

# GLOBAL ECONOMIC OUTLOOK - DECEMBER

Monetary and Statistics Department  
External Economic Relations Division

2014



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**Cut-off date for data**

8 - 12 December 2014

**CF survey date**

8 December 2014

**GEO publication date**

19 December 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.

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II.4 Japan	III.2 India	V. Commodity market developments		
	III.4 Brazil			

The December 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 validity of Okun's law, which empirically assesses the strength of the relationship between growth in unemployment and GDP. Using a sample of 59 countries, our analysis shows a significant asymmetry in the evolution of Okun's coefficient since the end of the 1990s.

Most outlooks for advanced euro area economies indicate that the threat of deflation was not averted in 2014 and economic growth failed to show a robust rebound. Particularly worrisome are developments in the economically strong euro area countries, such as Germany, France or Italy. However, the current outlooks for 2015 show that there is still hope that economic results could be somewhat better next year, but this depends on numerous factors including non-economic ones. Nonetheless, this year has also indicated that economic recovery is being driven by the US economy, although it has recently lost the status of the strongest world economy (in favour of the Chinese economy). Among the G7 countries, Canada and the UK should also maintain solid economic growth. The current results of the Japanese economy worsened, but the outlooks for 2015 are again slightly optimistic.

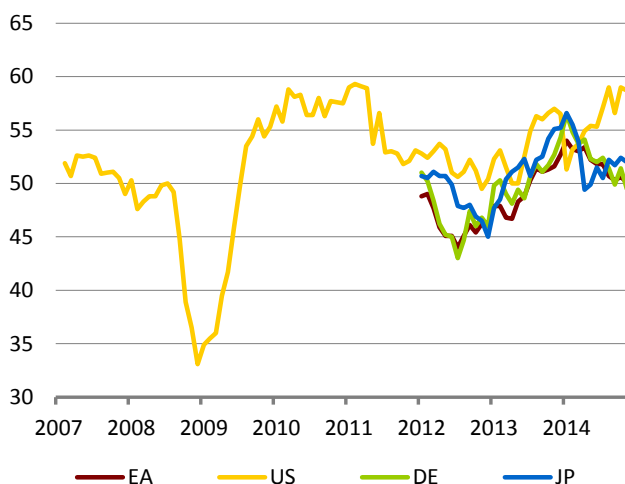
The outlooks for emerging economies, represented by the BRIC countries, remain mixed. Despite the slightly deteriorating results, the Chinese economy is best off, as it will be able to keep the 7% rate of growth also in 2015, amid relatively low inflation. By contrast, the Russian economy will be on the brink of recession in a situation of rising inflation (and a depreciating rouble). This primarily reflects the sanctions imposed by the international community and low dollar prices of oil. The macroeconomic situation is unfavourable also in Brazil. Its GDP growth is expected to be low (below 1%) amid fairly high inflation and a weakening real. Conversely, the outlooks for the Indian economy in 2015 are still mostly positive, as the growth rate should increase gradually and the disinflation trend should continue. Inflation should gradually approach the 6% level from above.

The outlooks for euro area interest rates remain very low and there is no sign of them rising before the end of 2015. The rates are affected by weak economic growth, the threat of deflation and unconventional instruments – both those already implemented and those under discussion – to further ease the ECB's monetary policy. In the USA, interest rates might start to increase in a matter of months (roughly in the second half of 2015). According to CF, the US dollar will appreciate against all the monitored currencies over the one-year horizon, except for a modest weakening against the Chinese renminbi.

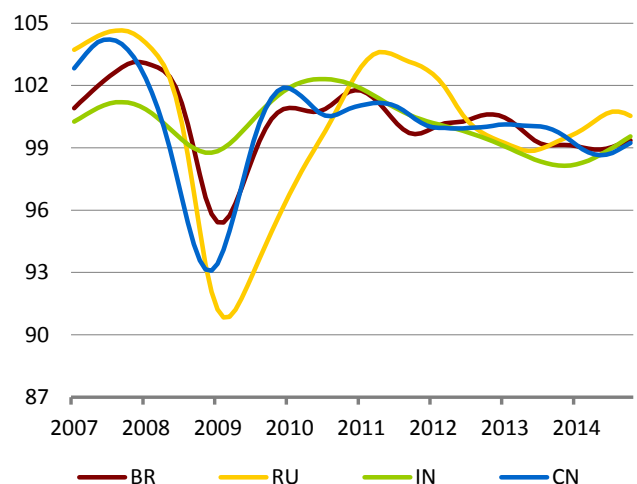
Oil prices again shifted visibly downwards at the end-2015 forecast horizon and are expected to stand slightly above USD 70 a barrel at the one-year horizon. Nevertheless, owing to a stronger dollar, the effects of cheaper oil will be weaker for consumers who do not pay in dollars. However, such consumers might benefit from a possible economic recovery, which as a rule occurs in the period of lower oil prices. The outlooks for natural gas prices, which normally lag behind oil prices, still suggest a pronounced decline. However, this decline may be offset by the impacts of a potential escalation of the Russian-Ukrainian conflict. The outlooks for prices on agricultural commodity and industrial metal markets are stable around the current levels.

## Leading indicators for countries monitored in the GEO

PMI in manufacturing - advanced countries



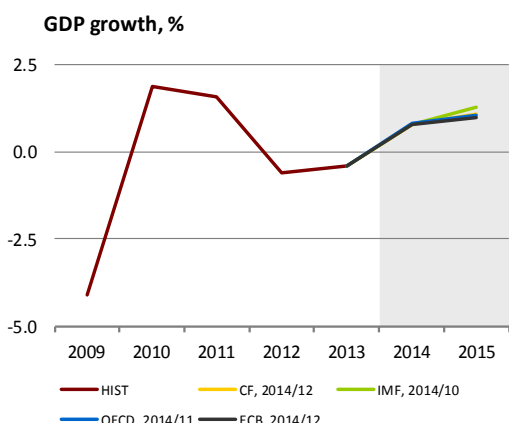
OECD CLI - BRIC countries



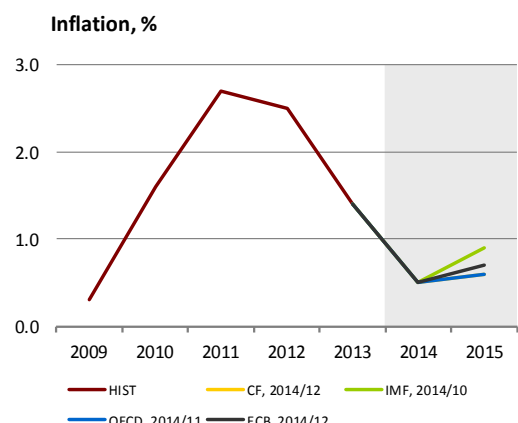
II.1 Euro area

Euro area GDP increased by 0.2% quarter on quarter in 2014 Q3 (after rising by 0.1% in Q2). The economy was driven by household and government consumption, while the contribution of net exports was negative and investment had a neutral effect. A continuing modest recovery is expected in the last quarter. For example industrial production and retail sales saw a slight increase in October compared to September. Consistent with a modest recovery are most leading indicators and sentiment indicators, the values of which are above the level signalling stagnation. The ECB published its new projection in December, where it revised downwards its outlook for GDP growth compared to October. Growth should thus reach 0.8% this year and rise by about 0.2 pp in 2015. In 2016, the ECB expects GDP growth to pick up to 1.5%. The OECD presented its new outlook in November, which is consistent with the ECB and CF outlooks. The December CF level is unchanged from the previous month.

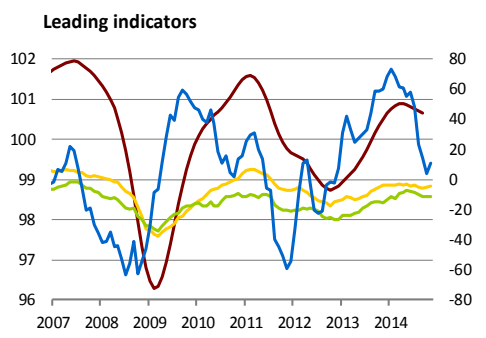
According to Eurostat’s flash estimate, inflation in the euro area dropped from 0.4% in October to 0.3% in November 2014. This decline was mostly due to a marked fall in energy prices and slower growth in prices of services. Low price level increases are expected also at the outlook horizon. Average inflation should reach 0.5% this year and rise just slightly in 2015. A further increase to 1.4% is expected by the ECB in 2016. The ECB responded to the prolonged period of low inflation by presenting several asset purchase programmes and cheap loans to banks aimed at increasing the ECB’s balance sheet to the level it had at the beginning of 2012. Purchases of asset-backed securities (ABS) were launched in November, but their volume has been relatively low so far. The December second round of targeted longer-term refinancing operations (TLTROs) fell short of expectations, although their take-up was EUR 47 billion higher (about EUR 130 billion) compared to the first round. The results of the programmes aimed at a further easing of monetary policy by the ECB, which were likely motivated by preventing deflation trends in the euro area, thus increase the likelihood of additional measures being adopted. Consistent with this is also a modest decline in interest rate outlooks compared to the previous month.



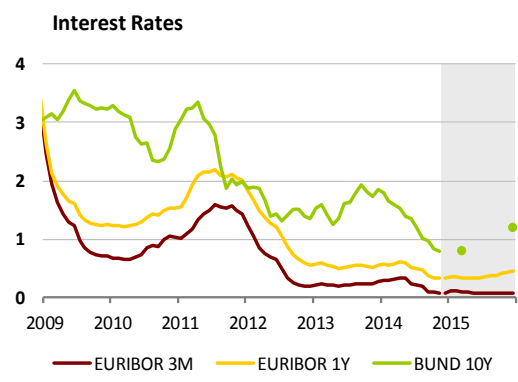
	CF	IMF	OECD	ECB
<b>2014</b>	0.8 ➡	0.8	0.8 ➡	0.8 ➡
<b>2015</b>	1.1 ➡	1.3	1.1 ➡	1.0 ➡



	CF	IMF	OECD	ECB
<b>2014</b>	0.5 ➡	0.5	0.5 ➡	0.5 ➡
<b>2015</b>	0.6 ➡	0.9	0.6 ➡	0.7 ➡



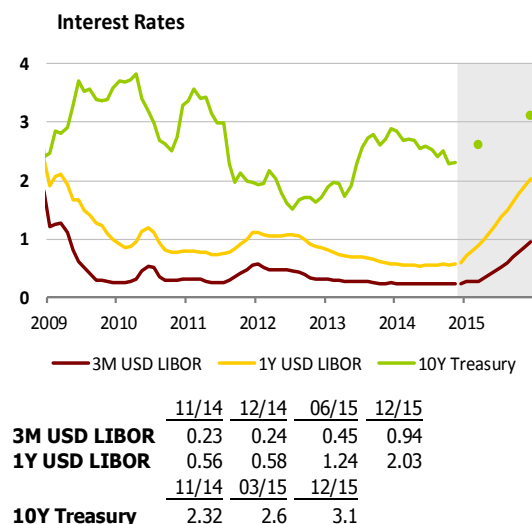
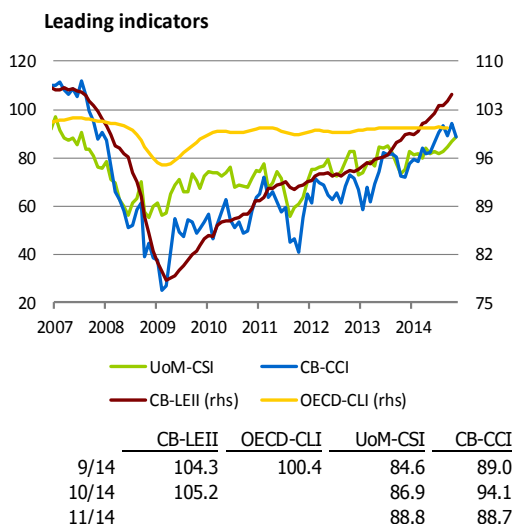
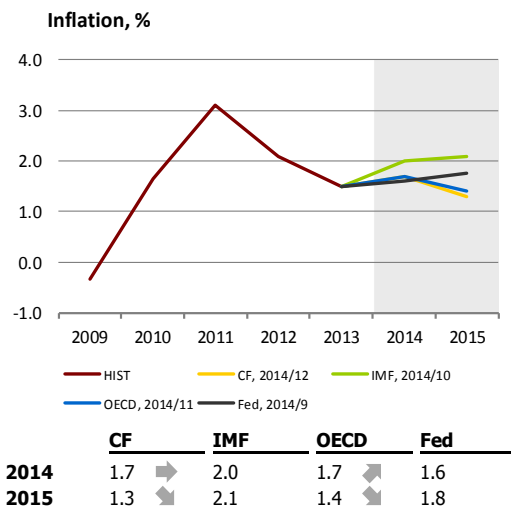
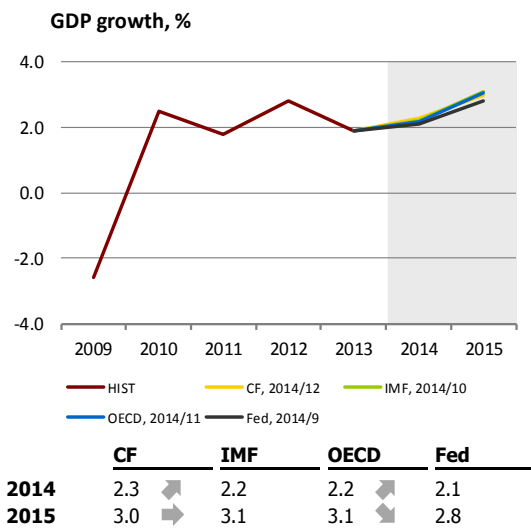
	OECD-CLI	EC-ICI	EC-CCI	ZEW-ES
9/14	100.7	-5.5	-11.4	14.2
10/14		-5.1	-11.1	4.10
11/14		-4.3	-11.6	11.00



	11/14	12/14	06/15	12/15
<b>3M EURIBOR</b>	0.08	0.08	0.08	0.08
<b>1Y EURIBOR</b>	0.33	0.33	0.34	0.46
<b>10Y Bund</b>	0.80	0.8	1.2	

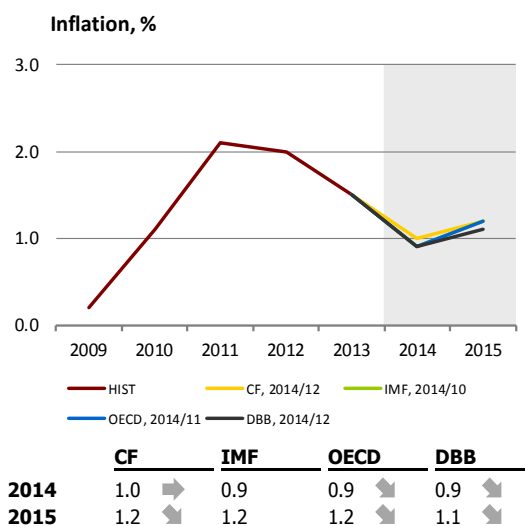
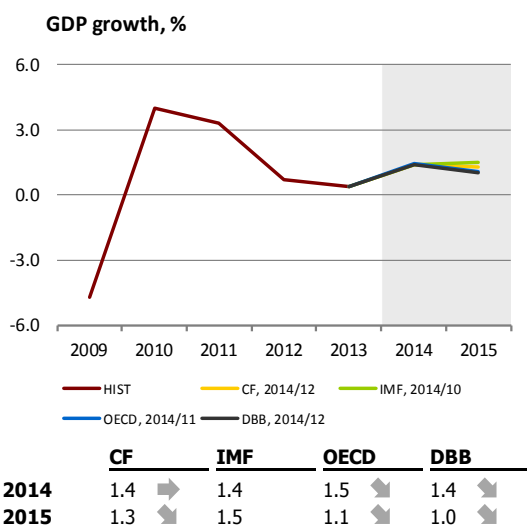
## II.2 United States

The outlook for economic growth in the United States this year has improved further and the prospects for 2015 remain favourable, at 3%. This is in line with the published better-than-expected revised GDP growth in 2014 Q3. Industrial production growth slowed to 4% year on year in October. In month-on-month terms, production decreased. Nonetheless, the November PMI in manufacturing is relatively high despite a slight downward correction. Another leading indicator – the University of Michigan Consumer Sentiment Index – continued rising in November and the consumer confidence indicator (Conference Board) stands close to a seven-year high despite showing a decline. The labour market situation is favourable and the unemployment rate stabilised at 5.8% in November, which, together with lower oil prices, could foster household consumption, which is the main driving force of growth. Inflation expectations for this year and the next remain well anchored safely below 2%. Consumer price inflation was at 1.7% for the third consecutive month in October. Attention is thus focused on the Fed and the likely date of the first rise in its interest rates. According to the current market yield curve, this is expected in mid-2015. The dollar appreciated below USD 1.23/EUR in December, but then reversed its gains. According to CF, the dollar is expected to continue to appreciate at the one-year horizon, by a total of 3% to USD 1.19/EUR, reflecting mainly the persisting problems in the euro area, which is balancing on the brink of deflation, and also the growth prospects for the US economy.



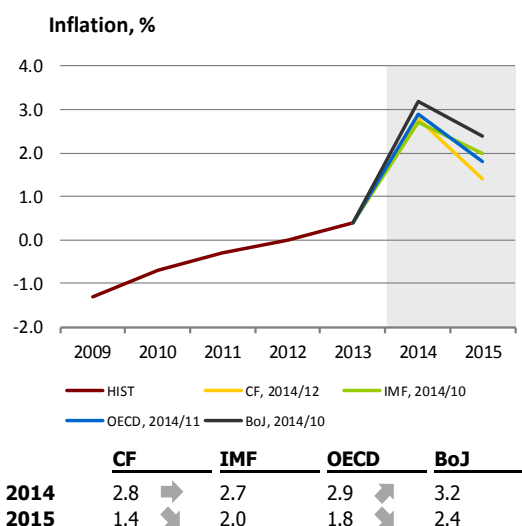
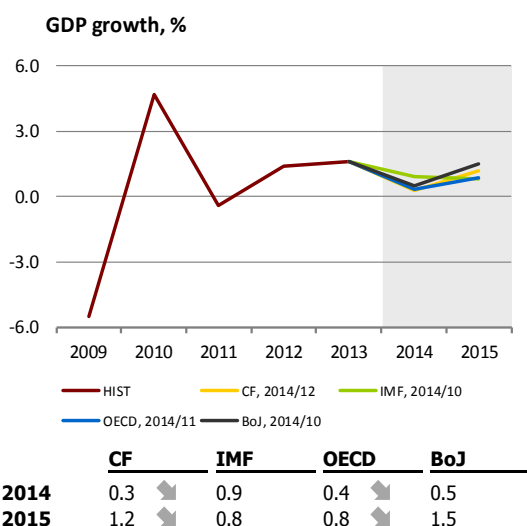
### II.3 Germany

Economic growth in Germany increased slightly to 0.1% quarter on quarter in 2014 Q3 from a 0.1% decline in Q2. By contrast, the annual GDP growth rate slowed by 0.2 pp to 1.2%. According to the December CF, stagnation or weak growth will continue into Q4. The same outlook is suggested by leading indicators for the end of this year and the beginning of 2015. The December CF expects GDP growth of 1.4% for this year as a whole and the outlook for next year has been decreased further to 1.3%. The German government, the Bundesbank and the European Commission predict even lower growth of around 1%. By contrast, the leading German institute Ifo increased its prediction for 2015 to 1.5%. Inflation dropped by 0.2 pp to 0.6% in November, owing to falling energy prices, flat food prices and slowing growth in services prices. The December CF expects inflation at 1% and 1.2% in 2014 and 2015 respectively.



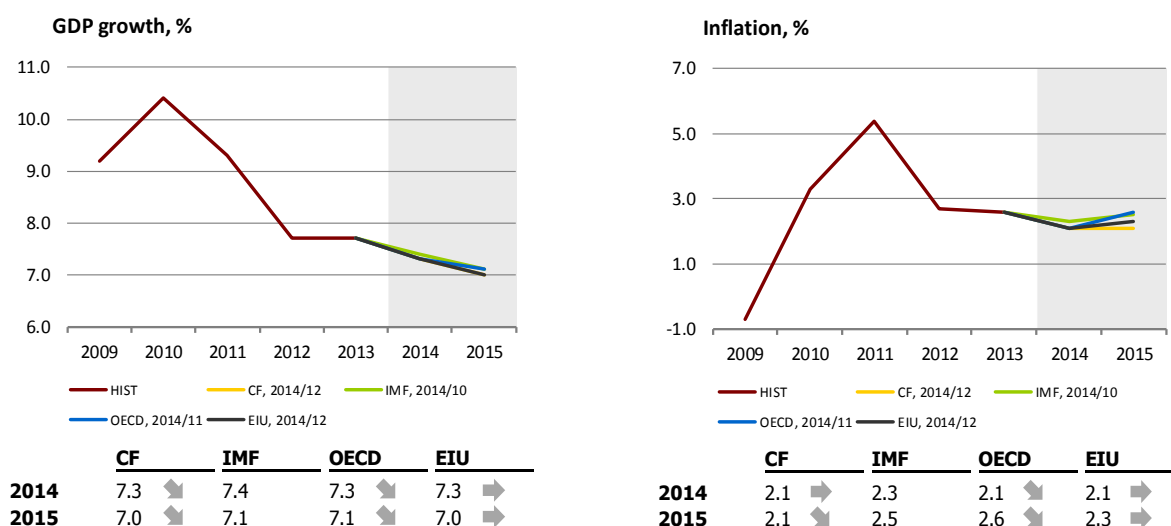
### II.4 Japan

The Japanese economy slipped into recession in Q3, as GDP declined by 0.5% (after revision) compared to the previous quarter. This GDP development was affected chiefly by a fall in inventories and capital investment. The expectations of a rise in net exports also failed to materialise. Exports should have taken over as the growth driver until consumer demand is renewed in full strength. Consumer spending, which accounts for 60% of overall economic growth, rose by only 0.4% year on year. The effect of the April tax increase on consumer demand thus persists. New data from the economy made Prime Minister Abe to postpone the next increase in turnover tax until April 2017. The CF outlook for GDP growth was revised downwards as well, by 0.7 pp for this year and by 0.1 pp for 2015. Inflation slowed for the third consecutive month in October (to 2.9% for inflation excluding food prices). The CF outlook for 2015 also shifted downwards by 0.4 pp, as the effect of yen depreciation against the dollar will be counteracted by falling oil prices.



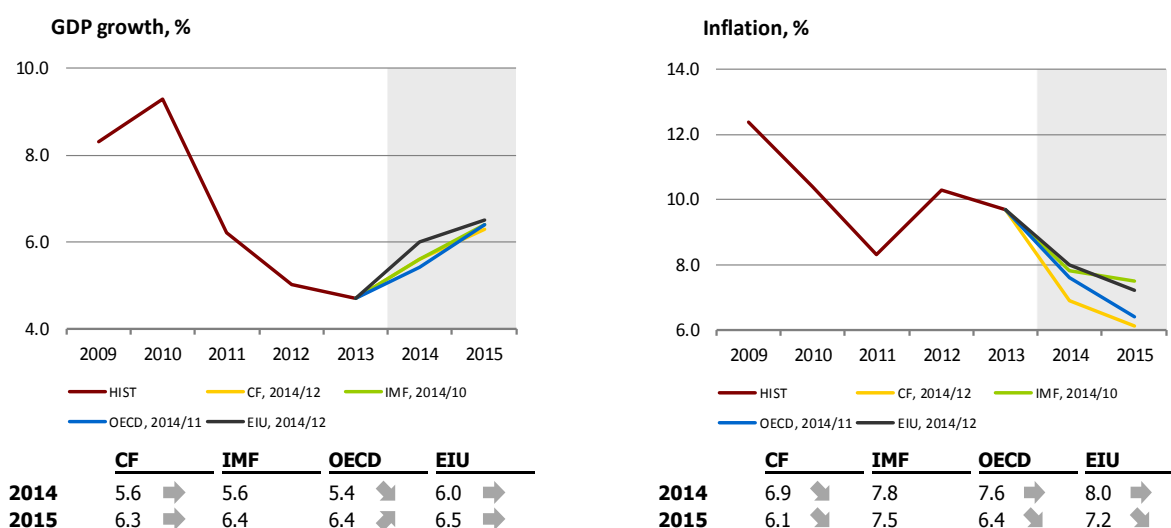
### III.1 China

Although economic growth in China is still solid compared to other countries, the growth rate continues slowing. Annual GDP growth dropped from 7.5% in Q2 to 7.3% in Q3. The continuing slowdown in economic activity is suggested also by short-term indicators. The industrial production growth index moderated from 7.7% in October to 7.2% in November (according to Bloomberg, the analysts had expected growth of 7.5%). The HSBC PMI in manufacturing fell to the 50-point contraction-expansion threshold. According to Bloomberg, the analysts expect the government to lower its growth target to 7% (the new target will be declared in March). The economy should be supported by additional government measures and further easing of the monetary conditions. The new CF, EIU and OECD outlooks agree on GDP growth of 7.3% this year. Next year the economy should grow at a rate approaching 7%.



### III.2 India

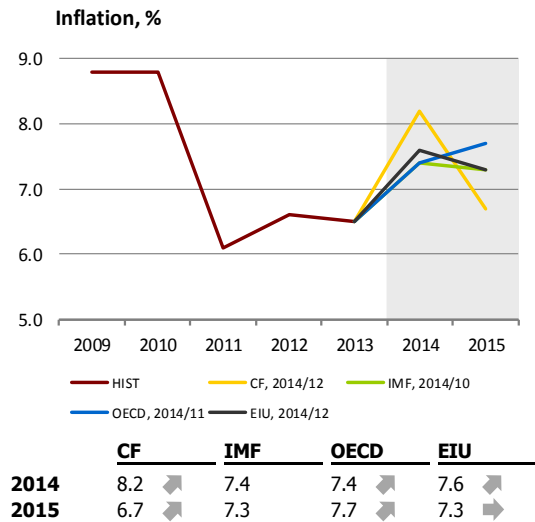
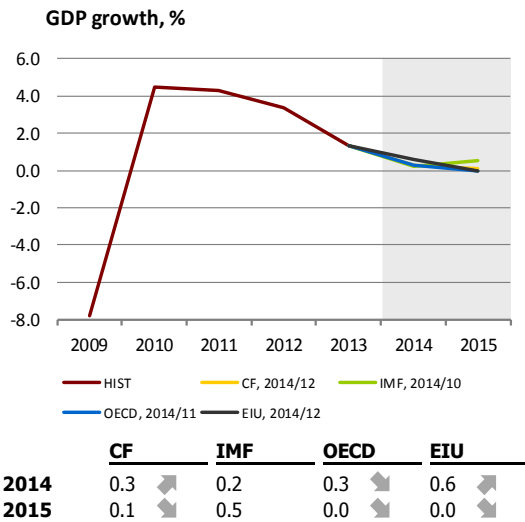
The Indian central bank left interest rates at 8% in December. At the same time it hinted that monetary policy easing is likely early next year, if the current trend of falling inflation continues. A rate reduction, together with gradually implemented government reforms, should stimulate the Indian economy, whose annual growth slowed slightly to 5.3% in Q3. Among other things, the government has already implemented reforms encouraging stronger entry of foreign investment into some industries. It would like to introduce a single tax rate on goods and services at the start of next year and is preparing a simplification of labour legislation. International institutions expect GDP growth to be between 5.4% and 6.0% this year and pick up to 6.3%–6.5% in 2015. CF revised downwards its inflation outlooks for both fiscal years by 0.4 pp. The EIU and the OECD lowered their inflation forecast to a similar extent only for the next fiscal year.





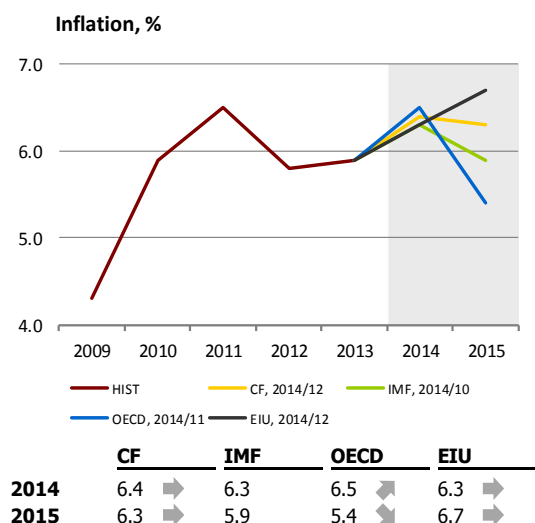
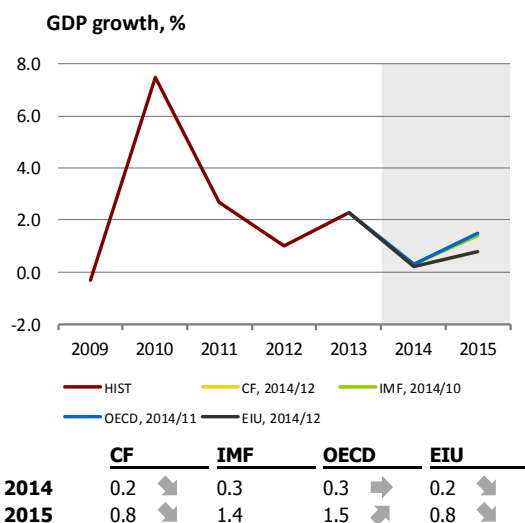
### III.3 Russia

According to the flash estimate of the Rosstat and the Russia’s Ministry of Economic Development (MER), annual GDP growth slowed to 0.7% in Q3. At the same time, seasonally adjusted quarter-on-quarter GDP growth was zero according to the MER. Annual inflation picked up to 9.1% in November. As in previous months, food prices recorded the biggest growth. The economic situation is worsening due to falling oil prices. Oil and gas exports account for almost 70% of Russia’s total exports and for about a half of federal budget revenues. The present situation contributes to further depreciation of the rouble. In the opening third of December the rouble weakened by more than 60% against the dollar in year-on-year terms (and by 16% month on month). The central bank renewed forex market interventions. Their volume between the beginning of the year and 12 December 2014 totalled USD 77 billion (3.7% of GDP). The key rate was raised to 10.5% on 12 December. The new CF, EIU and OECD outlooks expect GDP to rise by 0.3%–0.6% this year. The economy will slow further next year (growth of 0%–0.1%).



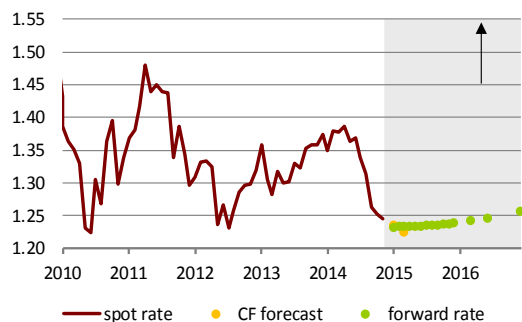
### III.4 Brazil

Brazil emerged from technical recession in Q3, but the economy grew by only 0.1% in quarter-on-quarter terms. Inflation in Brazil dropped marginally in November, but has remained above the upper boundary of the central bank’s target since June. The weakening real, which is currently at a nine-year low (BRL 2.6/USD), is contributing to the inflationary pressures; CF expects it to depreciate further to BRL 2.8 to the dollar at the one-year horizon. To combat inflation, the Brazilian central bank raised its interest rate by another 0.5 pp to 11.75%. At the same time, however, it indicated that further monetary policy tightening will be more moderate. The taming of inflation should be fostered by fiscal tightening under new finance minister J. Levy. The low growth in the Brazilian economy was reflected also in the December CF and EIU predictions, which both reduced the outlooks for Brazil’s GDP growth to 0.2% in 2014 and 0.8% in 2015.



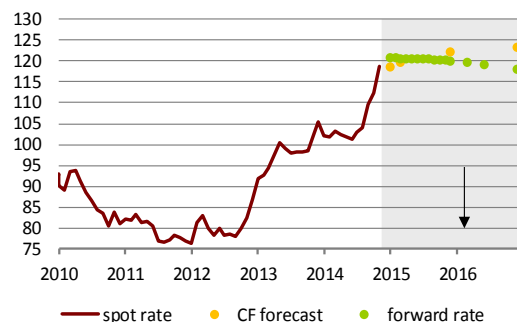
## IV. Outlook of exchange rates vis-à-vis the US dollar

## THE EURO



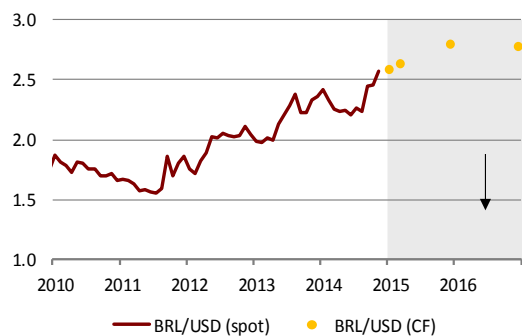
	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	1.229				
<b>CF forecast</b>		1.235	1.224	1.189	1.171
<b>forward rate</b>		1.232	1.232	1.238	1.255

## THE JAPANESE YEN



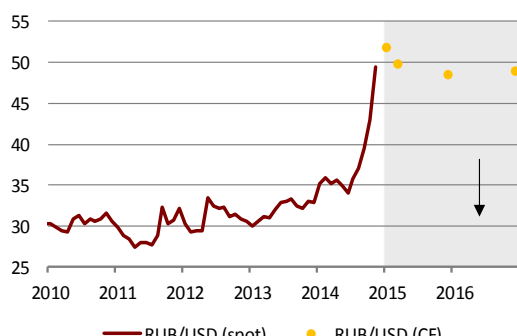
	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	120.90				
<b>CF forecast</b>		118.50	119.60	122.00	123.30
<b>forward rate</b>		120.60	120.54	119.91	117.86

## THE BRAZILIAN REAL



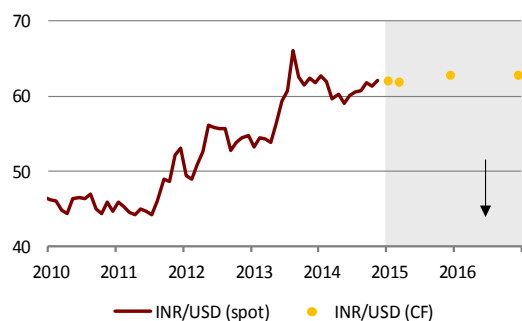
	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	2.60				
<b>CF forecast</b>		2.58	2.63	2.79	2.77

## THE RUSSIAN ROUBLE



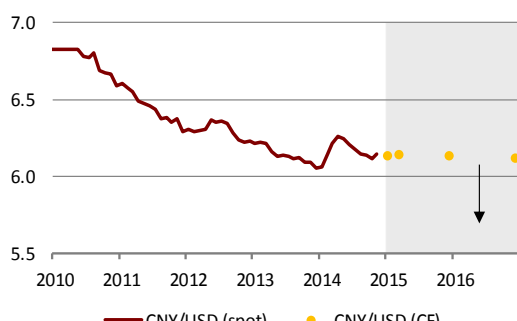
	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	53.61				
<b>CF forecast</b>		51.70	49.80	48.47	48.81

## THE INDIAN RUPEE



	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	61.88				
<b>CF forecast</b>		61.97	61.82	62.69	62.69

## THE CHINESE RENMINBI



	08/12/14	01/15	03/15	12/15	12/16
<b>spot rate</b>	6.17				
<b>CF forecast</b>		6.13	6.14	6.14	6.12

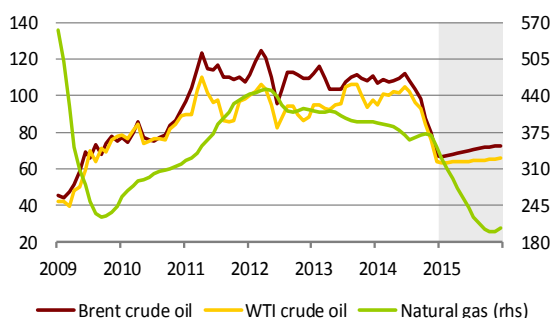
Arrow indicates currency appreciation against US dollar. Exchange rates as of last day of month. Forward rate does not represent outlook; it is based on covered interest parity, i.e. currency of country with higher interest rate is depreciating. Forward rate represents current (as of cut-off date) possibility of hedging future exchange rate.

### V.1 Oil and natural gas

The price of Brent crude oil continued to decline strongly in mid-November. Then it stabilised temporarily just below USD 80 a barrel (bbl), as dealers waited for the results of the forthcoming OPEC meeting. This meeting, however, just confirmed the unwillingness of Saudi Arabia and its allies to cut extraction at the expense of their market share. In reaction to this, the oil price fell sharply at the end of November and the downward trend was renewed. This trend was seen also in mid-December, when the Brent oil price was close to USD 63 bbl (the lowest level since mid-2009). The price of WTI oil fell below USD 60 bbl in the same period, chiefly due to the fundamental lead of supply over demand on the market. The increase in supply is mainly due to fast shale extraction in the USA. NGL production (natural gas liquids – liquid hydrocarbons produced in natural gas extraction and processing) is also rising steadily. Part of production from Libya also returned to the market. The weakening oil demand, particularly in China, Japan and Europe, is amplified by fuel price liberalisation in a number of Asian economies, which is reducing local consumption. Dollar oil prices are also being pushed down by the strengthening US dollar. Last but not least, we should mention sentiment and trends on futures markets: commercial entities that are hedging against further decrease in oil prices by buying options and futures and a re-grouping of speculative market participants' positions from long to short ones.

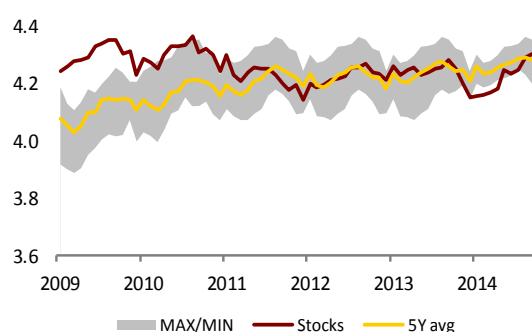
Spot prices of natural gas in the USA and Europe showed opposite trends. Prices in Europe declined thanks to moderate temperatures, lower oil prices and an agreement concluded between Ukraine and the Russian Gazprom. In addition, stocks in Europe were higher than a year ago. Conversely, prices in the USA were rising, as higher demand due to cold weather resulted in fast drawing of gas from underground reservoirs.

**OUTLOOK FOR PRICES OF OIL AND NATURAL GAS**

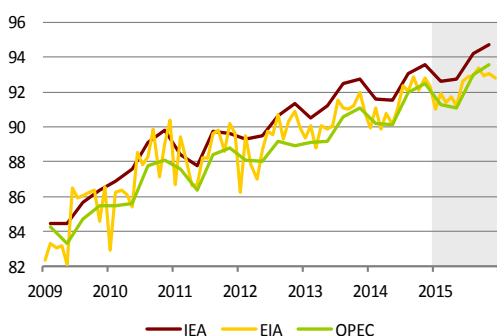


	<b>Brent</b>	<b>WTI</b>	<b>Natural gas</b>
2014	-8.22 ↘	-4.69 ↘	-7.06 ↘
2015	-29.74 ↘	-31.01 ↘	-34.34 ↘

**TOTAL STOCKS OF OIL AND OIL PRODUCTS IN OECD**

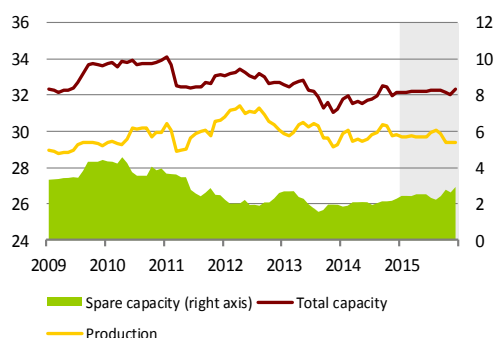


**GLOBAL CONSUMPTION OF OIL AND OIL PRODUCTS**



	<b>IEA</b>	<b>EIA</b>	<b>OPEC</b>
2014	0.75 ↗	1.06 ↗	1.33 ↗
2015	1.22 ↗	0.96 ↘	1.15 ↘

**PRODUCTION, TOTAL AND SPARE CAPACITY IN OPEC COUNTRIES**



	<b>Production</b>	<b>Total capacity</b>	<b>Spare capacity</b>
2014	-0.28 ↘	-0.44 ↘	-2.89 ↘
2015	-0.55 ↘	0.89 ↗	21.70 ↗

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).

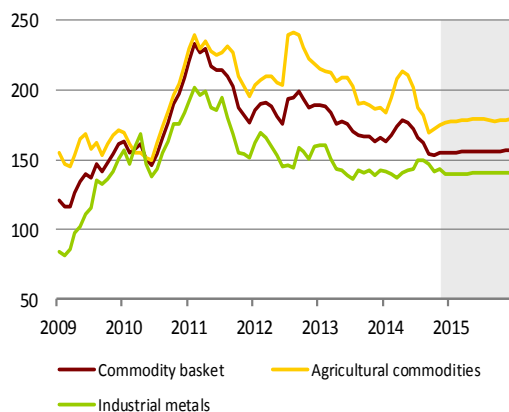
Source: Bloomberg, IEA, EIA, OPEC, CNB calculations

## V.2 Other commodities

The non-energy commodity price index increased slightly in November thanks to a recovery in prices of both basic metals and food. Prices of most agricultural commodities went up, due chiefly to recovering prices of food commodities, which recorded the lowest levels in many years at the end of September. A further rise in wheat prices was due to concerns about the effect of cold weather in the USA on winter wheat (possible delayed harvest) and to potential restrictions on exports from Russia. The price of corn in October was fostered by high production of ethanol in the USA (despite low US petrol prices), supported by rising demand. The price of soy grew in October thanks to high exports from the USA (which increased in reaction to the previous low prices and high overseas demand). However, the increase in prices of the last two commodities halted in November. The price of pork was flat and that of beef started to decline from its all-time high at the start of December.

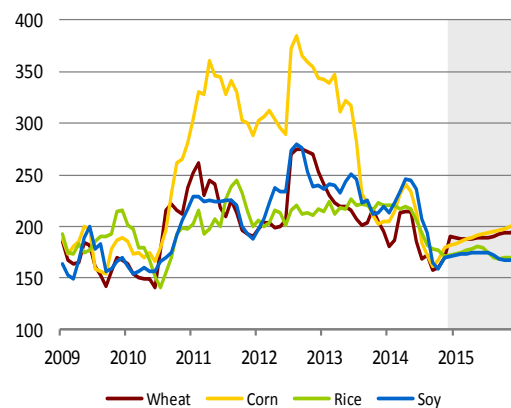
Industrial metal prices were generally under the pressure of the strengthening dollar and weakening growth in Chinese industry. Nonetheless, their aggregate price index strengthened in November, mainly thanks to the price of aluminium, which was the highest since December 2012, as stocks started to decrease after the industry's consolidation (reduction of excess capacities). By contrast, the price of copper fell slightly, as the slowing manufacturing sector in China and declining energy prices outweighed concerns about extraction shortfalls in Peru, which is a significant exporter of this commodity. Prices of iron ore decreased strongly with a view of rising deliveries thanks to new capacities of some large extraction companies, which will further increase the excess of ore on the market. The price of oil should in future reduce prices of energy-intensive commodities, whereas fiscal stimulus in Japan and China could support the prices of these commodities.

PRICES OF NON-ENERGY COMMODITIES



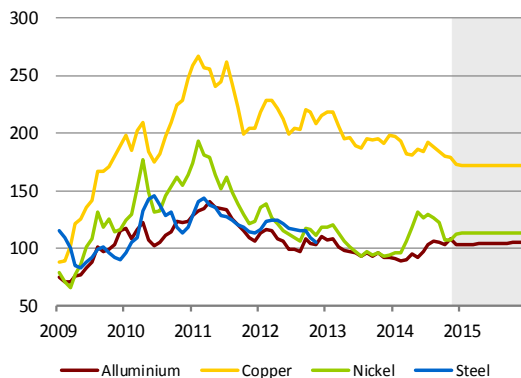
	Overall	Agricultural	Industrial
2014	-5.4 ↗	-5.7 ↗	-1.3 ↘
2015	-5.3 ↘	-5.9 ↗	-2.0 ↘

FOOD COMMODITIES



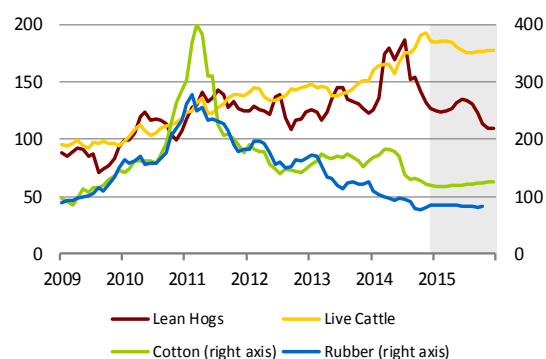
	Wheat	Corn	Rice	Soy
2014	-14.1 ↗	-28.5 ↗	-9.8 ↗	-11.4 ↗
2015	3.3 ↗	-2.8 ↗	-12.3 ↘	-16.3 ↘

METALS



	Aluminium	Copper	Nickel
2014	1.2 ↘	-6.9 ↘	12.7 ↗
2015	5.5 ↘	-7.0 ↘	-1.3 ↗

MEAT, NON-FOOD AGRICULTURAL COMMODITIES



	Lean hogs	Live Cattle	Cotton	Rubber
2014	18.7 ↘	19.8 ↘	-8.4 ↘	-31.4 ↗
2015	-19.9 ↘	3.8 ↗	-20.1 ↘	-9.0 ↘

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.

## Applicability of Okun's law to OECD countries and other economies<sup>1</sup>

The aim of this article is to empirically assess the strength of the relationship between growth in unemployment and GDP, which is known as "Okun's law". The econometric calculation performed on a sample of 59 countries using annual data for the last 17 years shows a significant asymmetry of Okun's coefficient. Across countries, the highest correlation was achieved between the change in the unemployment rate and GDP growth for EU countries and other OECD economies. As regards the sensitivity of Okun's coefficient to the GDP growth rate or the unemployment rate, Okun's coefficient increases significantly in worsening economic conditions (in the event of a fall in GDP or a high unemployment rate).

### 1 The substance of Okun's law

Although GDP growth is the basic indicator of aggregate economic growth, it informs about its current state with a lag of a couple of months. Moreover, the latest GDP figures are subject to revisions, which subsequently affects the accuracy of short-term outlooks. Therefore, short-term and leading indicators attract increased attention in periods of economic turbulence and uncertainty, reflecting earlier the adverse economic developments due to higher frequency and making it thus possible to respond to this situation as soon as possible. The relationship between the unemployment rate and economic activity is described by Okun's law. The research of American economist Arthur Okun (1929–1979) was sparked by negative economic impacts of repeated economic crises on economic agents in the United States. In particular, he aimed to identify how strongly a decline in output is affected by unemployment if unemployment grows above its natural rate. This gave rise to the empirical dependence known today as Okun's law (1962). Under this law, every increase in unemployment of 1 percentage point above the natural unemployment rate (NAIRU) is associated with a decline in real GDP<sup>2</sup> of about 3%. There are several versions of mathematical representation of Okun's law. According to Abel and Bernanke (2005), this empirical relationship can be formulated as follows:

$$\frac{Y^* - Y}{Y^*} = c(u^* - u), \quad (1)$$

where  $Y^*$  is potential output,  $Y$  actual output,  $u^*$  the natural unemployment rate,  $u$  the actual unemployment rate and  $c$  a constant. Despite its simplicity in practical calculations, formula (1) is difficult to apply due to the non-observability of potential output and the NAIRU. Approximation of these variables, e.g. filtering GDP using the HP filter, results in an inaccurate calculation of Okun's law. Therefore, empirical literature often prefers an estimate in differences

$$\Delta Y = k - c\Delta u, \quad (2)$$

where  $\Delta Y$  is the change in output (mostly real GDP),  $\Delta u$  is the change in the unemployment rate and  $k, c$  are dependence coefficients. The definition of the linear coefficient of correlation of the two monitored variables depends on each specific economy, usually taking values from 2% to 3%.<sup>3</sup> The above relationships show that it is possible to maintain unemployment at a constant level (at the level of the natural unemployment rate) if GDP grows at the same pace as potential output. Alternatively, this relationship expresses that the elasticity of the relationship between actual and potential real output, calculated relative to the change in the unemployment rate, remains constant and equal to about 3.

There are also other variants of formalisation of Okun's law. For example those that add other explanatory variables (labour productivity, investment, etc.) or extend the right-hand side of the equation to include lagged values of the dependent variable. The version of the equation in differences where the change in unemployment is explained by GDP growth is currently used most commonly:<sup>4</sup>

<sup>1</sup> Written by Oxana Babecká Kucharčuková (Oxana.Babecka-Kucharcukova@cnb.cz) and Luboš Komárek (lubos.komarek@cnb.cz). The views expressed in this article are those of the authors and do not necessarily reflect the official position of the Czech National Bank.

<sup>2</sup> The original article explored unemployment relative to GNP (gross national product). Current empirical literature uses GDP. The results are comparable due to the high correlation between GDP and GNP (the current differences between GDP and GNP are addressed in detail by the August 2013 Global Economic Outlook, see Žďárský, 2013).

<sup>3</sup> According to Mankiw (2009), Okun's law can be described using the following equation, including the expression of coefficients:  $\Delta u = -1/2(\Delta Y - 3\%)$ . It can thus be inferred that if GDP grows by 3%, the unemployment rate does not change. However, if GDP declines by 1% annually during a recession, for example, an increase in the unemployment rate of 2% can be expected.

<sup>4</sup> Formula (1) is in line with a theoretical derivation of Okun's law based on the production function (see Prachowny, 1993). Formula (3) is most often used in practical calculations.

$$\Delta u = \alpha - \beta \Delta Y \quad (3)$$

This equation was originally estimated by Okun (1962) using the data for the United States after WWII. Coefficient  $\beta$  was equal to 0.3. Okun's coefficient was recalculated many times over the following years. Although the coefficient of dependence of the two variables according to Okun's law may not be the same as the coefficient obtained from the data for the US economy when applied to other countries, this strength of dependence was often confirmed in empirical studies. However, there are studies which conversely show a change in the correlation both over time and across countries (Lee, 2000). The charts below confirm the variability of Okun's coefficient for OECD countries. Although Okun's coefficient has been close to 0.3 on average over the last 15 years (see Chart 1), it has been below the long-term average in 2014 (see Chart 2). One of the possible explanations of the change in the coefficient over time is an asymmetric reaction of the labour market in periods of recession and expansion. This explanation may also be linked with a relatively long period of prosperity of the global economy in the "pre-Lehman" period (great moderation). Moreover, the variability of the results for individual countries, including EU countries, is explained by major differences in the functioning of labour market institutions in individual countries.

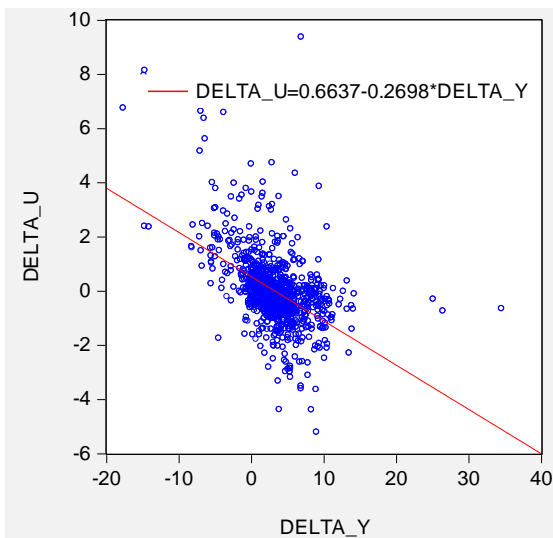


Chart 1: Okun's coefficient in OECD countries in 1998–2014

Source: EIU, own calculations

Note: 2014 – EIU estimate. 34 countries – current OECD members.

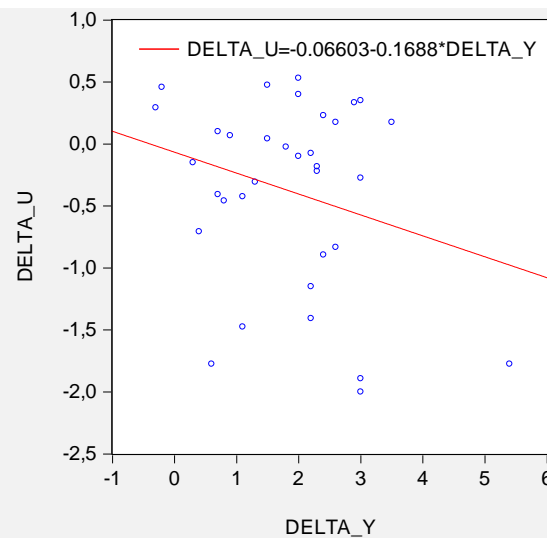


Chart 2: Okun's coefficient in OECD countries in 2014

Source: EIU, own calculations

Note: GDP and unemployment – EIU estimate. Historical data 2014 H1.

The economic crisis in recent years has sparked interest in verifying Okun's law. Lucchetta and Paradiso (2014) estimated Okun's law for the United States using non-linear models, concluding that the specification which includes factors explaining total labour productivity (e.g. the ratio of wages to machinery prices or the openness of the economy) and which is estimated using the DOLS or ECM non-linear model has better properties for the out-of-sample forecast after 2008 than the standard specification of Okun's law. Zanin (2014) explored the relationship between unemployment and GDP growth in OECD countries in different age groups and according to gender. The author observed the highest and statistically significant correlation between GDP growth and the change in unemployment in crisis periods for younger age groups. He concluded that young people, young men in particular, respond most sensitively to fluctuations in the business cycle and are the most vulnerable group in the labour market of all the age groups.<sup>5</sup> Durech et al. (2014) estimate Okun's coefficient using regional data for the Czech Republic and Slovakia. The authors state a great variability of the coefficient, with a greater and more significant correlation being observed in richer regions with lower unemployment. Guisinger and Sinclair (2015) examine "real-time" data and Ball et al. (2014) empirically confirm validity of Okun's law for Consensus Forecasts outlooks. The authors also find a negative correlation between the revision to unemployment outlooks and the revision to GDP outlooks. Moreover, Guisinger and Sinclair (2015) explore how Okun's coefficient changes for unrevised time series. Their calculations using "real-time" data point to a weaker relationship between unemployment and GDP in the first publication of new statistical data compared to the final revision or CF outlooks.

<sup>5</sup> In Babecká Kucharčuková and Komárek (2013), we explore unemployment in the euro area in recent years and also show that the economic and financial crisis has affected young employees the most despite major heterogeneity.



## 2 Data and calculations

This article focuses on examining the asymmetric relationship between economic growth and the change in the unemployment rate in periods of growth and economic decline and explores whether the size of Okun's coefficient changes proportionally in line with the GDP growth rate or the unemployment rate. The asymmetric relationship is studied the least by empirical literature. The existing studies either use data which exclude the current crisis (Harris and Silverstone, 2001, Holmes and Silverstone, 2006), i.e. the period which is the most important for the question we ask in our analysis, or the calculations are applied to a selected economy only (Chinn et al., 2014). In this article, Okun's coefficient is estimated for 59 countries. Calculations for the entire sample are compared with calculations in periods of economic growth ( $y > 0$ ), a GDP decline ( $y < 0$ ), a slowdown in economic growth from the previous quarter ( $\Delta y < 0$ ), or conversely a pick-up ( $\Delta y > 0$ ). A simple breakdown into a period of growth or decline may not be sufficient to capture a possible asymmetric relationship between the two variables. Although the level of unemployment is in line with the NAIRU in the case of a zero output gap, the deviation of actual unemployment from the NAIRU may not be proportionate to the deviation of real GDP from its potential. We therefore explore further how the correlation of the two variables changes in relation to economic growth or the level of unemployment. Calculations are first made in individual groups according to GDP growth or decline (0%–2%; 2%–5%; more than 5%, etc.) and then according to unemployment (up to 3%; 3%–4%; 4%–5%, etc.). The calculations have been made by applying equation (3), which is in the form of increases in the given variables. The calculations were made using annual data for 1998–2014 for 59 countries (ALL). Okun's coefficient is calculated for both the entire sample and for individual groups: EU-28, EA-18, OECD, CE (Central Europe), SE (Southern Europe), CIS (Russia and other 8 countries of the Commonwealth of Independent States), LA (Latin America) and Asia (see the list in the Appendix). Annual EIU data have been used for the calculations. The 2014 data are an EIU estimate (the latest available historic data for 2014 are for Q2 or Q3).

**Table 1: Results**

	Economic growth, pick-up					Decline or slowdown in growth		
	y	y > 0	$\Delta y > 0$			y ≤ 0	$\Delta y \leq 0$	
EU28	-0.28 ***	-0.19 ***	-0.19 ***			-0.40 ***	-0.31 ***	
EA18	-0.29 ***	-0.17 ***	-0.17 ***			-0.40 ***	-0.32 ***	
OECD	-0.27 ***	-0.18 ***	-0.18 ***			-0.44 ***	-0.31 ***	
CE	-0.31 ***	-0.36 ***	-0.36 ***			-0.48 **	-0.31 ***	
SE	-0.16 ***	-0.17 **	-0.17 **			-0.20 *	-0.17 ***	
CIS	-0.07 ***	-0.04	-0.04			-0.13	-0.08 **	
LA	-0.28 ***	-0.26 ***	-0.26 ***			-0.09	-0.29 ***	
ASIA	-0.03 *	-0.02	-0.02			-0.19	-0.05	
ALL	-0.16 ***	-0.08 ***	-0.08 ***			-0.33 ***	-0.20 ***	

	y ∈ [0;2]	y ∈ (2;5]	y > 5	y ∈ [-2;0]	y ∈ [-5;-2]	y < -5
EU-28	-0.13	-0.13 *	-0.03	-0.58 **	-0.62	-0.52 ***
EA-18	-0.26 *	-0.28 ***	-0.04	-0.64 **	-0.93 *	-0.45 **
OECD	-0.20 *	-0.14 **	-0.09	-0.37	-0.45	-0.66 ***
ALL	-0.16 *	-0.10 *	-0.01	-0.45 *	-0.08	-0.35 ***

The size of Okun's coefficient differs according to regional blocs (see Table 1) and individual countries (see Table 2). The coefficient is the lowest for the countries of Southern Europe, Asia and the former Soviet Union. The highest levels are observed in European economies and the OECD, in which Okun's coefficient equals roughly 0.3. But it is apparent that the negative relationship between GDP growth and unemployment increases for all groups in periods of a GDP decline and also in periods of its slower growth (the upper part of Table 1). A similar asymmetric reaction can also be observed in calculations according to the growth or decline in GDP (see the lower part of Table 1). Okun's coefficient is several times larger in periods of a GDP decline compared to a period of economic growth, reaching the highest correlation for an economic downturn amid a decline in GDP of more than 5%.

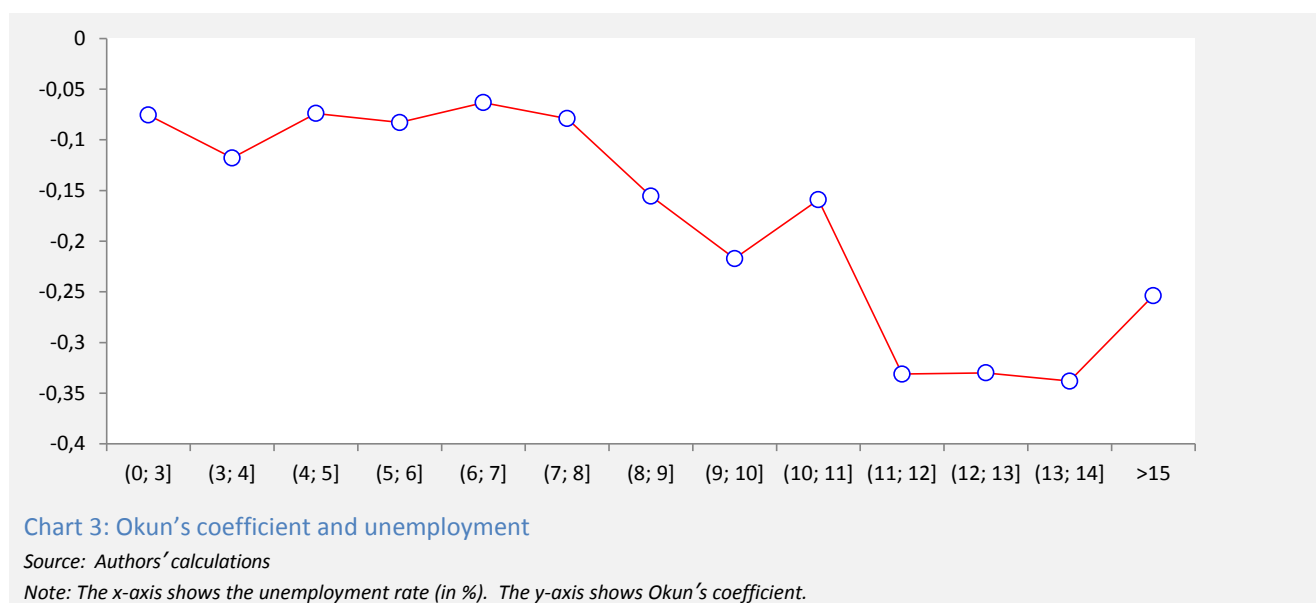
**Table 2: Okun's coefficient by country**

AL	-0.11 *	DK	-0.24 **	KZ	-0.12 ***	RO	-0.08 **
AR	-0.31 ***	EE	-0.34 ***	KR	-0.15 ***	RU	-0.16 **
AM	-0.11	FI	-0.17 ***	KG	-0.22	RS	-0.13
AU	-0.46 ***	FR	-0.33 ***	LV	-0.26 ***	SK	-0.42 ***
AT	-0.16 ***	GE	-0.05	LT	-0.42 ***	SI	-0.26 ***
AZ	-0.02	DE	-0.21 **	LU	-0.08 ***	ZA	-0.27
BE	-0.27 ***	GR	-0.46 ***	MK	0.04	ES	-0.87 ***

BR	-0.15	*	HU	-0.16	*	MT	-0.14	**	SE	-0.22	***
BG	-0.23	*	IC	-0.35	***	MX	-0.14	***	CH	-0.32	***
CA	-0.35	***	IN	-0.04		MD	-0.11		TR	-0.19	***
CL	-0.46	***	ID	-0.40	**	NL	-0.26	***	UA	-0.12	***
CN	-0.02		IE	-0.32	***	NZ	-0.29	***	GB	-0.26	***
HR	-0.23	**	IL	-0.26	***	NO	-0.16	*	US	-0.50	***
CY	-0.31	***	IT	-0.32	***	PL	-0.73	***	UZ	-0.16	***
CZ	-0.24	***	JP	-0.14	***	PT	-0.35	***	ALL59	-0.16	***

Note: For the list of abbreviations see the Appendix.

Further, Okun's coefficient is calculated in individual categories ordered by the unemployment rate. The calculations are made using formula (3), for the entire period and all 59 countries. Chart 3 shows an increase in the absolute value of Okun's coefficient as the unemployment rate rises. The value of Okun's coefficient remains roughly the same (around 0.07–0.13) unless unemployment exceeds 8%. Further, there's an apparent decline in the coefficient, amounting to around 0.15–0.23 with the unemployment rate standing at around 8%–11%. The highest absolute level of the negative coefficient is in the economies where the unemployment rate amounts to 11%–15%. The value of Okun's coefficient falls again afterwards.



To sum up, there is evidence of both significant heterogeneity in results across countries and a significant asymmetry of Okun's coefficient in periods of economic growth and decline. Econometric calculations show that the labour market is more sensitive to a decrease in GDP than its growth. However, this also applies *vice versa*: the higher the unemployment rate in the economy, the more unemployment responds to a decrease in GDP.

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### Appendix: List of countries and abbreviations

Country	ID	EU28	EA18	OECD	CE	SE	CIS	LA	Asia
Albania	AL					√			
Argentina	AR							√	
Armenia	AM						√		
Australia	AU			√					
Austria	AT	√	√	√					
Azerbaijan	AZ						√		
Belgium	BE	√	√	√					
Brazil	BR							√	
Bulgaria	BG	√				√			
Canada	CA			√					
Chile	CL			√				√	
China	CN								√
Croatia	HR	√				√			
Cyprus	CY	√	√						
Czech Republic	CZ	√		√	√				
Denmark	DK	√		√					
Estonia	EE	√	√	√					
Finland	FI	√	√	√					
France	FR	√	√	√					
Georgia	GE						√		
Germany	DE	√	√	√					
Greece	GR	√	√	√					
Hungary	HU	√		√	√				
Iceland	IC			√					
India	IN								√
Indonesia	ID								√
Ireland	IE	√	√	√					
Israel	IL			√					
Italy	IT	√	√	√					
Japan	JP			√					√
Kazakhstan	KZ						√		
Korea	KR			√					√
Kyrgyz Republic	KG						√		
Latvia	LV	√	√						
Lithuania	LT	√							
Luxembourg	LU	√	√	√					
Macedonia	MK					√			
Malta	MT	√	√						
Mexico	MX			√				√	
Moldova	MD						√		
the Netherlands	NL	√	√	√					
New Zealand	NZ			√					
Norway	NO			√					

Country	ID	EU28	EA18	OECD	CE	SE	CIS	LA	Asia
Poland	PL	✓		✓	✓				
Portugal	PT	✓	✓	✓					
Romania	RO	✓				✓			
Russia	RU						✓		
Serbia	RS					✓			
Slovak Republic	SK								
	Slovakia	✓	✓	✓	✓				
Slovenia	SI	✓	✓	✓		✓			
South Africa	ZA								
Spain	ES	✓	✓	✓					
Sweden	SE	✓		✓					
Switzerland	CH			✓					
Turkey	TR			✓		✓			
Ukraine	UA						✓		
United Kingdom	GB	✓		✓					
United States	US			✓					
Uzbekistan	UZ						✓		
<b>TOTAL (59)</b>	<b>ALL</b>	<b>28</b>	<b>18</b>	<b>34</b>	<b>4</b>	<b>8</b>	<b>9</b>	<b>4</b>	<b>5</b>

## A1. Change in GDP predictions for 2014

	CF		IMF		OECD		CB / EIU	
<b>EA</b>	0.0	2014/12 2014/11	-0.3	2014/10 2014/7	0.0	2014/11 2014/9	-0.1	2014/12 2014/9
<b>US</b>	0.1	2014/12 2014/11	0.5	2014/10 2014/7	0.1	2014/11 2014/9	-0.1	2014/9 2014/6
<b>DE</b>	0.0	2014/12 2014/11	-0.5	2014/10 2014/7	0.0	2014/11 2014/9	-0.5	2014/12 2014/6
<b>JP</b>	-0.7	2014/12 2014/11	-0.7	2014/10 2014/7	-0.5	2014/11 2014/9	-0.5	2014/10 2014/7
<b>BR</b>	-0.1	2014/12 2014/11	-1.0	2014/10 2014/7	0.0	2014/11 2014/9	-0.2	2014/12 2014/11
<b>RU</b>	0.1	2014/12 2014/11	0.0	2014/10 2014/7	-0.2	2014/11 2014/5	0.2	2014/12 2014/11
<b>IN</b>	0.0	2014/12 2014/11	0.2	2014/10 2014/7	-0.3	2014/11 2014/9	0.0	2014/12 2014/11
<b>CN</b>	-0.1	2014/12 2014/11	0.0	2014/10 2014/7	-0.1	2014/11 2014/9	0.0	2014/12 2014/11

## A2. Change in inflation predictions for 2014

	CF		IMF		OECD		CB/EIU	
<b>EA</b>	0.0	2014/12 2014/11	-0.4	2014/10 2014/4	-0.2	2014/11 2014/5	-0.1	2014/12 2014/9
<b>US</b>	0.0	2014/12 2014/11	0.6	2014/10 2014/4	0.2	2014/11 2014/5	0.0	2014/9 2014/6
<b>DE</b>	0.0	2014/12 2014/11	-0.5	2014/10 2014/4	-0.2	2014/11 2014/5	-0.2	2014/12 2014/6
<b>JP</b>	0.0	2014/12 2014/11	-0.1	2014/10 2014/4	0.3	2014/11 2014/5	-0.1	2014/10 2014/7
<b>BR</b>	0.0	2014/12 2014/11	0.4	2014/10 2014/4	0.6	2014/11 2014/5	0.0	2014/12 2014/11
<b>RU</b>	0.2	2014/12 2014/11	1.6	2014/10 2014/4	1.4	2014/11 2014/5	0.1	2014/12 2014/11
<b>IN</b>	-0.4	2014/12 2014/11	-0.2	2014/10 2014/4	0.0	2014/11 2014/5	0.0	2014/12 2014/11
<b>CN</b>	0.0	2014/12 2014/11	-0.7	2014/10 2014/4	-0.3	2014/11 2014/5	0.0	2014/12 2014/11

## A3. List of abbreviations

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

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

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