GLOBAL ECONOMIC OUTLOOK – JULY

2014

Monetary and Statistics Department
External Economic Relations Division

CNB CZECH NATIONAL BANK

Cut-off date for data
14 - 18 July 2014

CF survey date
14 July 2014

GEO publication date
25 July 2014

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.

Editors and authors

Luboš Komárek
lubos.komarek@cnb.cz
Editor-in-chief
Summary

Oxana Babecká Kucharčuková
oxana.babecka-kucharcukova@cnb.cz
Editor
III.1 Russia
III.3 China

Tomáš Adam
tomas.adam@cnb.cz
Editor

Filip Novotný
filip.novotny@cnb.cz
II.2 United States

Milan Klíma
milan.klima@cnb.cz
II.1 Eurozone
II.3 Germany

Soňa Benecká
sona.benecka@cnb.cz
II.4 Japan
III.2 India
III.3 Brazil

Jan Hošek
jan2461.hosek@cnb.cz
V. Commodity market developments
Focus

I. SUMMARY

The July issue of Global Economic Outlook presents its regular 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 examine the future of natural gas in a context of growing shale gas extraction in the USA, which is affecting gas and coal prices in different regions of the world. We describe the different substitution dynamics between these two commodities in North America and Europe and discuss the sustainability of low gas prices in the USA.

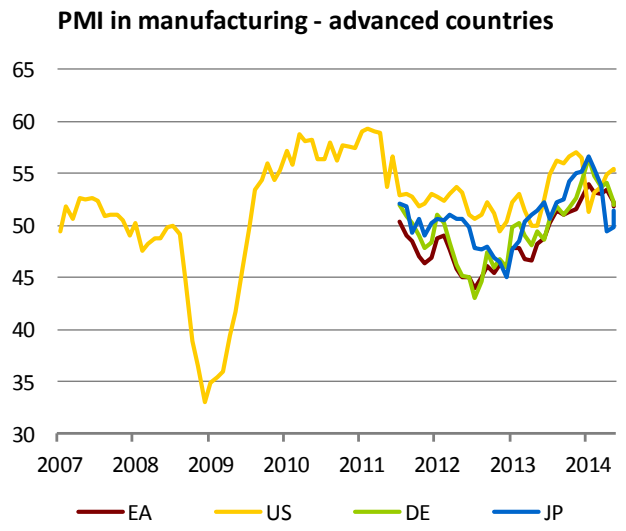
Developments in advanced economies should continue to be driven by the US economy, although its performance estimate for this year has been reduced substantially. In Europe, both the euro area as a whole and its most important part, the German economy, are expected to maintain their current rates of growth. Despite that, GDP growth in the euro area is expected to be only about half that in the US in 2015. The outlooks for the Japanese economy are still satisfactory, as confirmed by the leading indicator for Japanese industry, which recorded visible growth. The inflation outlooks for advanced countries are still at acceptable levels. According to the Federal Reserve, the rise in the inflation outlook in the USA does not currently pose a risk and is taken more as a short-term fluctuation. The higher inflation rate persisting in Japan primarily reflects a recent consumption tax hike. The inflation outlooks in the euro area were unchanged from the previous month, leading the ECB to repeat its commitment to maintain easy monetary conditions.

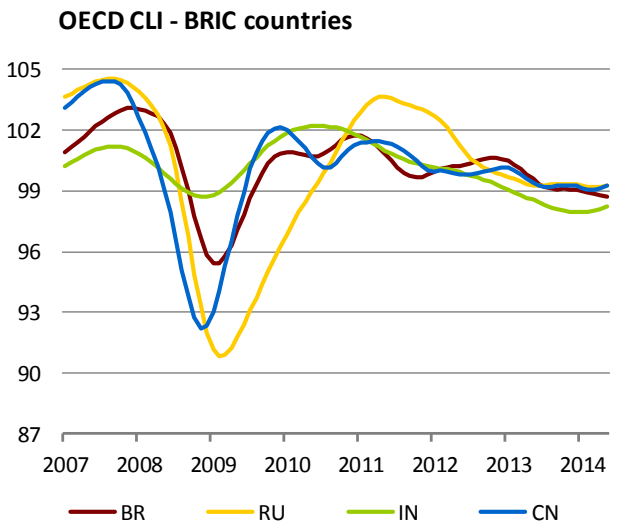
Developments in the BRIC countries remain mixed. The Chinese economy is continuing to slow gradually. Its growth rate is expected to be slightly above 7% this year and the next, amid relatively low inflation. The outlooks for the Brazilian economy are still none too optimistic, indicating a fall in economic performance and accelerating inflation, partly due to the football World Cup. The macroeconomic prospects of the Russian economy are not encouraging, especially given the current political tensions. Russia is on the brink of recession in a situation of relatively high inflation. By contrast, the Indian economy is still enjoying good news, reflected in an increasing growth outlook and a clear disinflationary process.

The outlooks for euro area interest rates are still very low, with no clear reversal in trend. Interest rates in the USA are expected to rise gradually at the end of this year, a trend which should continue into 2015. According to CF, the US dollar should appreciate against the euro and the Japanese yen. The dollar is also expected to appreciate against the Brazilian and Russian currencies. Central bank interventions are preventing the Indian currency from appreciating. By contrast, the US dollar should depreciate against the Chinese renminbi.

The outlooks for oil prices remain slightly falling until the end of 2015, although the current trend may be further affected by a worse security situation in Iraq and Ukraine. A falling price trend currently prevails in agricultural commodity markets, although the medium-term outlook is rising. The industrial metals price index, by contrast, rose slightly last month, but the outlook is flat.

Available PMI time series for countires monitored in the GEO



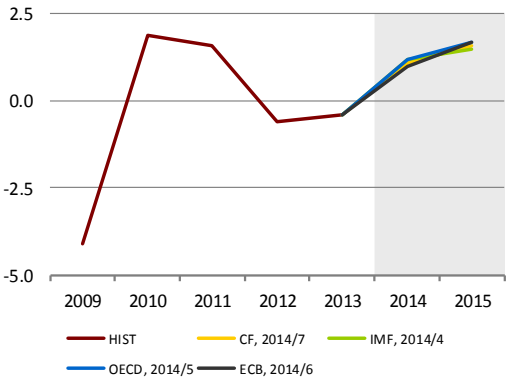


II.1 Euro area

Quarterly GDP growth in the euro area slowed by 0.1 pp to 0.2% in 2014 Q1 owing to a negative contribution of net exports. Annual GDP growth in the euro area conversely strengthened from 0.5% to 0.9% thanks to the contribution of domestic demand – mainly household consumption and investment. For 2014 Q2, the July CF expects approximately the same growth as in Q1. This outlook is supported by the industrial production and retail sales figures for the first two months of Q2 and by the leading indicators for June. The July CF predicts euro area growth of 1.1% for 2014 as a whole, accelerating to 1.5% next year. The ECB presented a similar outlook in its June forecast.

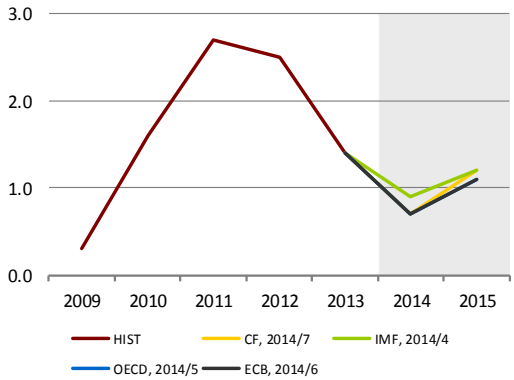
HICP inflation in June was unchanged from May, remaining at 0.5%. Inflation is being reduced by food prices (-0.2%) and energy prices (0.1%), whereas services prices (1.3%) are pushing it upwards. The July CF expects average inflation of 0.7% in 2014 and 1.2% in 2015. The ECB's June prediction is similar. At its June meeting, the ECB introduced several measures to ease the monetary conditions in the euro area. It lowered its key interest rates (the deposit rate even to a negative level), introduced measures to support bank lending to non-financial corporations, including targeted longer-term refinancing operations (TLTROs), and intensified preparatory work related to outright purchases of asset-backed securities (ABS). In July, the ECB kept rates unchanged and repeated its commitment to leave them at present levels for an extended period of time in view of the current outlook for inflation.

GDP growth, %



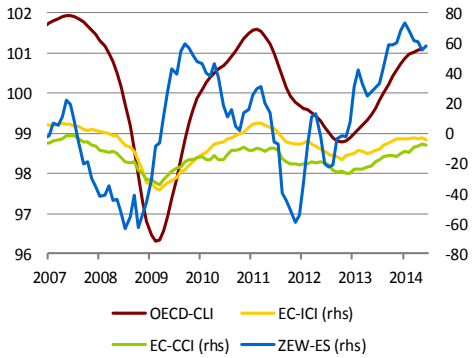
	CF	IMF	OECD	ECB
2014	1.1	1.2	1.2	1.0
2015	1.6	1.5	1.7	1.7

Inflation, %



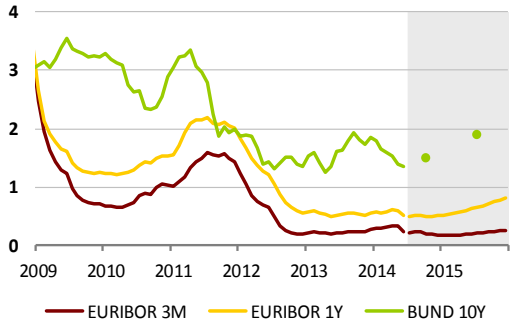
	CF	IMF	OECD	ECB
2014	0.7	0.9	0.7	0.7
2015	1.2	1.2	1.1	1.1

Leading indicators



	OECD-CLI	EC-ICI	EC-CCI	ZEW-ES
4/14	101.1	-3.5	-8.6	61.2
5/14	101.1	-3.1	-7.1	55.20
6/14		-4.3	-7.5	58.40

Interest Rates



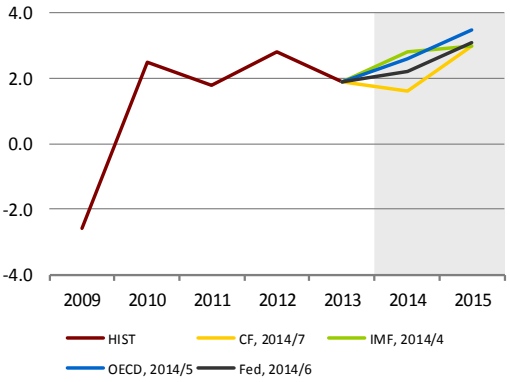
	06/14	07/14	12/14	06/15	12/15
3M EURIBOR	0.24	0.20	0.18	0.20	0.25
1Y EURIBOR	0.51	0.49	0.50	0.62	0.81

	06/14	10/14	07/15
10Y Bund	1.35	1.5	1.9

II.2 United States

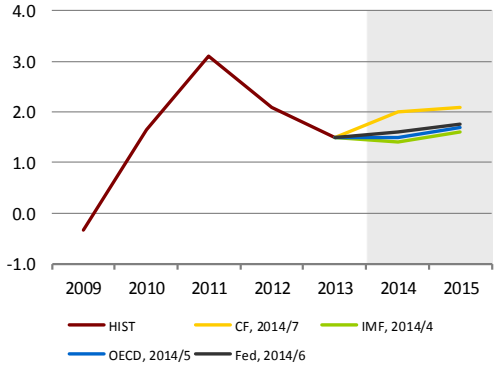
The July CF revised its GDP growth outlook for the USA this year quite significantly downwards. This was due to weak performance of the economy in 2014 Q1 because of extremely cold weather. However, all the institutions we monitor are now expecting robust growth for 2015. The still sizeable contribution of household consumption to total growth is a positive sign. This reflects a further decline in the unemployment rate to 6.1% in June and a simultaneous improvement in consumer confidence and consumer sentiment. Consumer confidence reached a five-year high. The pick-up in economic growth in Q2 is confirmed by nominal retail sales, which were 4.5% higher than a year earlier and 2.3% higher than in the previous quarter. Industrial production accelerated to 4.2% year on year in Q2, and the PMI in industry in June stayed at roughly the same expansionary level as in the previous month. The July CF increased its inflation outlook for 2015 to 2.1%. According to the Fed, however, the currently observed rise in consumer prices does not pose a risk and is taken more as a short-term fluctuation. At its June meeting, the FOMC decided to further reduce its monthly purchases of mortgage-backed securities and longer-term Treasury securities. It is expected to completely end these purchases at its October meeting. The markets are therefore turning their attention increasingly to future interest rates, which are expected to go up next year. The dollar appreciated against the euro after the June monetary policy easing by the ECB and is expected to strengthen by a further 5% or so at the one-year horizon according to CF.

GDP growth, %



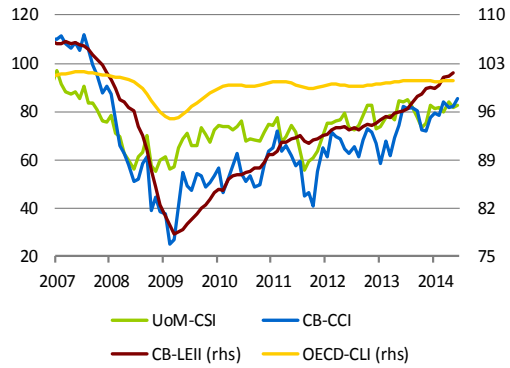
	CF	IMF	OECD	Fed
2014	1.6	2.8	2.6	2.2
2015	3.0	3.0	3.5	3.1

Inflation, %



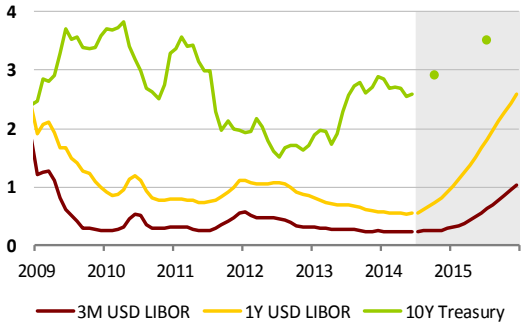
	CF	IMF	OECD	Fed
2014	2.0	1.4	1.5	1.6
2015	2.1	1.6	1.7	1.8

Leading indicators



	CB-LEII	OECD-CLI	UoM-CSI	CB-CCI
4/14	101.2	100.5	84.1	81.7
5/14	101.7	100.6	81.9	82.2
6/14			82.5	85.2

Interest Rates



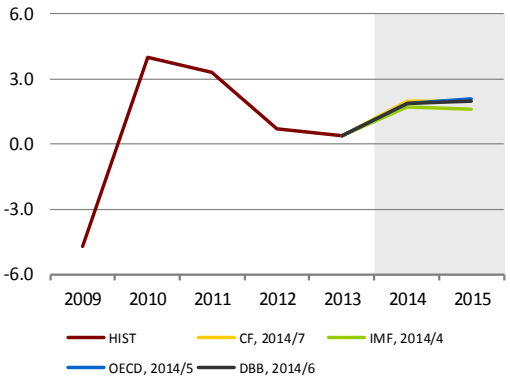
	06/14	07/14	12/14	06/15	12/15
3M USD LIBOR	0.23	0.23	0.28	0.55	1.03
1Y USD LIBOR	0.54	0.55	0.91	1.66	2.59

	06/14	10/14	07/15
10Y Treasury	2.59	2.9	3.5

II.3 Germany

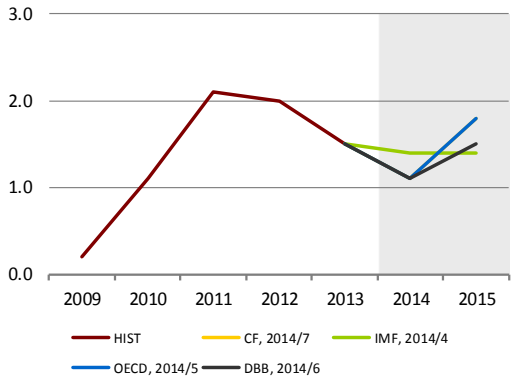
Economic growth in Germany strengthened substantially in both quarter-on-quarter and year-on-year terms in 2014 Q1, to 0.8% and 2.3% respectively. In both cases, the increased growth was due to rising domestic demand. The July CF expects both quarterly and annual growth to slow temporarily in 2014 Q2. This is also indicated by a sharp slowdown in monthly and annual growth of industrial production and retail sales in the first two months of Q2. The leading indicators also fell slightly in June. The July CF estimates GDP growth of 2% both this year and the next. Inflation in Germany edged up by 0.1 pp to 1% in June. Growth in services prices accelerated and the decline in energy prices slowed, and these items outweighed a halt in growth of food prices. The July CF reduced its outlook for average inflation to 1.2% this year, but still expects it to rise to 1.8% in 2015.

GDP growth, %



	CF	IMF	OECD	DBB
2014	2.0	1.7	1.9	1.9
2015	2.0	1.6	2.1	2.0

Inflation, %

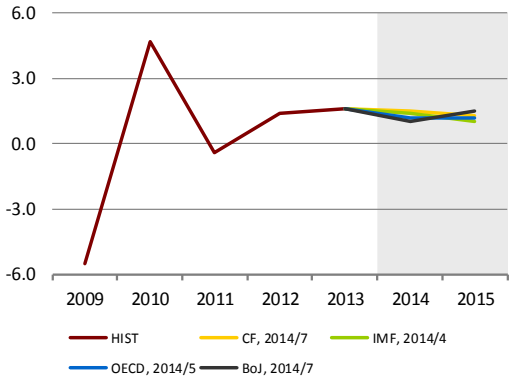


	CF	IMF	OECD	DBB
2014	1.1	1.4	1.1	1.1
2015	1.8	1.4	1.8	1.5

II.4 Japan

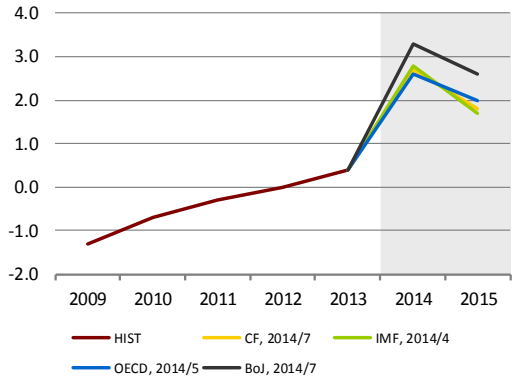
The May figures confirmed the strong effect of the consumption tax hike on the Japanese economy. Inflation remains at high levels (3.4% in the case of non-food inflation and 3.7% in the case of overall inflation), while household expenditure and retail sales fell year on year. Export growth was also disappointing; the central bank had expected positive foreign trade developments to offset the drop in domestic demand. The biggest surprise was low supplies to the USA – Japan is clearly not yet benefiting from the recovery in advanced economies. On the other hand, the unemployment rate reached a 16-year low in May (3.5%) and a slight improvement can also be seen in manufacturing, where the PMI jumped above 50 into the expansion zone in June. The positive signals are reducing speculation that the central bank will have to expand its current support for the economy. The July CF left its GDP growth outlook for 2014 at 1.5% and increased that for 2015 by 0.1 pp to 1.3%. The inflation forecast for this year from this institution was revised slightly upwards to 2.7%.

GDP growth, %



	CF	IMF	OECD	BoJ
2014	1.5	1.4	1.2	1.0
2015	1.3	1.0	1.2	1.5

Inflation, %

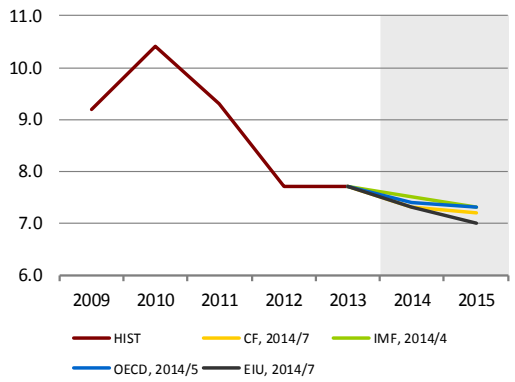


	CF	IMF	OECD	BoJ
2014	2.7	2.8	2.6	3.3
2015	1.8	1.7	2.0	2.6

III.1 China

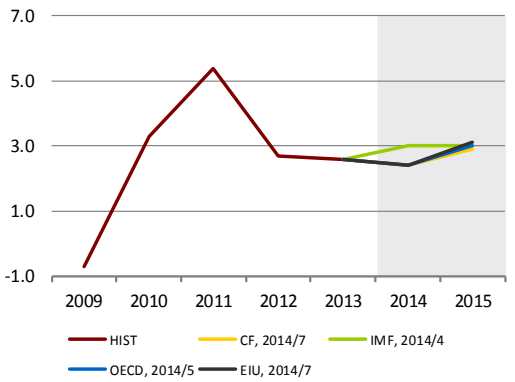
After a sluggish start to the year, the Chinese economy is now showing stable growth. GDP growth reached 7.5% in Q2 (according to a Reuters survey analysts had been expecting growth of 7.4%). The economy was supported by mini stimulus package such as tax cuts for small firms, a reduction in the reserve requirement for some banks and increased government spending on infrastructure. Although the Chinese government expects to hit its 7.5% growth target this year, it has confirmed its willingness to tolerate slight deviations from the target as long as economic growth supports the creation of new jobs, boosts income and is based on quality, efficiency and environmental protection. Stable growth is indicated by the PMI in manufacturing compiled by HSBC, which exceeded the 50-point level (50.7) in June for the first time this year. The CF and EIU outlooks for 2014 were unchanged from June (7.3%). Seasonally unadjusted inflation was running at 2.3% in June compared to 2.5% in May. For 2014 as a whole, CF and the EIU expect consumer price inflation of 2.4%.

GDP growth, %



	CF	IMF	OECD	EIU
2014	7.3	7.5	7.4	7.3
2015	7.2	7.3	7.3	7.0

Inflation, %

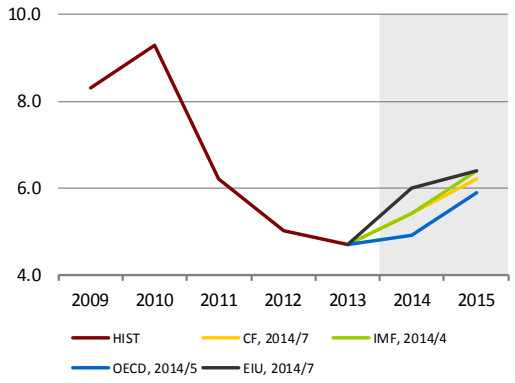


	CF	IMF	OECD	EIU
2014	2.4	3.0	2.4	2.4
2015	2.9	3.0	3.0	3.1

III.2 India

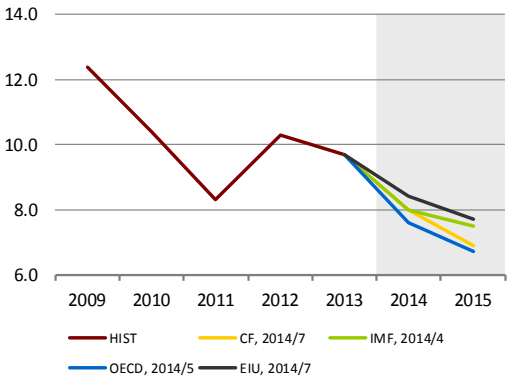
India's economic outlook improved in several respects. The good news included an upswing in industrial production, where year-on-year growth rose to 3.4% in April. Support for industry and investment is one of the priorities of the newly elected government. In addition, slower growth in food prices helped inflation to fall to 8.3% in May. To bring inflation under control, the government announced export restrictions on some foods (sugar and onions) and ordered the release of stockpiled rice. This should reduce speculation and price volatility. However, wholesale prices recorded faster growth in May, showing that the government has a limited ability to intervene. The good news from the economy and the government's reform efforts were reflected in investment inflows and appreciation pressures. The central bank is intervening to stop the currency appreciating. The July CF outlook for GDP growth was unchanged, while the inflation forecast increased for this fiscal year and decreased for the next fiscal year.

GDP growth, %



	CF	IMF	OECD	EIU
2014	5.4	5.4	4.9	6.0
2015	6.2	6.4	5.9	6.4

Inflation, %

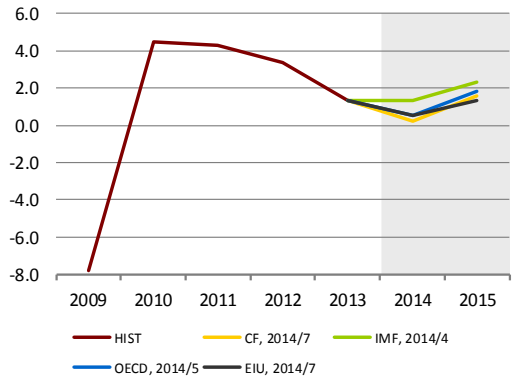


	CF	IMF	OECD	EIU
2014	8.0	8.0	7.6	8.4
2015	6.9	7.5	6.7	7.7

III.3 Russia

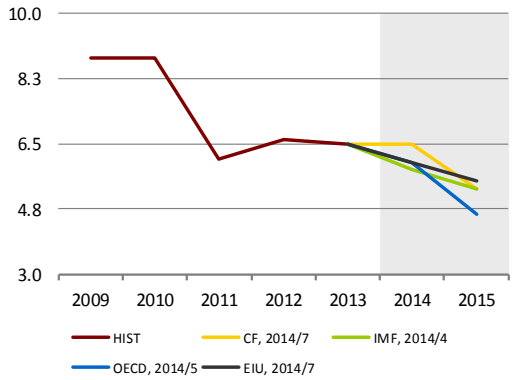
Economic growth in Russia slowed to 0.9% in 2014 Q1. A decline of around 0.2 pp was recorded in quarter-on-quarter terms. The Russian Ministry of Economic Development expects quarterly GDP growth of 1.2% in Q2, which would mean the Russian economy avoiding the risk of going into the "technical recession" expected by many analysts. Macroeconomic indicators are not very encouraging. After recording 0.1% growth in May, the industrial production index fell by 0.7% in June instead of rising as expected. According to the latest CF and EIU outlooks, GDP growth will reach only 0.2%–0.5% in 2014 as a whole. The CBR expects growth of 0.4% and the World Bank left its July outlook unchanged at 0.5%. Inflation continued to edge up. In June it reached 7.8% and was driven by growth in food prices. A previous significant weakening of the rouble and rising oil prices are also contributing to inflation. The July CF substantially increased its outlook for this year and expects inflation of 6.5%. The EIU outlook puts inflation at 6.0%.

GDP growth, %



	CF	IMF	OECD	EIU
2014	0.2	1.3	0.5	0.5
2015	1.6	2.3	1.8	1.3

Inflation, %

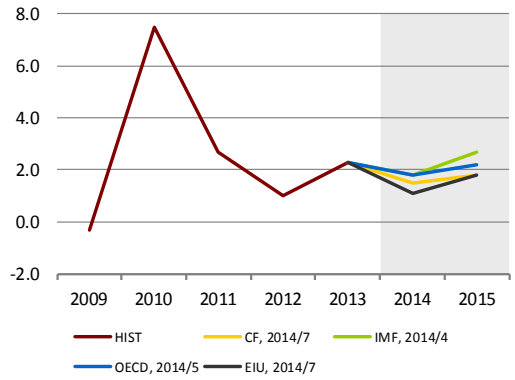


	CF	IMF	OECD	EIU
2014	6.5	5.8	6.0	6.0
2015	5.3	5.3	4.6	5.5

III.4 Brazil

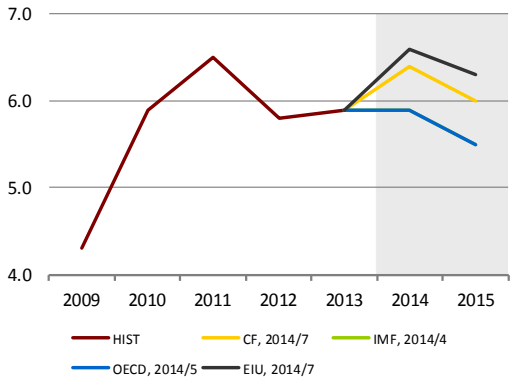
Newly published inflation figures again drew attention to one of the biggest problems in the Brazilian economy, a problem that is jeopardising the country's growth prospects. Inflation in Brazil accelerated in June (to 6.5%), partly as a result of higher air fares and accommodation rates due to the football World Cup. This took inflation to the upper limit of the central bank's target of 4.5% ± 2 pp. However, the central bank is refusing to tighten monetary policy, as inflation will fall to the target at the end of the monetary policy horizon given the current monetary conditions. The bank also decided to continue intervening against depreciation of the domestic currency in the form of currency swaps. However, the programme will be implemented on a reduced scale as financial markets have calmed significantly. The July CF and the EIU reduced their economic growth forecasts and increased their inflation forecasts for Brazil for both years.

GDP growth, %



	CF	IMF	OECD	EIU
2014	1.5	1.8	1.8	1.1
2015	1.8	2.7	2.2	1.8

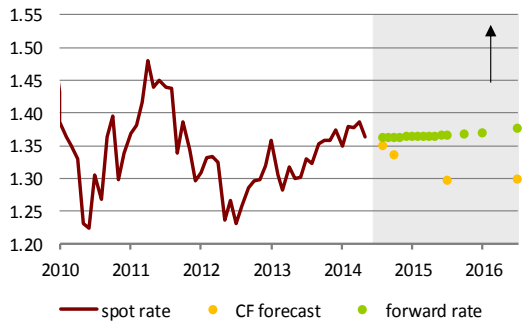
Inflation, %



	CF	IMF	OECD	EIU
2014	6.4	5.9	5.9	6.6
2015	6.0	5.5	5.5	6.3

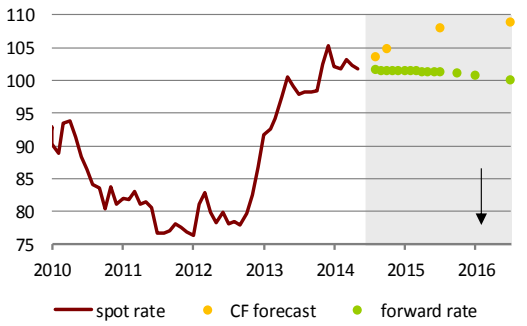
IV. Outlook of exchange rates vis-à-vis the US dollar

THE EURO



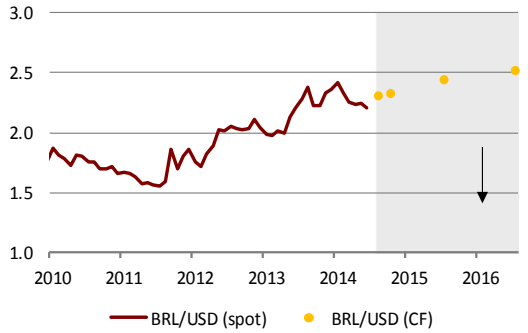
	14/07/14	08/14	10/14	07/15	07/16
spot rate	1.359				
CF forecast		1.349	1.336	1.296	1.299
forward rate		1.362	1.362	1.365	1.376

THE JAPANESE YEN



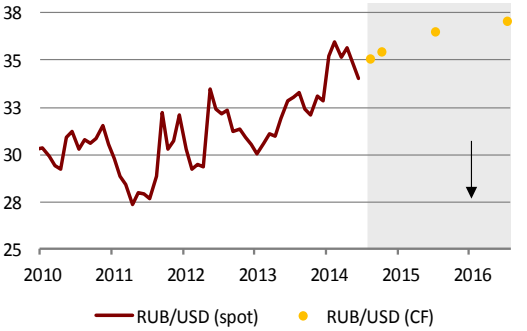
	14/07/14	08/14	10/14	07/15	07/16
spot rate	102.60				
CF forecast		103.50	104.80	107.90	108.80
forward rate		101.52	101.48	101.17	99.99

THE BRAZILIAN REAL



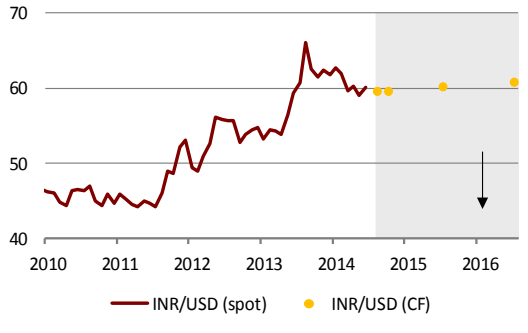
	14/07/14	08/14	10/14	07/15	07/16
spot rate	2.21				
CF forecast		2.31	2.32	2.44	2.51

THE RUSSIAN ROUBLE



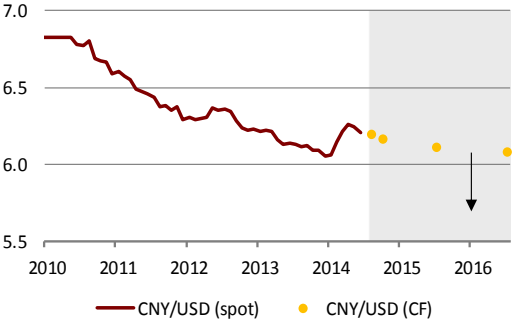
	14/07/14	08/14	10/14	07/15	07/16
spot rate	34.32				
CF forecast		35.00	35.43	36.45	37.04

THE INDIAN RUPIE



	14/07/14	08/14	10/14	07/15	07/16
spot rate	60.13				
CF forecast		59.58	59.54	60.08	60.69

THE CHINESE RENMINBI



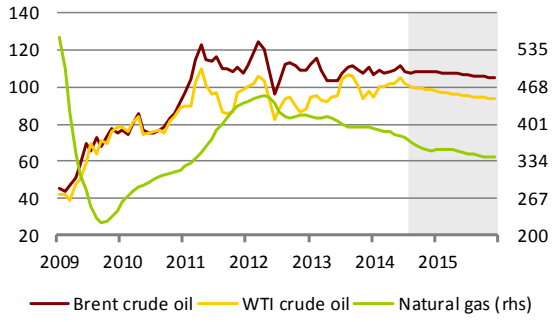
	14/07/14	08/14	10/14	07/15	07/16
spot rate	6.21				
CF forecast		6.19	6.16	6.11	6.08

Arrow indicates currency appreciation against US dollar. 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

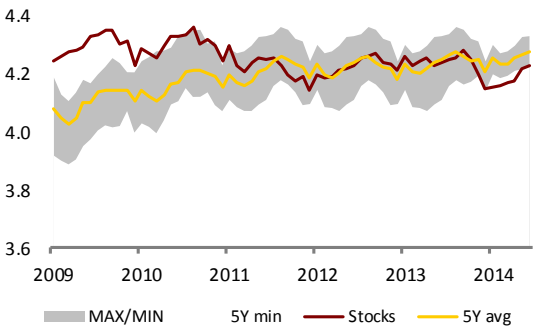
The Brent crude oil price briefly climbed above USD 115 a barrel (bbl) in mid-June in reaction to the armed uprising in northern Iraq. In the rest of June and the first half of July, it fell back below USD 105/bbl as it became apparent that extraction and exports from Iraq were not directly threatened. The monthly average nevertheless rose from USD 109.2/bbl in May to USD 112/bbl in June. In mid-July, prices rebounded on the back of growing geopolitical risks in Ukraine and the Middle East. The WTI price was supported by a drop in stocks in the USA. The market supply of oil is nonetheless sufficient and the price rise reflects growth in the risk premium only. Oil prices are being pushed down by expectations that oil exports from Libya will soon rise, by a rise in exports from the Kurdish part of Iraq, and by a temporary easing of restrictions on exports from Iran. Rising oil extraction in the USA is reducing the need for imports there. Demand for oil is being depressed by low activity at refineries, which are facing low margins, especially in Europe. The sufficient supply of physical oil is confirmed by a surge in commercial stocks of oil and oil products in OECD countries in April and May and also preliminarily in June. The market outlook expects Brent crude oil prices to be flat at roughly the current level until the end of 2014 (annual average: USD 108.5/bbl). In 2015, the price is on a slightly downward path (average: USD 106.7). The EIA upped its forecast for the average Brent price by USD 2 to USD 110/bbl this year and by USD 3 to USD 105/bbl next year. This is in line with the June CF, which predicts a Brent price of around USD 105/bbl one year ahead. According to the EIA, the average WTI crude oil discount to Brent should be around USD 9/bbl, rising to USD 10/bbl next year.

OUTLOOK FOR PRICES OF OIL AND NATURAL GAS

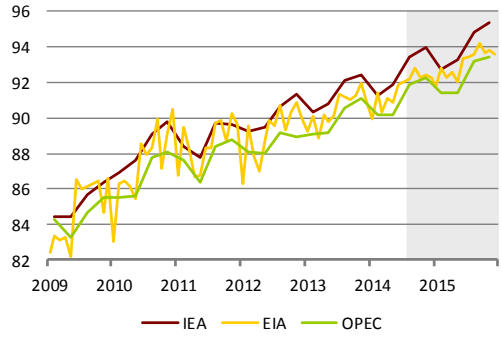


	Brent	WTI	Natural gas
2014	-0.24	2.38	-7.16
2015	-1.66	-4.62	-6.95

TOTAL STOCKS OF OIL AND OIL PRODUCTS IN OECD

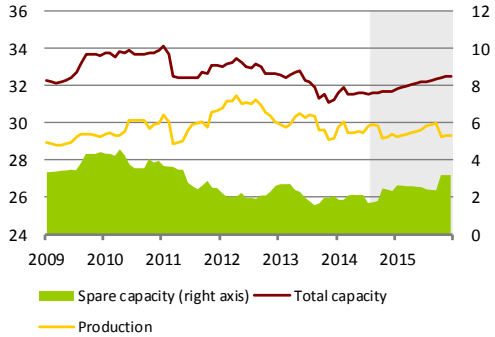


GLOBAL CONSUMPTION OF OIL AND OIL PRODUCTS



	IEA	EIA	OPEC
2014	1.32	1.26	1.28
2015		1.59	

PRODUCTION, TOTAL AND SPARE CAPACITY IN OPEC COUNTRIES



	Production	Total capacity	Spare capacity
2014	-1.07	-1.31	-4.75
2015	-0.26	1.80	31.52

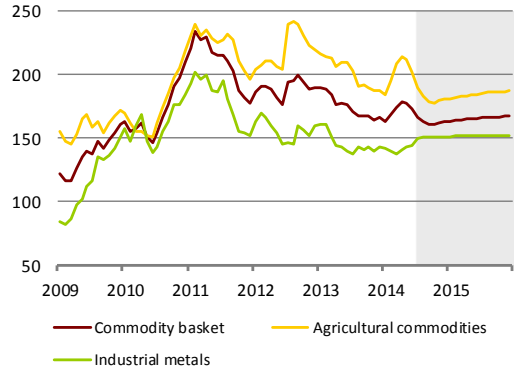
Note: Oil price in USD/barrel, price of Russian natural gas at German border in USD/1,000 m3 (IMF data, smoothed by the HP filter). Future oil prices (grey area) are derived from futures and future gas prices are derived from oil prices using model. Tables show annual percentage changes. Total oil stocks (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 calculations

V.2 Other commodities

Supply-side developments are currently the determining factor on non-energy commodity markets. A bumper wheat crop in the Black Sea area and significantly better growing conditions for corn and soy in the USA compared to last year thanks to good weather led to a further decline in the food commodity price index. The gradual easing of political tensions in Ukraine also had an effect. The decline in soy and rice prices is expected to continue, while the outlook for wheat and corn prices is now rising from current levels. The decline in the food index was counteracted by pork prices, which hit another all-time high, although their outlook is sharply falling, and by beef prices, which are expected to fall slightly in spring 2015. Turning to non-food agricultural commodities, prices of cotton continued to fall sharply with a flat outlook, while rubber prices were flat with a slightly rising outlook.

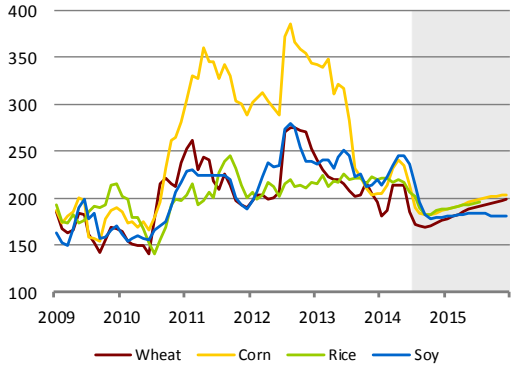
By contrast, the industrial metals price index rose slightly and has a flat outlook, as the improving outlook for manufacturing in the USA and China is offset by surplus extraction and processing capacity. Intervention by the Chinese government, which has restricted commodity-backed lending, is also acting against growth in industrial commodity prices. The rise in the index was due mainly to prices of aluminium, which reacted to falling processing capacity. The outlook is therefore also rising. The price of copper also went up in line with the improving prospects for Chinese industry, but is not expected to continue rising. Following previous growth, the price of nickel stabilised, as did its outlook, as the effect of the earlier ban on exports of unprocessed commodities from Indonesia subsided. Iron went down in price.

PRICES OF NON-ENERGY COMMODITIES



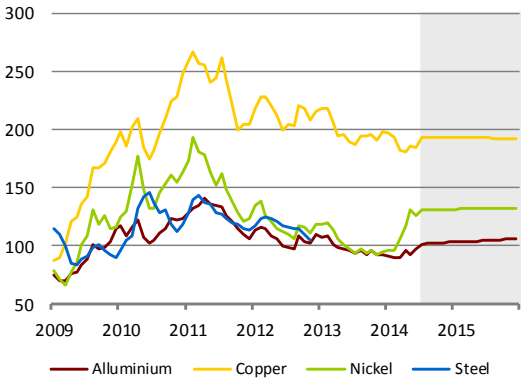
	Overall comm. basket	Agricultural comm.	Industrial metals
2014	-4.0	-4.8	0.4
2015	-1.1	-3.8	3.9

FOOD COMMODITIES



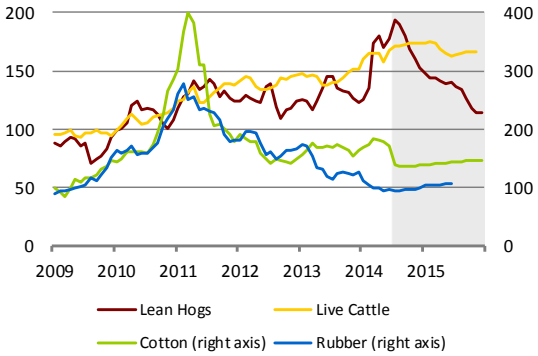
	Wheat	Corn	Rice	Soy
2014	-13.7	-26.5	-7.5	-9.2
2015	2.4	-3.5	-5.2	-13.5

METALS



	Aluminium	Copper	Nickel
2014	-0.1	-4.2	19.4
2015	7.5	1.3	8.2

MEAT, NON-FOOD AGRICULTURAL COMMODITIES



	Lean hogs	Live Cattle	Cotton	Rubber
2014	28.2	16.2	-5.7	-27.2
2015	-20.3	-0.2	-8.6	

Note: Structure of non-energy commodity price indices corresponds to composition of The Economist commodity indices. All prices are given as indices, 2005 = 100 (charts) and percentage changes (tables).
Source: Bloomberg, CNB calculations.

The future of natural gas [1]

Rapid growth in unconventional shale gas extraction in the USA in 2011–2012, facilitated by the development of horizontal-drilling and fracking technology, led to a sharp fall in natural gas prices in the USA. The USA's dependence on imports of this commodity thus dropped significantly. This factor also caused the price of natural gas in the USA to diverge significantly from that in other regions. However, impacts can also be seen on the coal market. A switch from coal to natural gas consumption in US power plants owing to greater utilisation of gas power stations resulted in a fall in coal prices in the USA. Due to higher coal exports to Europe, coal prices also dropped in Europe. European power stations do not have access to cheap US gas and are therefore returning to coal power. This is also being aided by low prices of CO_2 emission allowances, the market for which has collapsed in Europe as a result of the recent recession. Paradoxically, CO_2 production is falling in the USA while rising in Europe. This article attempts to answer the questions of whether this trend is temporary or long-term, whether gas prices in the USA will remain low for an extended period, and whether rising production of liquefied natural gas (LNG) and potential exports of LNG from the USA will result in renewed convergence of natural gas prices in different regions.

1 Natural gas market developments

As described in a previous issue (GEO, 2013), there are three main natural gas markets at present: Europe, America and the Pacific region. These markets differ considerably in price trends and trends in the consumption of natural gas and other fossil energy resources. The biggest changes have recently occurred in North America, where rapid growth in shale gas (and oil) extraction since 2010 has been accompanied by a sharp fall in the price of natural gas (see Chart 1) and by rising gas consumption, particularly in industry and power generation, where coal is being replaced by gas (see Chart 2). Prices in the USA are determined exclusively on a market basis.

Japan is the biggest natural gas consumer in the Pacific region. It imports most of its consumption in the form of liquefied natural gas (LNG). A marked change occurred in 2011, when the accident at the

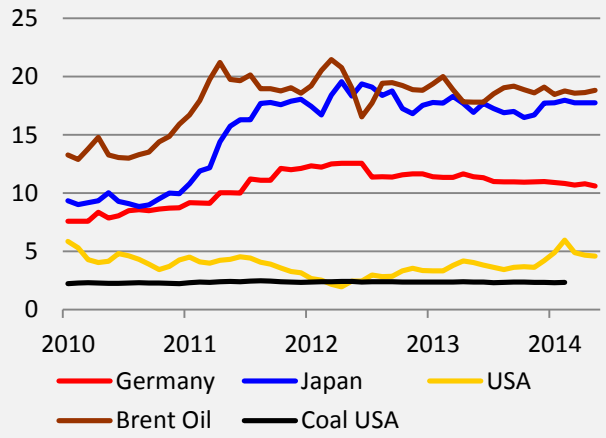


Chart 1: Natural gas, oil and coal prices

Source: IMF, Bloomberg, US EIA

Note: Prices in USD/MBtu, Russian gas in Germany, Indonesian LNG in Japan, average natural gas price in the USA, Brent crude oil price, price of coal for US power stations

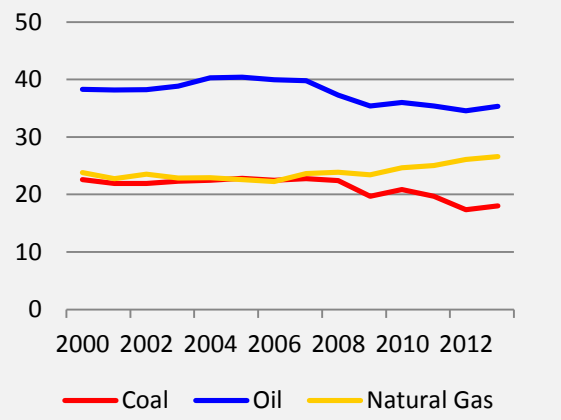


Chart 2: Consumption of fossil fuels in the USA

Source: US EIA

Note: Annual consumption in 10^{15} Btu

Fukushima nuclear power station in March was followed by the gradual shutdown of all nuclear reactors in Japan. Their production was replaced mostly by gas power stations. This led to rising consumption (see Chart 3) and imports of LNG and to a surge in its price. However, this price also reflects the rise in oil prices, as a large proportion of long-term LNG import contracts are indexed to oil prices. The price of LNG per unit of energy content in Japan has thus converged towards the price of Brent crude oil (see Chart 1).

[1] Written by Jan Hošek (Jan2461.hosek@cnb.cz). The views expressed in this article are those of the author and do not necessarily reflect the official position of the CNB. This article is a follow-up to the February 2013 *Focus* on *Natural gas market developments*, which introduced the issue of world gas trade.

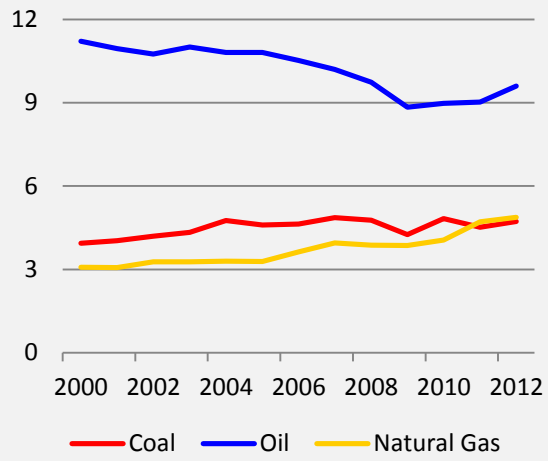


Chart 3: Consumption of fossil fuels in Japan
Source: US EIA
Note: Annual consumption in 10^{15} Btu

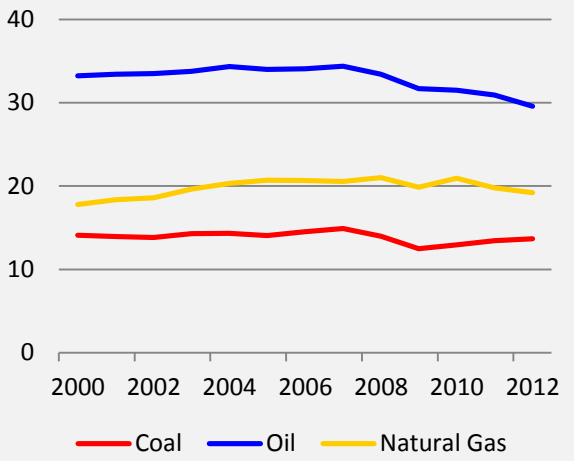


Chart 4: Consumption of fossil fuels in Europe
Source: US EIA
Note: Annual consumption in 10^{15} Btu

The European gas market is highly specific. Part of the gas consumed is extracted directly on the Continent or in the North Sea. The rest is imported via pipelines from the former Soviet Union and North Africa. LNG imports are currently insignificant. Prices of long-term contracts (particularly with Russia) are derived from the oil price. However, there is also a functioning spot market for gas (mainly from the UK and the Netherlands). More and more long-term contracts (mainly with Norway, but increasingly also with Russia) are taking into account these market prices as well as oil prices. This is leading to a gradual fall in average gas prices in Europe.[2] However, market prices are much higher in Europe than in the USA, as there is no simple arbitrage between the two markets. Imports of cheap LNG from the USA (and elsewhere) are being prevented by a ban on exports of US natural gas and by increased demand from South-East Asia, where countries are willing to pay significantly more for LNG. Due to more difficult geological conditions and concerns about environmental damage in densely populated areas, shale gas extraction is not currently a real alternative to conventional extraction in Europe. That said, the European market has been affected by the shale gas boom. Owing to the low gas prices, US power stations have cut down on coal consumption. This has led to a fall in coal prices in the USA[3] and a rise in exports to Europe, causing coal prices to fall and electricity generation from coal to start rising again in Europe. Meanwhile, some new gas power stations have been shut down because the high gas prices were making them unprofitable. Another contributing factor has been a fall in prices of CO_2 emission allowances, which have been in surplus on the European market owing to the recent recession.

2 Natural gas as a substitute for coal and oil

Gas is not currently used widely enough in transport for it to substitute for petrol or diesel to a greater extent there, but in electricity generation it is used quite commonly in gas power stations and can serve as a substitute for coal (and oil). Thanks to their more favourable environmental impact (lower production of greenhouse gases and other pollutants), the construction of gas power stations is widely supported in most countries. The number of gas power stations is rising and the share of natural gas in power generation has been trending upwards since 1987. From the short-term perspective, however, the use of individual fossil fuels in electricity generation reflects many factors (administrative, price, technical). Producers try to generate electricity at the lowest variable cost at any given moment. The large changes in relative prices in the recent past have thus led to changes in the shares of fossil fuels in electricity generation. These changes are not conditional on the construction of new power stations. Most gas power stations serve as reserve sources and are not used at full capacity (see Box 1). Consequently, producers can change the ratio of input fuels merely by changing the load factors of the individual types of power stations.

[2] This is taken into account in our model forecast for gas prices (see section V.1 *Oil and natural gas*), which is based on the market forecasts for both the Brent crude oil price and the natural gas price.

[3] This fall is not visible in Chart 1, as it shows the prices paid by US power stations on the basis of long-term contracts. Market coal prices differ significantly across the USA, but the aggregate index slumped from about 450 in 2011 and 2012 to around 150 in 2013.

Box 1: Coal and gas power stations

In coal-fired power stations generators are powered by steam turbines, whereas in gas power stations they are powered by combustion turbines (using gas combustion products directly). Gas power stations are thus simpler and cheaper to build. They are also more flexible, as their simpler technology makes them quicker to start up and shut down The disadvantage is that combustion turbines are less thermally efficient than steam turbines. Gas power stations are therefore used either as reserve sources brought online quickly to supply electricity during peak periods, or as back-up for solar and wind power stations, whose output is weather-dependent. Newer combined cycle power stations address the efficiency issue by using waste heat from the gas turbine's exhaust fumes to create steam, which then powers a steam turbine. These power stations can compete in terms of efficiency with coal power stations even at times of baseload power demand, when the price of electricity is lower, provided that the price of gas is sufficiently low compared to the price of coal and/or the price of emission allowances is sufficiently high. This is because the volume of CO_2 produced per unit of electricity generated is lower for natural gas combustion than for coal combustion. Low greenhouse gas emissions were the reason for building gas power stations in Europe. In the USA, the law restricting the construction of new oil and gas plants introduced 1978 in response to oil shocks was abolished in 1990. The vast majority of new plants built in the USA since then have been designed to use gas. Since 2002, the nameplate capacity of gas power stations has been higher than that of coal power stations (although their actual total production is still lower). The proportion of power stations fired by oil products has never been very high in most US regions, but has dropped significantly further since 2005 owing to rising oil prices.

An EIA study (2012) for 2005–2010 estimates the elasticity of substitution among the individual types of fossil fuels, i.e. how the ratio of fuels used in electricity generation varies as their relative prices change. It concludes that substitution elasticities are relatively low (for example a 10% increase in the ratio of the price of coal to the price of gas leads to a 1.4% increase in the use of natural gas relative to coal), with the exception of fuel displacement between petroleum and natural gas. The substitution effects differ across US regions and depend on many non-price factors (e.g. non-fuel variable operating costs, start-up/shutdown costs, available capacity, emission rates and environmental regulations, operating reliability and local electricity network constraints). An IEEJ study (Yanagisawa, 2013) concludes that substitution between natural gas and coal is significant only when the price of gas relative to coal falls below a certain level. This was the case in the USA in 2012, when the price of gas in USD/MBtu[4] neared the price of coal. The share of gas in total electricity generation rose from 25% to 31%, whereas the share of coal fell from 42% to 36%. This, however, was primarily due to higher utilisation of the capacity of gas power plants. Therefore, this substitution is not permanent and may change if relative prices change again. The fall in gas prices has also led to a decline in electricity prices, as prices are determined by marginal producers, which in this case are the gas power stations.

3 Is the low gas price in the USA sustainable?

The previous section showed that if the gas price falls below a certain level, there is significant substitution between gas and coal in electricity generation. Based on this fact, various institutions issue long-term forecasts for demand for individual fossil fuels, especially in electricity generation. However, these institutions differ markedly in their conclusions. Some expect the share of natural gas to rise faster than that of coal and some just the opposite. Of course, all the forecasts are based on the expected price of natural gas. We will therefore now discuss whether the currently much lower gas prices in the USA are sustainable. Many observers claim that they are not and that gas prices are currently below the costs of unconventional gas extraction.

The price of natural gas in the USA started to diverge from prices in other regions roughly in 2010 (see Chart 1), when prices in the rest of the world rose in line with the price of oil, while in the USA the price was flat and started to decline markedly in mid-2011. The lowest average monthly value (below USD 2/MBtu) was recorded in April 2012, when it was ten times lower than in Japan. The price in Europe was roughly in the middle. At that time, the price of gas in the USA was below the most optimistic estimates of the costs of shale gas extraction. For example Weijermars (2013) puts the breakeven price of gas in the largest US shale gas fields at USD 4–6/MBtu. Ken Medlock, quoted by Anderson (2013), estimates an even wider range for the breakeven price (USD 2.6–7.9/MBtu, with a median of USD 4.7/MBtu). Berman (2012) estimates the breakeven price for three large shale gas fields in the USA – taking into account total costs over the well's entire production cycle – at more than USD 8/MBtu. The presence of liquid hydrocarbon components, which fetch higher prices, can increase the cost-effectiveness of a rig. An important and more problematic factor is the estimated ultimate recovery (EUR). This factor is specific to each well even within a single field. It depends on the speed at which the well's production falls over time. Anderson (2013) states that to determine this parameter firms are using models that are 50 years old and were developed for

[4] Btu = British Thermal Unit. According to the EIA energy calculator, 1,000 cubic feet = 1.025 MBtu.

conventional vertical drilling. In addition, firms tend to overestimate this factor on account of potential investors. For example Berman and Pittinger (2011) estimate that the actual EUR is only about half that claimed by well operators. The dependence of total production on the total rig count is highly non-linear, because companies lay down their least productive rigs when gas prices fall.

Oil and natural gas producers' economic results also indicate that natural gas prices in the USA were below extraction costs in 2012. For example EIA (2013) states that producers with a 0–20% share of liquids recorded substantial losses in 2012, and firms with a 20–40% share of liquids were also loss-making on average. In 2011, when gas prices were about USD 4/MBtu, producers were profitable on average across all categories, although those oriented on gas less so than those oriented on oil. This would suggest that a price of USD 4/MBtu could be sufficient for shale gas extraction to continue. However, sceptics point to the fact that because of rapidly decreasing shale well yields it will be necessary to drill more and more wells just to maintain current production, and this will require ever increasing investment. The price of labour and drilling equipment is meanwhile rising. Some firms may even have reported their 2011 profits on the basis of incorrect calculations because of over-optimistic EUR estimates. Amid the many uncertainties about shale gas extraction in the USA only one thing is certain: the number of gas-only wells is falling sharply, while the number of mixed wells where oil extraction is the main objective and gas is produced as a side product, is rising. Thanks to such wells, oil production in the USA has shown rapid growth in recent years and is returning to the figures seen in the 1970s. On the other hand it should be said that the initial yields of new wells in the USA are continuing to rise and their setup costs are falling. This is allowing output to grow despite the falling number of new wells and is improving the economics of extraction.

The history of shale gas extraction in the USA is too short to draw any stronger conclusions. The 2011/2012 winter was extremely mild, leading to a rise in gas reserves and a sharp decline in gas prices (with virtually no response from supply – except imports), whereas the 2013/2014 winter was extremely cold, so reserves dropped sharply and the price rose above USD 4/MBtu. The large uncertainty about future shale gas production in the USA is also apparent from the US EIA's current energy outlook up to 2040 (EIA, 2014). In addition to a reference scenario, the EIA has prepared an optimistic scenario (High Oil and Gas Resource) and a pessimistic scenario (Low Oil and Gas Resource) depending on how much oil and natural gas can be economically extracted from unconventional reservoirs and how extraction technology and costs will improve. According to this study, natural gas production in the USA should rise from 24.06 Tcf (trillion cubic feet) in 2012 to 37.54 Tcf in 2040 (28.07 Tcf in the pessimistic scenario and 45.51 Tcf in the optimistic scenario). Demand will grow primarily in the electricity generation sector (where gas will replace coal) and the industrial sector, and also among exporters. The USA should become a net exporter of natural gas in 2018 (LNG exports to Asia, a drop in pipeline imports from Canada and increased pipeline exports to Mexico). The growth in demand is expected to be accompanied by growth in prices (reflecting rising costs) from USD 2.75/MBtu in 2012 to USD 7.65(10.53–4.58)/MBtu (2012 dollars) in 2040. Gas extraction and exports will also depend on oil prices. Higher oil prices in Europe will lead to higher LNG exports and to the substitution of diesel by gas in transport. The growth in extraction will come mainly from shale reservoirs and partly from other unconventional reservoirs.

4 Conclusion

Regions in which the price of natural gas is currently much higher than in the USA are looking to shale gas extraction in the USA in the hope that the USA will allow its producers to export natural gas to a larger extent and that this competition will lead to a fall in prices in other markets. However, this is conditional, among other things, on growth in LNG production. Another condition is that natural gas production in the USA must grow further, as the USA currently has no gas surplus. Given current prices, it is not certain, however, whether production growth will continue at a sufficient pace. Even in these cases, however, full price equalisation would not be possible, as import prices – unlike prices in the USA – would additionally contain at least the costs of liquefaction, transport and regasification (see GEO, 2013 for an estimate). The EU is currently looking at how to diversify its gas suppliers and reduce its dependence on Russia. If, however, Europe wanted to obtain LNG from the USA, it would have to compete with Japan and other Asian countries, which are willing to pay much higher prices for LNG than those currently prevalent in Europe. This means that natural gas prices in Europe would have to rise (or the price of LNG would have to fall, for example if Japan were to return to nuclear power generation). Australia is another significant player in the market. It will become the largest LNG exporter in the world after the projects currently under development go online.[5] However, the costs of gas extraction and LNG production are higher in Australia than in the USA. So, no decline in natural gas prices in other regions to the US level can be expected. The final option is to develop shale gas extraction directly in the regions in question. However, as stated for example in Anderson (2013), it is not possible to generalise the US experience to other regions. A 10,500 feet vertical well with a 4,000 feet lateral length in the Haynesville Shale costs about USD 8 million. The same well in Poland would

[5] For example Morgan Stanley predicts that this will occur as early as 2017, but other forecasts estimate 2030.

cost USD 14–16 million because the industry is not so advanced there and equipment and crews would need to be imported. Moreover, geological conditions and population density are not as favourable as in the USA. Natural gas consumption in the USA may also be affected by the US administration's new plan to cut greenhouse gas emissions in power generation. On the other hand, prices in Europe and Asia may be affected by an agreement on future exports of large volumes of Russian gas to China.

Sources:

Anderson, Jared (2013): *How Much Does a Shale Gas Well Cost? "It Depends"*, Breaking Energy, 6 August 2013 http://breakingenergy.com/2013/08/06/how-much-does-a-shale-gas-well-cost-it-depends/

Berman, Arthur E. and Lynn F. Pittinger (2011): *U.S. Shale Gas: Less Abundance, Higher Cost* http://www.theoildrum.com/node/8212

Berman, Arthur E. (2012): *After The Gold Rush: A Perspective on Future U.S. Natural Gas Supply and Price*, ASPO Conference 2012 Vienna, Austria, 30 May 2012 http://www.aspo2012.at/wp-content/uploads/2012/06/Berman_aspo2012.pdf

EIA (2012): *Fuel Competition in Power Generation and Elasticities of Substitution,* June 2012 http://www.eia.gov/analysis/studies/fuelelasticities/pdf/eia-fuelelasticities.pdf

EIA (2013): *Low Natural Gas Prices in 2012 Reduced Returns for Some Oil and Gas Producers*, Today in Energy, 9 May 2013 http://www.eia.gov/todayinenergy/detail.cfm?id=11191

EIA (2014): *Annual Energy Outlook 2014*, 7 May 2014 http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf

GEO (2013*)*: *Natural Gas Market Developments*, Global Economic Outlook, February 2013 http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/en/monetary_policy/geo/geo_2013/gev_2013_02_en.pdf

Weijermars**,** Ruud (2013): *Economic Appraisal of Shale Gas Plays in Continental Europe*, *Applied Energy 106 (2013), pp. 100–115,* http://www.alboran.com/files/2013/07/SR-7.pdf

Yanagisawa, Akira (2013): *Impacts of Shale Gas Revolution on Natural Gas and Coal Demand*, The Institute of Energy Economics, Japan, January 2013 http://eneken.ieej.or.jp/data/4687.pdf

A1. Change in GDP predictions for 2014

	CF		IMF		OECD		CB / EIU	
EA	0.0	2014/7 2014/6	0.2	2014/4 2014/1	0.2	2014/5 2013/11	-0.2	2014/6 2014/3
US	-0.6	2014/7 2014/6	0.0	2014/4 2014/1	-0.3	2014/5 2013/11	-0.7	2014/6 2014/3
DE	0.0	2014/7 2014/6	0.1	2014/4 2014/1	0.2	2014/5 2013/11	0.2	2014/6 2013/12
JP	0.0	2014/7 2014/6	-0.3	2014/4 2014/1	-0.3	2014/5 2013/11	-0.1	2014/7 2014/4
BR	-0.2	2014/7 2014/6	-0.5	2014/4 2014/1	-0.4	2014/5 2013/11	-0.7	2014/7 2014/6
RU	-0.1	2014/7 2014/6	-0.7	2014/4 2014/1	-1.8	2014/5 2013/11	0.0	2014/7 2014/6
IN	0.0	2014/7 2014/6	0.0	2014/4 2014/1	-0.2	2014/5 2013/11	0.0	2014/7 2014/6
CN	0.0	2014/7 2014/6	0.0	2014/4 2014/1	-0.8	2014/5 2013/11	0.0	2014/7 2014/6

A2. Change in inflation predictions for 2014

	CF		IMF		OECD		CB/EIU	
EA	0.0	2014/7 2014/6	-0.6	2014/4 2013/10	-0.5	2014/5 2013/11	-0.3	2014/6 2014/3
US	0.2	2014/7 2014/6	-0.1	2014/4 2013/10	-0.3	2014/5 2013/11	0.1	2014/6 2014/3
DE	-0.1	2014/7 2014/6	-0.4	2014/4 2013/10	-0.7	2014/5 2013/11	-0.2	2014/6 2013/12
JP	0.1	2014/7 2014/6	-0.1	2014/4 2013/10	0.3	2014/5 2013/11	0.0	2014/7 2014/4
BR	0.1	2014/7 2014/6	0.1	2014/4 2013/10	0.9	2014/5 2013/11	0.1	2014/7 2014/6
RU	0.1	2014/7 2014/6	0.1	2014/4 2013/10	0.3	2014/5 2013/11	0.0	2014/7 2014/6
IN	0.2	2014/7 2014/6	-0.9	2014/4 2013/10	-1.4	2014/5 2013/11	0.4	2014/7 2014/6
CN	-0.1	2014/7 2014/6	0.0	2014/4 2013/10	0.0	2014/5 2013/11	0.1	2014/7 2014/6

A3. List of abbreviations

BoJ	Bank of Japan
BR	Brazil
BRIC	Brazil, Russia, India and China
CB-CCI	Conference Board Consumer Confidence Index
CB-LEII	Conference Board Leading Economic Indicator Index
CBOT	Chicago Board of Trade
CF	Consensus Forecasts
CN	China
CNB	Czech National Bank
DBB	Deutsche Bundesbank
DE	Germany
EA	euro area
EC	European Commission
ECB	European Central Bank
EC-CCI	European Commission Consumer Confidence Indicator
EC-ICI	European Commission Industrial Confidence Indicator
EIU	The Economist Intelligence Unit database
EEA	European Economic Area
ES	Spain
EU	European Union

EMI	European Monetary Institute
EURIBOR	Euro Interbank Offered Rate
Fed	Federal Reserve System (the US central bank)
FRA	forward rate agreement
GBP	pound sterling
GDP	gross domestic product
GR	Greece
CHF	Swiss franc
ICE	Intercontinental Exchange
IE	Ireland
IFO	Institute for Economic Research
IFO-BE	IFO Business Expectations
IMF	International Monetary Fund
IN	India
IRS	interest rate swap
IT	Italy
JP	Japan
JPY	Japanese yen
LIBOR	London Interbank Offered Rate
N/A	not available
OECD	Organisation for Economic Co-operation and Development
OECD-CLI	OECD Composite Leading Indicator
PMI	Purchasing Managers' Index
PT	Portugal
RU	Russia
UoM	University of Michigan
UoM-CSI	University of Michigan Consumer Sentiment Index
US	United States
USD	US dollar
ZEW-ES	ZEW Economic Sentiment

A4. List of thematic articles published in the GEO

2014

	Issue
The future of natural gas (Jan Hošek)	2014-7
Annual assessment of the forecasts included in GEO (Filip Novoný)	2014-6
How far the V4 countries are from Austria: A detailed look using CPLs (Václav Žďárek)	2014-5
Heterogeneity of financial conditions in euro area countries (Tomáš Adam)	2014-4
The impacts of the financial crisis on price levels in Visegrad Group countries (Václav Žďárek)	2014-3
Is the threat of deflation real? (Soňa Benecká and Luboš Komárek)	2014-2
Forward guidance – another central bank instrument? (Milan Klíma and Luboš Komárek)	2014-1

2013

	Issue
Financialisation of commodities and the structure of participants on commodity futures markets (Martin Motl)	2013-12
The internationalisation of the renminbi (Soňa Benecká)	2013-11
Unemployment during the crisis (Oxana Babecká and Luboš Komárek)	2013-10
Drought and its impact on food prices and headline inflation (Viktor Zeisel)	2013-9
The effect of globalisation on deviations between GDP and GNP in selected countries over the last two decades (Vladimír Žďárský)	2013-8
Competitiveness and determinants of travel and tourism (Oxana Babecká)	2013-7
Annual assessment of the forecasts included in GEO (Filip Novotný)	2013-6
Apartment price trends in selected CESEE countries and cities (Michal Hlaváček and Luboš Komárek)	2013-5
Selected leading indicators for the euro area, Germany and the United States (Filip Novotný)	2013-4

Financial stress in advanced economies (Tomáš Adam and Soňa Benecká)	2013-3
Natural gas market developments (Jan Hošek)	2013-2
Economic potential of the BRIC countries (Luboš Komárek and Viktor Zeisel)	2013-1

2012

	Issue
Global trends in the services balance 2005–2011 (Ladislav Prokop)	2012-12
A look back at the 2012 IIF annual membership meeting (Luboš Komárek)	2012-11
The relationship between the oil price and key macroeconomic variables (Jan Hošek, Luboš Komárek and Martin Motl)	2012-10
US holdings of foreign securities versus foreign holdings of securities in the US: What is the trend? (Narcisa Kadlčáková)	2012-9
Changes in the Czech Republic's balance of payments caused by the global financial crisis (Vladimír Žďárský)	2012-8
Annual assessment of the forecasts included in the GEO (Filip Novotný)	2012-7
A look back at the IIF spring membership meeting (Filip Novotný)	2012-6
An overview of the world's most frequently used commodity indices (Jan Hošek)	2012-5
Property price misalignment around the world (Michal Hlaváček and Luboš Komárek)	2012-4
A macrofinancial view of asset price misalignment (Luboš Komárek)	2012-3
The euro area bond market during the debt crisis (Tomáš Adam and Soňa Benecká)	2012-2
Liquidity risk in the euro area money market and ECB operations (Soňa Benecká)	2012-1

2011

	Issue
An empirical analysis of monetary policy transmission in the Russian Federation (Oxana Babecká)	2011-12
The widening spread between prices of North Sea Brent crude oil and US WTI crude oil (Jan Hošek and Filip Novotný)	2011-11
A look back at the IIF annual membership meeting (Luboš Komárek)	2011-10
Where to look for a safe haven currency (Soňa Benecká)	2011-9
Monetary policy of the central bank of the Russian Federation (Oxana Babecká)	2011-9
Increased uncertainty in euro area financial markets (Tomáš Adam and Soňa Benecká)	2011-8
Eurodollar markets (Narcisa Kadlčáková)	2011-8
Assessment of the forecasts monitored in the GEO (Filip Novotný)	2011-7
How have global imbalances changed during the crisis? (Vladimír Žďárský)	2011-6
Winners and losers of the economic crisis in the eyes of European investors (Alexis Derviz)	2011-5
Monetary policy of the People's Bank of China (Soňa Benecká)	2011-4
A look back at the IIF spring membership meeting (Jan Hošek)	2011-3
The link between the Brent crude oil price and the US dollar exchange rate (Filip	2011-2

	Issue
Novotný)	
International integration of the Chinese stock market (Jan Babecký, Luboš Komárek and Zlatuše Komárková)	2011-1