter. The outlook for all three indices is slightly rising.

Food commodity prices fell further in May as the USDA increased its estimates of final stocks of wheat and oil plants for the 2015/2016 growing season. Only the outlook for corn was lowered slightly, but it remains well above the five-year average. Cocoa prices fell on account of a lower harvest outlook in Ghana. Agricultural commodity prices will probably remain under pressure unless larger production shortfalls occur.

Prices of most metals rose sharply between mid-April and early May, due to the weakening dollar and a rise in the PMI for the USA, the euro area, Japan and China. However, there was a turnaround in the second half of May as the dollar returned to appreciation. The copper price was supported by a decline in stocks on the LME, the first since July 2014. The price of iron ore surged by more than 20% from the ten-year low recorded in April and held steady in the first half of June. However, steel prices have yet to reflect this increase. In the near term, metal prices should be supported by stabilisation of the property market in China. A strengthening dollar – reflecting stronger GDP growth in the USA – should counteract price growth.

Non-energy commodities price indicies
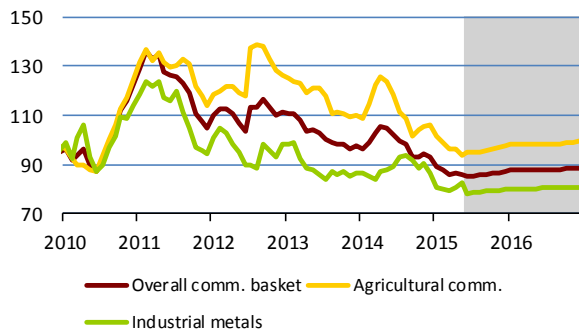
	Overall	Agricultural	Industrial
2015	86.5	96.6	79.9
2016	88.1	98.5	80.4

Food commodities
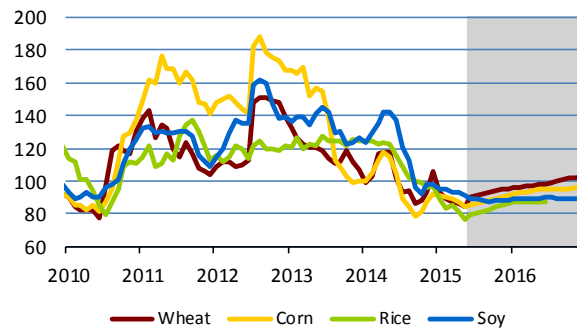
	Wheat	Corn	Rice	Soy
2015	91.0	88.5	83.0	90.6
2016	99.2	94.7	87.2	89.3

Meat, non-food agricultural commodities
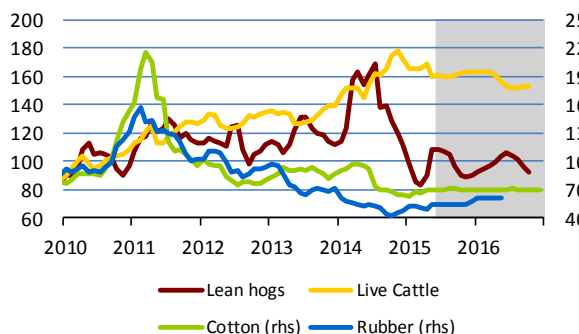
	Lean hogs	Live Cattle	Cotton	Rubber
2015	96.0	162.9	69.0	53.6
2016	98.9	157.0	70.3	

Basic metals and iron ore
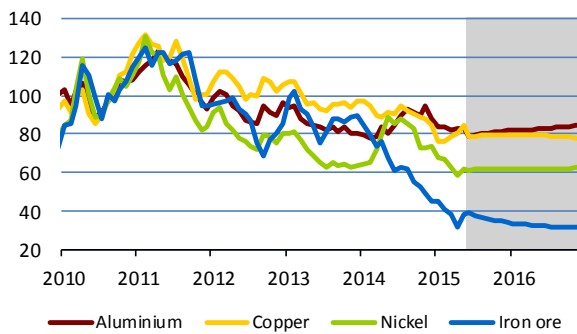
	Aluminium	Copper	Nickel	Iron ore
2015	81.5	79.2	62.5	37.39
2016	83.1	79.0	62.1	32.44

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 price movements in the commodity markets[1]

Many time series show periodic swings referred to as seasonality. Commodity prices, which are subject to very strong seasonal tendencies stemming from deep long-term fundamentals, are no exception. 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 an underlying asset (commodity) will change in the future. There are a whole range of seasonal tendencies: for example, increased sales of eggs before Easter and higher petrol consumption during the summer holidays and hence a rise in fuel prices in late spring/early summer. Seasonal effects differ across types of commodities as well. There are also months of the year when demand for a commodity is higher and other months when it is lower. This article sets out to identify long-term seasonal price patterns in commodity markets, focusing on the WTI crude oil market.

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 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 in time series include changes of season and related changes in the weather and the number of hours of sunlight, as well as institutionally entrenched human habits – holidays, religious festivals, anniversaries and so on. The analysis below focuses on seasonal tendencies in 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. 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. 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.[3] 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 very frequently repeating past price movements rather than on constant short-term reactions of prices to an infinite flow of often "contradictory" news about macroprudential developments, expected stocks and so on. There are many factors affecting the commodity markets which – in specific conditions and circumstances – repeat at regular annual intervals. The most visible is the annual weather cycle, i.e. the alternation of winter and summer seasons. For example, large post-harvest grain stocks dwindle over the rest of the year, and demand for heating oil tends to rise as the winter approaches and fall as soon as stocks are replenished. However, there are other significant events which occur regularly during the year. These include the 15 April deadline for income tax returns in the USA and the dividend payment season. As a result, monetary liquidity in the economy can decline after income tax is collected and increase in periods when the Federal Reserve conducts currency recirculation to ensure that institutions hold a sufficient supply of cash.[4]

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 give rise to specific times of year when prices are

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[1] Written by 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] 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 commodity of a specified quality and quantity 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).
[4] See Federal Reserve System (2006) for more information.

more likely to rise or fall. Analysis of seasonal tendencies in individual markets can thus provide a better understanding of the main forces shaping the balance of supply and demand (see Chart 1).

Chart 1 Annual seasonal price cycles and fundamental conditions

Seasonal peak:

Seasonal rise:

Rising demand /
falling supply

Highest demand /
lowest supply

Seasonal fall:

Falling demand /
rising supply

Seasonal trough:

Highest supply /
lowest demand

Seasonal trough:

Highest supply /
lowest demand
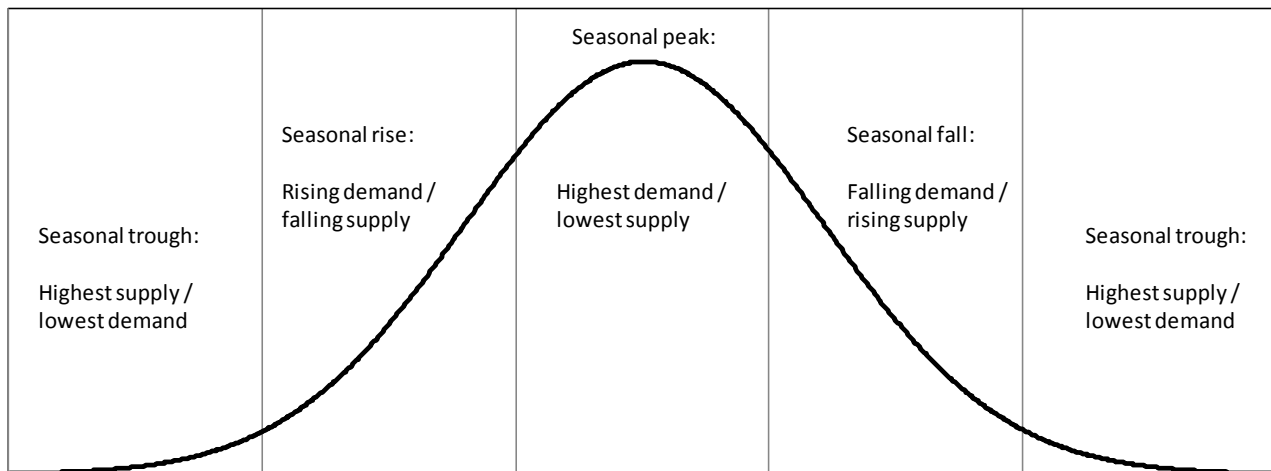
These annual supply and demand cycles lend more significance to the phenomenon of price seasonality. The annual pattern of changing conditions can subsequently more or less pre-define the annual pattern of price behaviour. Seasonality can therefore be viewed as a *natural market rhythm*[5] based on the 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 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 long-term seasonal price patterns in the WTI oil market

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 assess the existence of long-term price patterns on a practical example, we chose the WTI crude oil market.

WTI crude oil futures are traded on the New York Mercantile Exchange (NYMEX).[6] According to NYMEX data on the average daily number of contracts traded, WTI crude oil is the most traded natural commodity in the world (240,000 contracts a day on average last year). One oil contract represents 1,000 barrels of light sweet crude oil for physical delivery in Cushing (Oklahoma, USA), which is accessible on the international spot market via a wide network of pipelines. Refineries prefer light sweet oil because of its low sulphur content and very high quality, a desirable property for production of other oil products (petrol, diesel, heating oil and kerosene).

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. 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

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[5] See Colley, Moore and Toepke (2006).
[6] See Chicago Mercantile Exchange Group (2015) for more information.

frequency corresponding to the calendar year, which has 365 days. In the case of a leap year, i.e. every four years, 29 February was removed from the time series. In the case of weekends and holidays, when the commodity was not traded, we worked with the figure for the last trading day. Using a seven-day calendar week also allows for better recording of the data in a matrix, where the data for individual days in each year overlap and so no time inconsistency arises. For this reason, a seasonal price pattern constructed from daily data, as opposed to averaged weekly or monthly data, can illustrate not only the four main phases of cyclical seasonal price movement (see Chart 1), but also other fine characteristics accompanying the long-term seasonal trend.

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[7] 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.

The available time series for WTI futures starts on 30 March 1983. In the case of WTI futures, rollover to the next contract month and simultaneous contract expiration occur every calendar month. Chart 2 depicts the evolution of the WTI crude oil price each year between 1984 and 2014 based on daily data.

Chart 2 Annual evolution of the WTI crude oil price 1984–2014
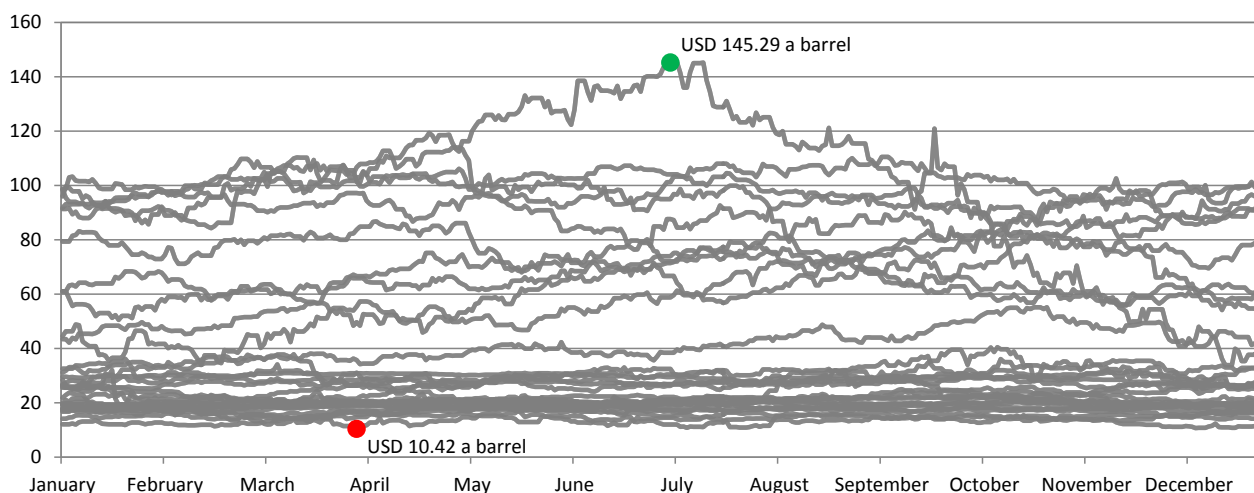
Source: Bloomberg.

Significant price extremes can be instantly identified. The WTI price reached its low (as measured by closing prices on the relevant day of the week) of USD 10.42 a barrel on 31 March 1986 (the red point). By contrast, the maximum of USD 145.29 a barrel was attained on 3 July 2008 (the green point). However, it is very hard to identify repeating seasonal tendencies in individual years only on the basis of the price in absolute terms. This is mainly due to a different degree of oil price volatility in the past. For example, in the 1980s and 1990s the price of oil fluctuated within a relatively narrow price band of USD 10–40 a barrel, whereas since 2000 the volatility of the WTI price has increased significantly.[8]

To obtain a seasonal price pattern based on the evolution of prices in individual years on time series showing various degrees of volatility, it is therefore necessary to convert the absolute values into a normalised index. The normalised index represents the converted absolute values of the oil price in individual years on a scale of 0–100%. The converted data offer a clearer picture for identifying significant long-term seasonal tendencies. Chart 3 describes seasonal patterns in the WTI market. The x-axis gives the number of days in the year, i.e. from 1 January to 31 December. The y-axis shows the 0–100 scale for the numerical normalised index describing the most significant historical price tendencies, i.e. when prices were

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[7] 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.

[8] In addition to traditional explanations of the sharp increase since 2000, which refer to rising demand for oil and other commodities due to fast economic growth in emerging countries (BRIC), the increased volatility in this period may have been due to Federal Reserve monetary policy, which might have been reflected – via real interest rates – in increasing trading activity by financial institutions in the commodity markets (see Hošek, Komárek and Motl, 2010, and Juvenal and Petrella, 2011).

usually close to their peak (index = 100) at a given time of year and, conversely, when prices often recorded lows (index = 0). Besides the clearly visible extreme values illustrating the highs and lows, we can see smaller but obvious movements that usually precede certain regularly repeating events, such as holidays and pre-delivery contract expiration. This pattern provides a historical view of the market annual price cycle of the underlying asset, in this case WTI crude oil.

Chart 3 Seasonal WTI crude oil price patterns
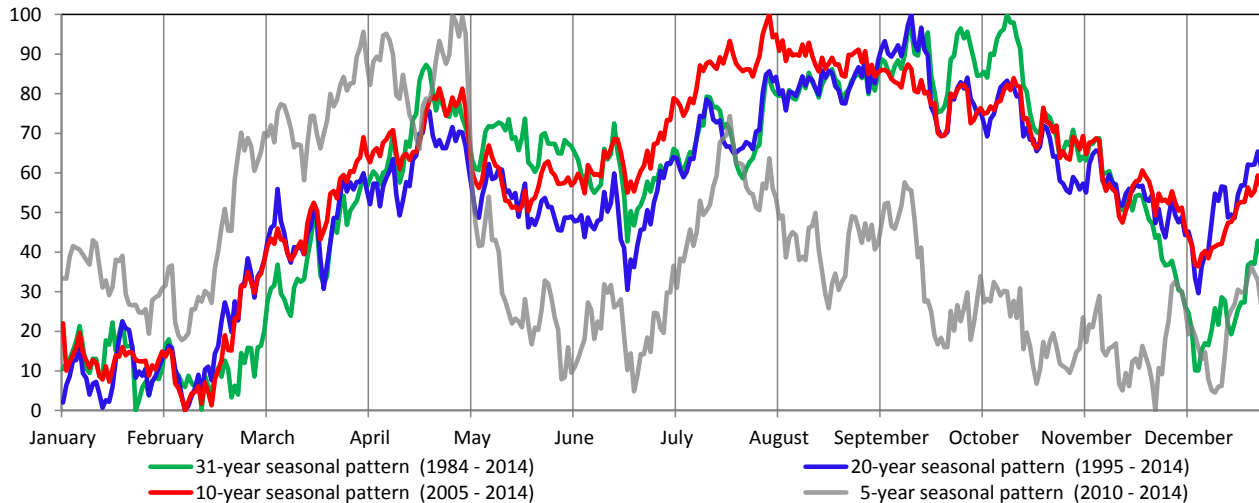
Source: Bloomberg, own calculations.

The longest seasonal tendency obtained for the WTI price is the price pattern depicted by the green line, which shows the average annual WTI price cycle in individual months calculated from normalised price indices of oil prices over the last 31 years (i.e. the maximum available data sample). To examine whether seasonal oil price tendencies change over time, the chart also shows three shorter periods describing the 20-year average seasonal price pattern based on oil prices in 1995–2014 (the blue line) and an average sample of oil price movements over the last 10 years (2005–2014, the red line). The grey line represents the average seasonal oil price tendency over the last five years.

The evolution of the WTI price over the course of the year mainly reflects seasonal demand for key oil products such as petrol and heating oil. This is confirmed by Chart 3, which shows two significant times of year when the oil price is close to annual highs. The first local price peak is in April, when refineries consume the most oil, reflecting rising production due to growing demand for petrol before the coming motoring season and summer holidays. The second period of high oil prices runs from July to mid-October, when refineries again increase oil consumption, leading to growth in production due to rising demand for heating oil as the colder weather approaches. Another substantial movement cannot be ignored: a pronounced decline in the price of oil between mid-October and the end of December. This phenomenon may be due to "financial motives" reflecting the fact that oil and oil product stocks held by refineries at the end of the year are subject to tax. As a result, the oil stocks needed to sustain production in the coming months are accumulated in the period up to mid-October and further purchases are postponed until the end of the year. In the rest of the year, refineries produce solely by consuming those stocks. In some cases, this can cause greater seasonal volatility in the given period. After a time, however, the market expects refineries sooner or later to start making purchases as their stocks dwindle. This usually occurs during December, when market expectations of a renewed surge in oil demand start to strengthen. At a time of still high consumption, this process may give rise to an upswing in oil demand as efforts are made to replenish stocks. This is subsequently reflected in higher oil prices (see Chart 3).

4 Conclusion

The above analysis of seasonality using the example of the WTI crude oil price confirms the existence of long-term and marked seasonal tendencies that strongly affect the price of this commodity. The price of oil tends to reach a local maximum each April due to high oil consumption by refineries, which try to cover the rising demand for petrol associated with the coming motoring season by increasing production. They then gradually scale down production towards the end of the motoring season. At this time of low demand for oil products, before the process of re-accumulation of oil stocks begins in preparation for the expected growth in demand connected with the approaching heating season, refineries concentrate on maintenance or modernisation of their equipment. The price of oil thus tends to go down between May and June every year. The accumulation of stocks by refineries thus precedes the consumption peak. As soon as refineries increase production, their consumption of oil goes up. The last quarter in the year is the period of maximum refinery production, so July to mid-October can be characterised as the time when demand is highest on the

oil market and prices therefore rise. As winter approaches, attention turns to heating oil, whose consumption in the densely populated US North-West is the highest in the world. The accumulation of stocks usually peaks in mid-October. This is reflected in falling demand for oil in the rest of the year, as the price of oil tends to decrease from mid-October onwards. In this period, refineries consume oil to meet demand solely from their own stocks and deliberately postpone new oil purchases until the end of the year. In this way, they reduce their inventories in an effort to minimise their year-end stocks of oil and oil products, which are subject to tax.

However, although some of the typical seasonal tendencies identified in the past are very strong, in the case of WTI, for example, it is never certain that they will repeat in exactly the same way every year. 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.

To obtain the long-term seasonal tendency for the WTI price, we worked in the first step with the maximum available history of data on futures prices (i.e. since 1984). However, including a different number of years in the calculation increases the likelihood of finding different seasonal price profiles, as the determinants of the price of a commodity can change over the years. To verify the robustness of the result, it is appropriate to compare seasonal tendencies from the perspective of different lengths of time, i.e. the 30-, 20-, 10- or 5-year price pattern, to better capture the changing price tendencies for various periods (see Chart 3). The calculated seasonal tendencies show that oil prices followed very stable and similar price tendencies between 1984 and 2005. After 2005, however, the average seasonal tendency on the oil market shows strong volatility and more marked deviations from the long-term pattern. This may be partly due to the use of a shorter time sample of data, in this case 5 years, but even from this perspective the problem may be more structural. The fact that the price pattern 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, 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 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 (hedge funds, indexed commodity funds, banks, etc.) 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.[9]

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, firms (producers and processors) tend to try to push down prices of a commodity so that they can buy it more cheaply. Governments with their various policies can also affect seasonality in various commodity markets. 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 the weather. Climatic conditions can ultimately outweigh any efforts made by the biggest commercial interests, production cartels and governments.

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[9] See Motl (2013).

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A1. Change in GDP predictions for 2015

	CF		IMF		OECD		CB / EIU	
EA	0	2015/6 2015/5	+0.3	2015/4 2015/1	+0.0	2015/6 2015/3	0	2015/6 2015/3
US	-0.3	2015/6 2015/5	-0.5	2015/4 2015/1	-1.1	2015/6 2015/3	-0.3	2015/3 2014/12
DE	-0.1	2015/6 2015/5	+0.3	2015/4 2015/1	-0.1	2015/6 2015/3	-1.0	2014/12 2014/6
JP	+0.1	2015/6 2015/5	+0.4	2015/4 2015/1	-0.3	2015/6 2015/3	0	2015/5 2015/1
BR	-0.1	2015/6 2015/5	-1.3	2015/4 2015/1	-2.3	2015/6 2014/11	0	2015/6 2015/5
RU	+0.4	2015/6 2015/5	-0.8	2015/4 2015/1	-3.1	2015/6 2014/11	+0.4	2015/6 2015/5
IN	0	2015/6 2015/5	+1.2	2015/4 2015/1	+0.5	2015/6 2014/11	0	2015/6 2015/5
CN	0	2015/6 2015/5	-0.0	2015/4 2015/1	-0.3	2015/6 2014/11	0	2015/6 2015/5

A2. Change in inflation predictions for 2015

	CF		IMF		OECD		CB/EIU	
EA	+0.1	2015/6 2015/5	-0.9	2015/4 2014/10	+0.0	2015/6 2014/11	+0.3	2015/6 2015/3
US	0	2015/6 2015/5	-2.0	2015/4 2014/10	-0.0	2015/6 2014/11	-0.6	2015/3 2014/12
DE	+0.1	2015/6 2015/5	-1.0	2015/4 2014/10	+0.0	2015/6 2014/11	-0.4	2014/12 2014/6
JP	+0.1	2015/6 2015/5	-1.0	2015/4 2014/10	+0.0	2015/6 2014/11	-0.2	2015/5 2015/1
BR	+0.1	2015/6 2015/5	+2.0	2015/4 2014/10	-0.1	2014/11 2014/5	0	2015/6 2015/5
RU	-0.7	2015/6 2015/5	+10.6	2015/4 2014/10	+3.1	2014/11 2014/5	-0.2	2015/6 2015/5
IN	+0.1	2015/6 2015/5	-1.4	2015/4 2014/10	-0.3	2014/11 2014/5	0	2015/6 2015/5
CN	0	2015/6 2015/5	-1.3	2015/4 2014/10	-0.4	2014/11 2014/5	+0.3	2015/6 2015/5

A3. List of abbreviations

ABS	asset-backed securities	**HICP**	harmonised index of consumer prices
BoJ	Bank of Japan	**CHF**	Swiss franc
BR	Brazil	**ICE**	Intercontinental Exchange
BRIC	countries of Brazil, Russia, India and China	**IFO**	Institute for Economic Research
BRL	brazilian real	**IFO-BE**	IFO Business Expectations
CB-CCI	Conference Board Consumer Confidence Index	**IMF**	International Monetary Fund
CB-LEII	Conference Board Leading Economic Indicator Index	**IN**	India
CBOT	Chicago Board of Trade	**INR**	Indian rupee
CBR	Central Bank of Russia	**IRS**	Interest Rate swap
CF	Consensus Forecasts	**JP**	Japan
CN	China	**JPY**	Japanese yen
CNB	Czech National Bank	**LI**	leading indicators
CNY	Chinese renminbi	**LIBOR**	London Interbank Offered Rate
DBB	Deutsche Bundesbank	**MER**	Ministry of Economic Development (of Russia)
DE	Germany	**OECD**	Organisation for Economic Co-operation and Development
EA	euro area	**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	**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
EIU	The Economist Intelligence Unit database	**UoM-CSI**	University of Michigan Consumer Sentiment Index
EU	European Union	**US**	United States
EUR	the euro	**USD**	US dollar
EURIBOR	Euro Interbank Offered Rate	**WEO**	World Economic Outlook
Fed	Federal Reserve System (the US central bank)	**WTI**	West Texas Intermediate (crude oil used as a benchmark in oil pricing)
FRA	forward rate agreement	**ZEW-ES**	ZEW Economic Sentiment
GBP	pound sterling	**ABS**	asset-backed securities
GDP	gross domestic product		

A4. List of thematic articles published in the GEO

2015

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Assessment of the effects of quantitative easing in the USA (Filip Novoný)	2015-5
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The US dollar's position in the global financial system	2015-3
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The effect of oil prices on inflation from a GVAR model perspective (Soňa Benecká and Jan Hošek)	2015-1

2014

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