

GLOBAL ECONOMIC OUTLOOK – OCTOBER

Monetary and Statistics Department
External Economic Relations Division

2012

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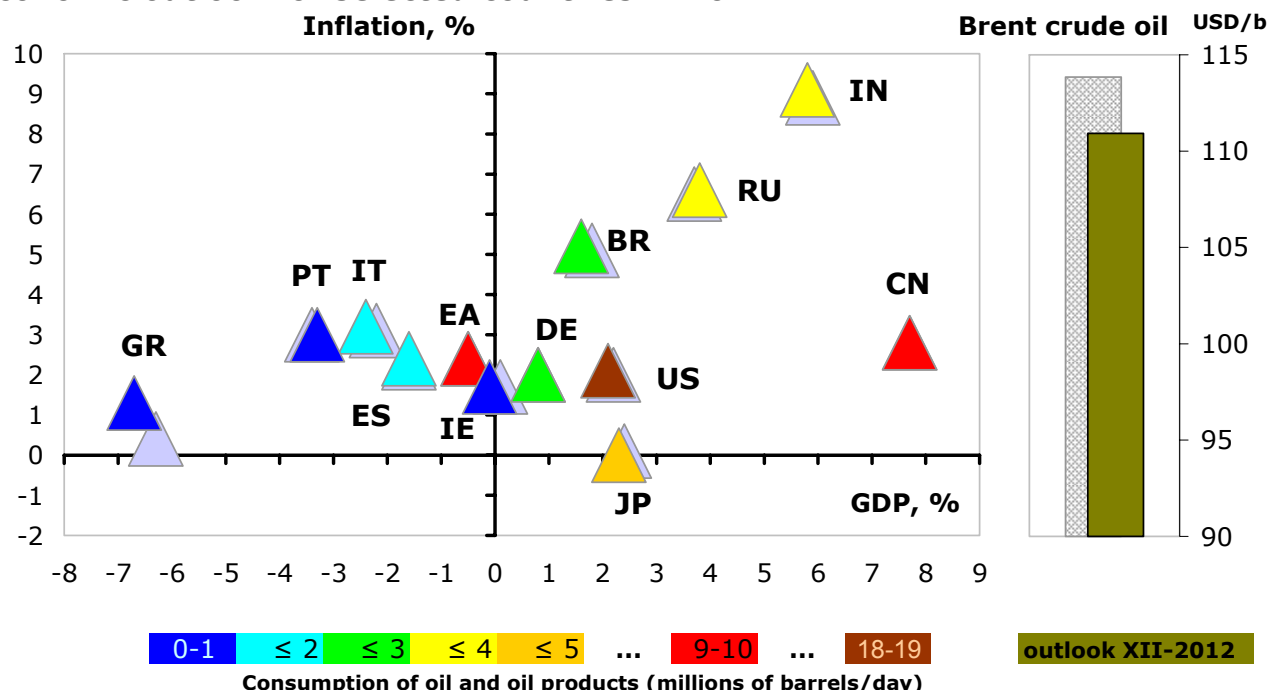
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The October issue of Global Economic Outlook presents its regular overview of recent and expected developments in selected territories, focusing on key economic indicators such as GDP, inflation, leading indicators, interest rates, exchange rates and commodity prices. In this issue, we also focus our attention on analysing the relationships between the oil price and selected macroeconomic variables, including the appropriate central bank response to an oil shock.

Leading indicators for the euro area and Germany suggest a further deterioration of the economy. By contrast, the situation in the USA and China, which showed improved leading indicators, seems more favourable. Accordingly, the new IMF forecast lowered the GDP outlooks for all the countries under review except the USA. The CF is leaving its 2012 economic outlook for the euro area and Germany at the same level as in September. A slight improvement is expected in these two economies in 2013. Similarly, an improvement is expected in China next year. On the other hand, the US economy is likely to slow down next year compared to this year. In comparison with Europe, however, its growth will remain higher. The fastest growing economies in 2012 include China, India and Russia. Nevertheless, the last member of the BRIC countries, Brazil, is lagging behind both the USA and Japan this year (see the figure). The outlooks for consumer price inflation show mostly a slightly downward trend for the euro area, Germany and the USA for 2012 and 2013. Due to the weak economic outlook, no major inflation pressures are visible in the global economy and consumer price inflation should fall below 2% in 2013. According to the current CF, inflation will rise only in China next year.

In light of the deteriorating economic situation, declines also were recorded for interest rates in the euro area, where their market outlook also decreased from a month earlier, and in the USA. Owing to a decline in risk aversion in September, yields on German and US government bonds edged up. The dollar-euro exchange rate depreciated month on month in September and during October. On the one hand, the euro was positively affected by the measures taken by the ECB; on the other hand, depreciation of the dollar was fostered by a further monetary policy easing by the Fed in the form of QE3. However, the CF October forecast expects the dollar to appreciate. Due to the global economic slowdown, OPEC reduced its forecast for oil consumption this year. Subdued demand and higher extraction capacity thus explain the fall in the market outlook for the Brent crude oil price below USD 105 a barrel at the end of 2013.

Economic outlook for selected countries in 2012



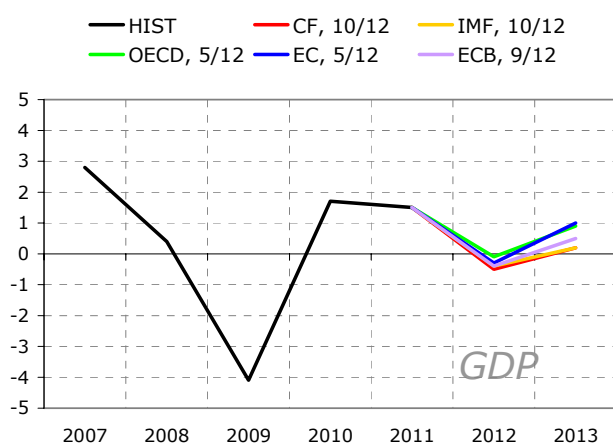
Note: EA – euro area, DE – Germany, US – United States, JP – Japan, CN – China, IN – India, BR – Brazil, RU – Russia, GR – Greece, IE – Ireland, IT – Italy, PT – Portugal, ES – Spain. The points are coloured according to consumption of oil and oil products (millions of barrels/day) in 2012 Q2. The grey colour is the CF forecast (GDP, inflation) or Bloomberg survey (oil price) from the previous month. [Cut-off date for data: 11 October 2012]

Source: CNB calculation using Bloomberg, Consensus Economics and IEA.

II.1 GDP

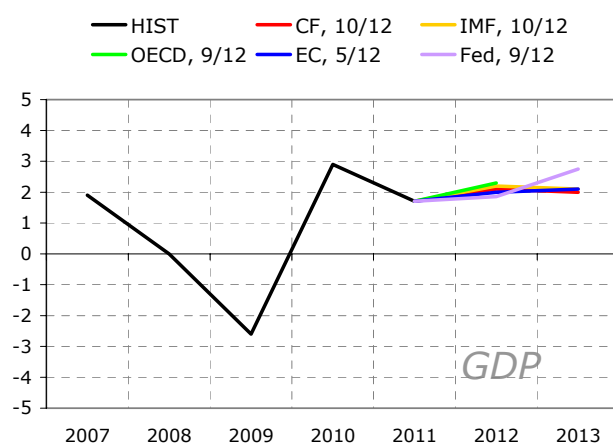
CF left its outlook for the fall in euro area GDP **this year** at 0.5% for the fourth time in a row, whereas the outlook for Germany worsened slightly in the last two months only and currently remains at 0.8%. Economic growth in the USA will reach 2.1% this year, while GDP will grow at a rate of 7.7% in China. Although the October *World Economic Outlook* is 0.1 pp more optimistic than the October CF in the outlooks for all the economies under review in GEO, the IMF points to a slower global recovery and a further worsening of the outlooks. In **2013**, the CF and the IMF agree on growth of 0.2% in the euro area and 0.8% in Germany. These institutions expect economic growth in the USA to slow to 2.0%–2.1%. On the other hand, economic growth in China should strengthen slightly to 8.1%–8.2%.

EURO AREA



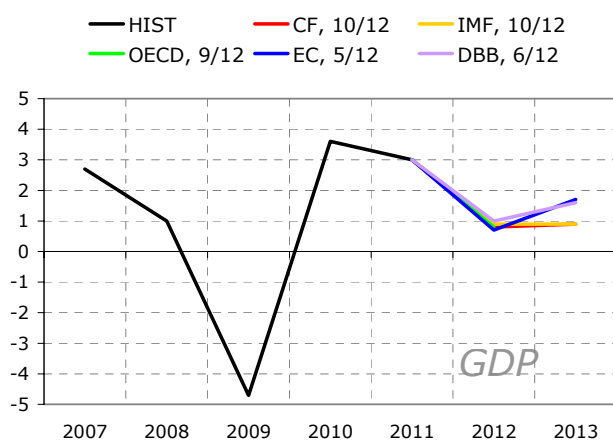
	HIST	CF	IMF	OECD	EC	ECB
2011	1.5					
2012		-0.5	-0.4	-0.1	-0.3	-0.4
2013		0.2	0.2	0.9	1.0	0.5

USA



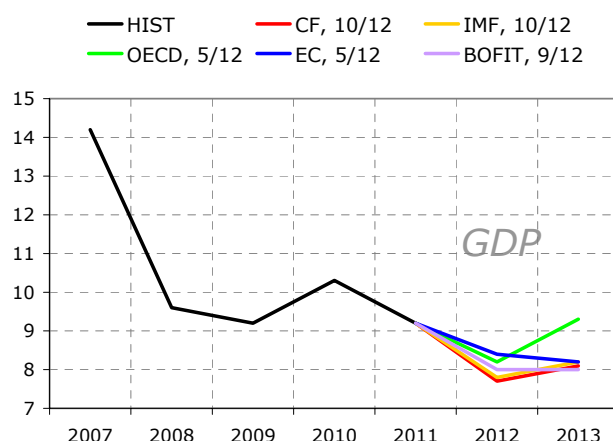
	HIST	CF	IMF	OECD	EC	Fed
2011	1.7					
2012		2.1	2.2	2.3	2.0	1.9
2013		2.0	2.1		2.1	2.8

GERMANY



	HIST	CF	IMF	OECD	EC	DBB
2011	3.0					
2012		0.8	0.9	0.8	0.7	1.0
2013		0.9	0.9		1.7	1.6

CHINA



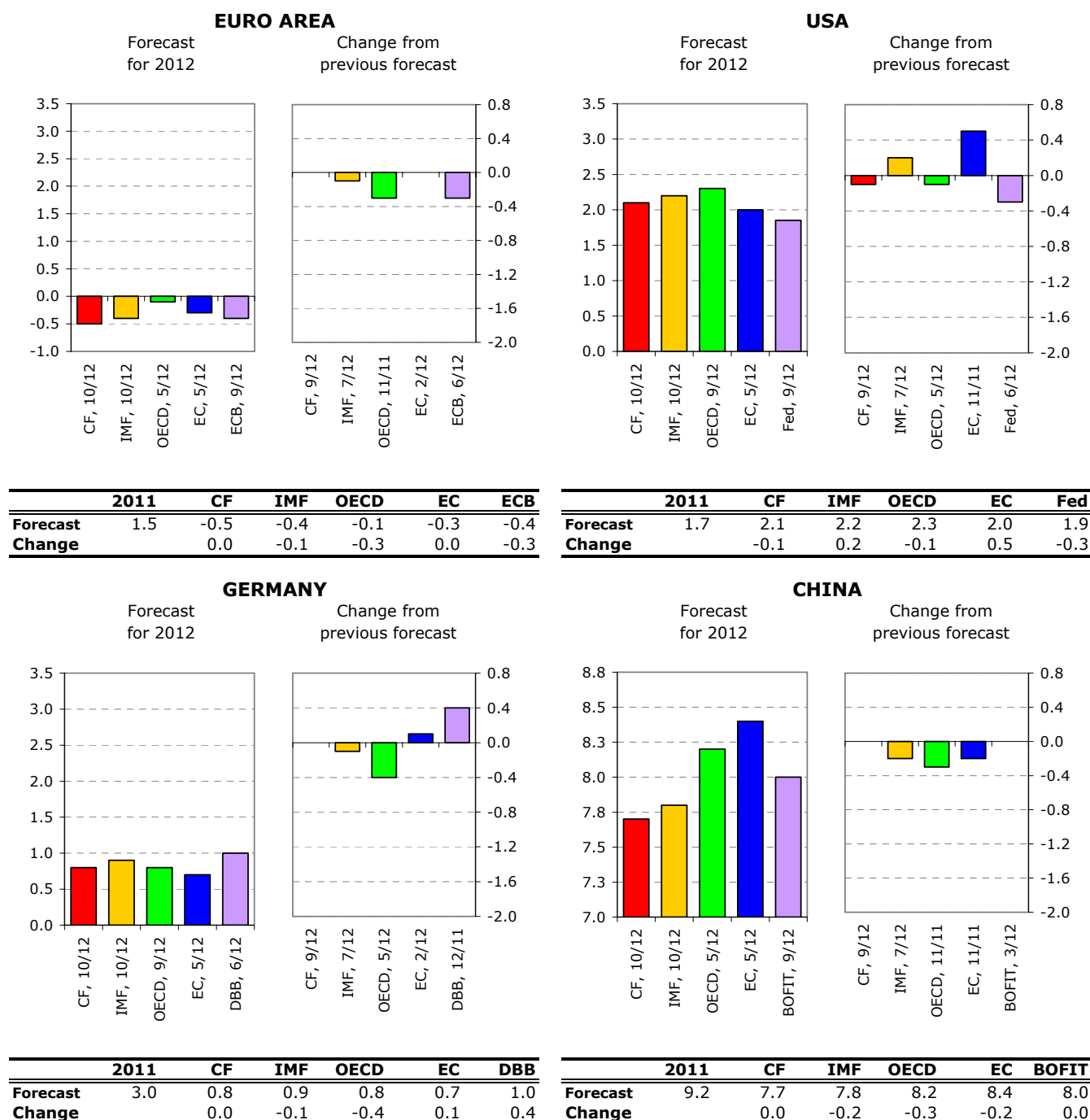
	HIST	CF	IMF	OECD	EC	BOFIT
2011	9.2					
2012		7.7	7.8	8.2	8.4	8.0
2013		8.1	8.2	9.3	8.2	8.0

Note: Legend shows latest forecast data in format „Source, month/year of forecast publication“. HIST: historical value. ECB and Fed: midpoint of range. [Cut-off date for data: 11 October 2012]

Source: CNB calculation using Eurostat, CF, IMF, OECD, EC, ECB, Fed, DBB and BOFIT databases.

II.2 Current GDP forecast and change from the previous forecast

The October CF left **this year's** outlook for GDP unchanged, except for the outlook for the USA, which is 0.1 pp lower than the September CF. The new *World Economic Outlook* (IMF) expects growth in the economies under review to be 0.1–0.2 pp weaker than the July outlook. The exception is again the USA, for which the IMF increased its GDP forecast by 0.2 pp.



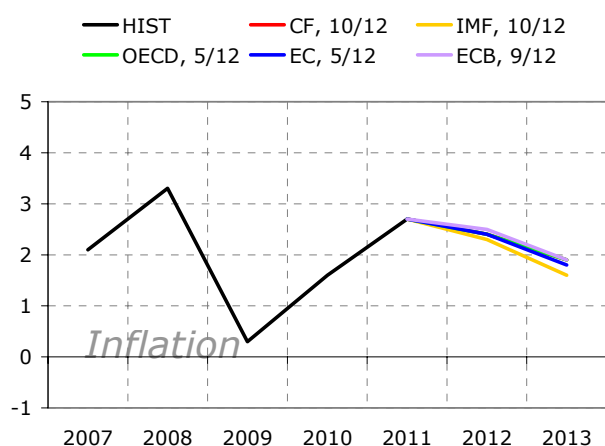
Note: Horizontal axis of left-hand (right-hand) chart shows latest (previous) forecast data in format "Source, month/year of forecast publication". HIST: historical value. ECB and Fed: midpoint of range.
[Cut-off date for data: 11 October 2012]

Source: CNB calculation using Eurostat, CF, IMF, OECD, EC, ECB, Fed, DBB and BOFIT databases.

II.3 Inflation

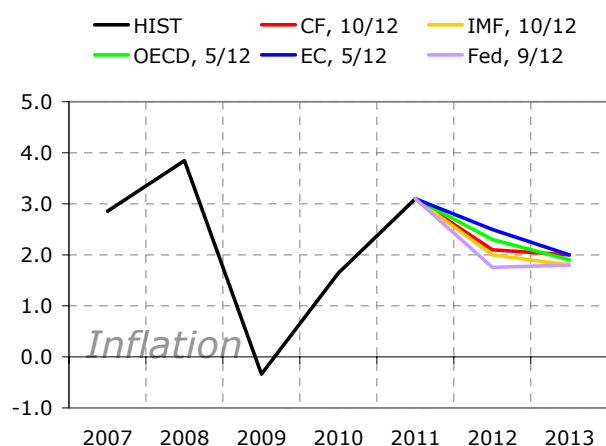
The inflation outlook for **this year** for the economies under review remains in a narrow range according to the new CF and IMF forecasts. Consumer price inflation of 2.0%–2.2% is expected in Germany and the USA, while prices in the euro area will rise by 2.3%–2.4%. Inflation in China will be somewhat higher, reaching 2.8%–3.0%. Inflation in the euro area and Germany will return below 2% **next year**. Consumer price inflation in the USA will fall to 1.8%–2.0%. By contrast, inflation in China will increase to 3.0%–3.4%.

EURO AREA



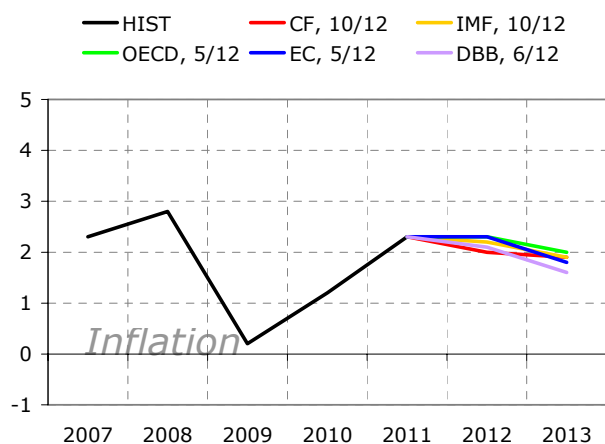
	HIST	CF	IMF	OECD	EC	ECB
2011	2.7					
2012		2.4	2.3	2.4	2.4	2.5
2013		1.9	1.6	1.9	1.8	1.9

USA



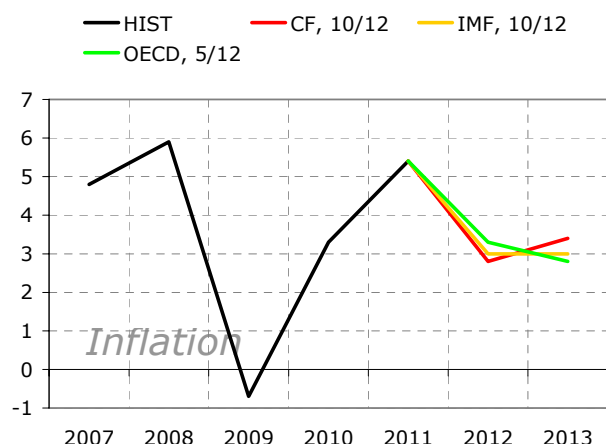
	HIST	CF	IMF	OECD	EC	Fed
2011	3.1					
2012		2.1	2.0	2.3	2.5	1.8
2013		2.0	1.8	1.9	2.0	1.8

GERMANY



	HIST	CF	IMF	OECD	EC	DBB
2011	2.3					
2012		2.0	2.2	2.3	2.3	2.1
2013		1.9	1.9	2.0	1.8	1.6

CHINA



	HIST	CF	IMF	OECD
2011	5.4			
2012		2.8	3.0	3.3
2013		3.4	3.0	2.8

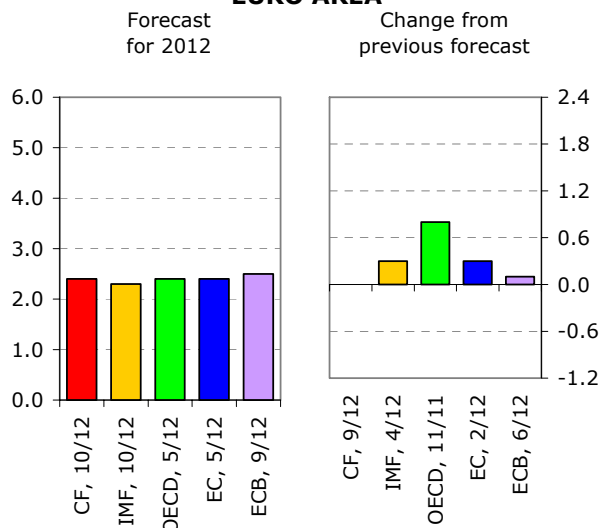
Note: Legend shows latest forecast data in format „Source, month/year of forecast publication“. HIST: historical value. ECB and Fed: midpoint of range. [Cut-off date for data: 11 October 2012]

Source: CNB calculation using Eurostat, CF, IMF, OECD, EC, ECB, Fed, DBB and BOFIT databases.

II.4 Inflation forecast and change from the previous forecast

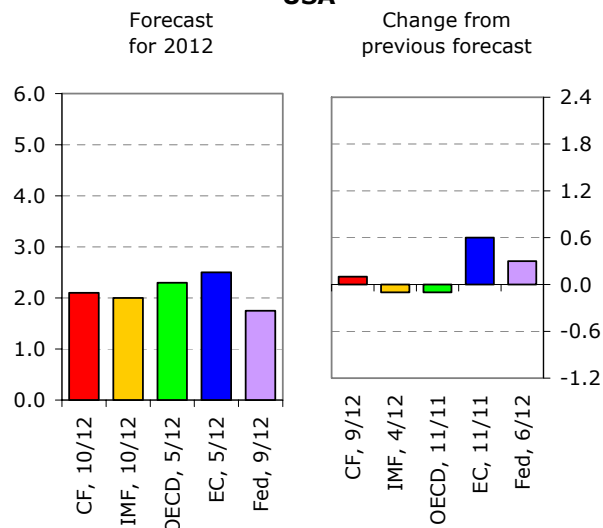
The October CF forecast expects inflation in the USA to be 0.1 pp higher in **2012**. The CF outlook for the other economies under review remained unchanged from September. The IMF outlooks recorded more significant revisions; the inflation forecast for the euro area and Germany was increased by 0.3 pp and the inflation outlooks for the USA and China were reduced by 0.1 pp and 0.3 pp respectively.

EURO AREA



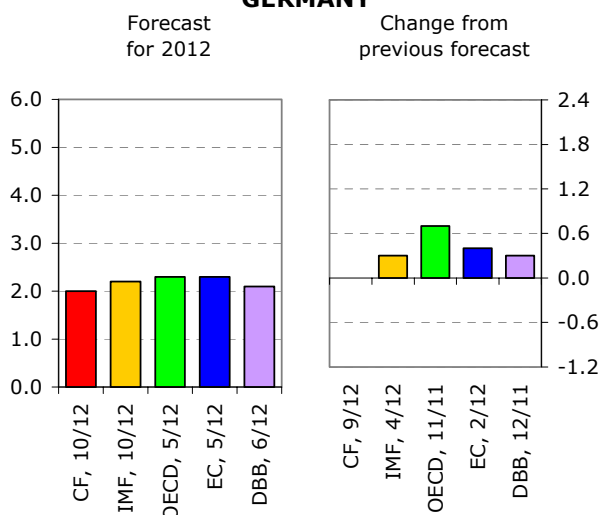
	2011	CF	IMF	OECD	EC	ECB
Forecast	2.7	2.4	2.3	2.4	2.4	2.5
Change		0.0	0.3	0.8	0.3	0.1

USA



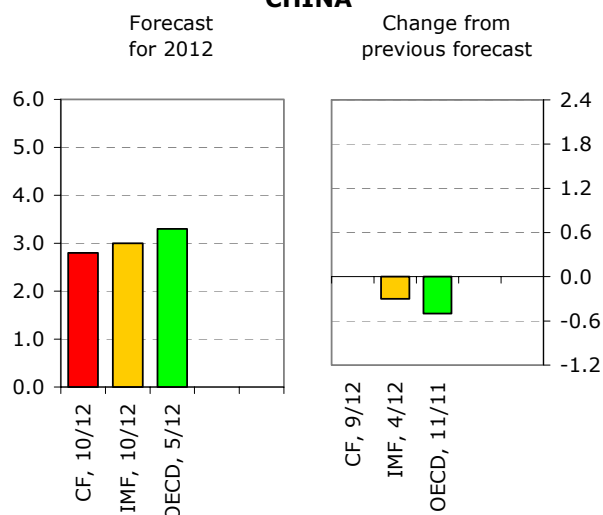
	2011	CF	IMF	OECD	EC	Fed
Forecast	3.1	2.1	2.0	2.3	2.5	1.8
Change		0.1	-0.1	-0.1	0.6	0.3

GERMANY



	2011	CF	IMF	OECD	EC	DBB
Forecast	2.3	2	2.2	2.3	2.3	2.1
Change		0.0	0.3	0.7	0.4	0.3

CHINA



	2011	CF	IMF	OECD
Forecast	5.4	2.8	3	3.3
Change		0.0	-0.3	-0.5

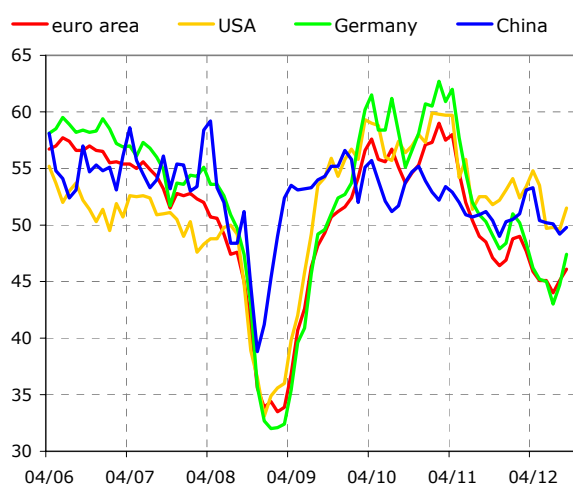
Note: Horizontal axis of left-hand (right-hand) chart shows latest (previous) forecast data in format "Source, month/year of forecast publication". HIST: historical value. ECB and Fed: midpoint of range.

[Cut-off date for data: 11 October 2012]

Source: CNB calculation using Eurostat, CF, IMF, OECD, EC, ECB, Fed, DBB and BOFIT databases.

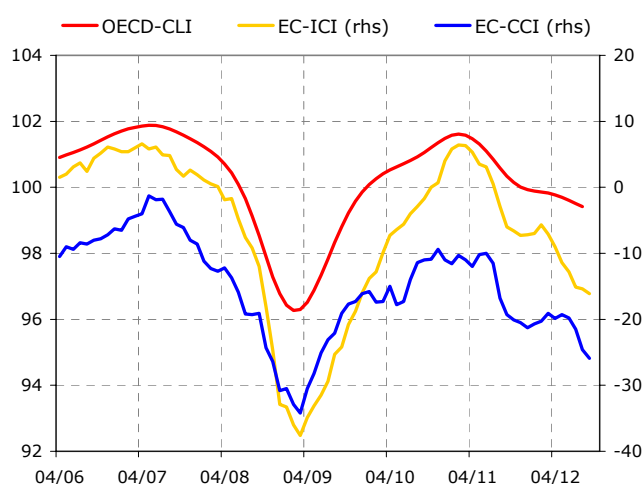
From the perspective of leading indicators, major differences persist in the economic outlook for the remainder of this year and early next year for the USA and China on the one hand and the euro area and Germany on the other. The Purchasing Managers' Index (PMI) in industry rose in all the countries and regions under review in September. In the USA it returned above the 50% threshold separating growth from contraction, and in China it was very close to that level. In the euro area, however, it remains well below this level, suggesting a continued economic downturn in the quarters ahead. The German PMI is also still well under the 50% threshold. In the USA, all the other monitored leading indicators in addition to the PMI increased or were at least flat. The improvement in the two consumer confidence indicators was particularly strong. In the euro area and Germany, by contrast, all the monitored indicators except the PMI declined.

PMI IN MANUFACTURING



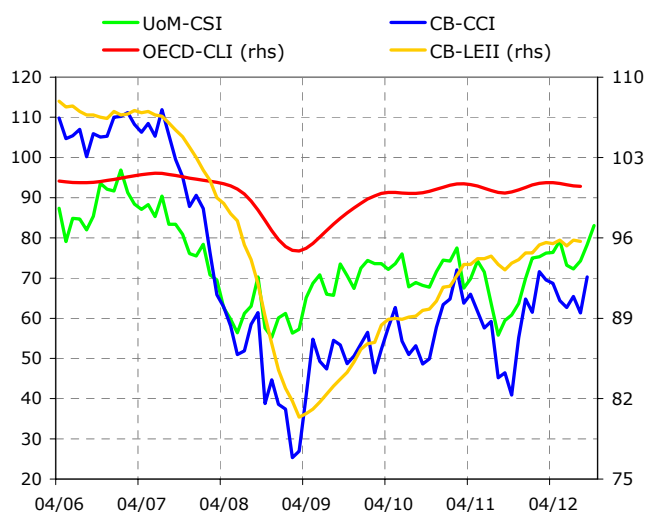
	EA	US	DE	CN
7/12	44.0	49.8	43.0	50.1
8/12	45.1	49.6	44.7	49.2
9/12	46.1	51.5	47.4	49.8

EURO AREA



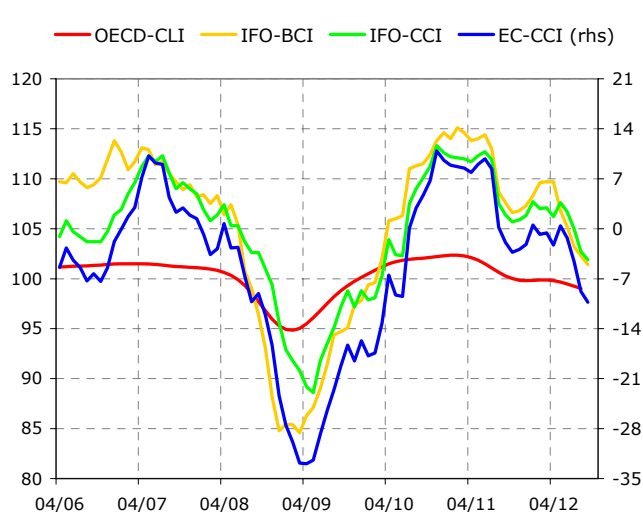
	OECD-CLI	EC-ICI	EC-CCI
7/12	99.5	-15.1	-21.5
8/12	99.4	-15.4	-24.6
9/12		-16.1	-25.9

USA



	OECD-CLI	CB-LEII	UoM-CSI	CB-CCI
7/12	100.5	95.8	72.3	65.4
8/12	100.5	95.7	74.3	61.3
9/12			78.3	70.3

GERMANY



	OECD-CLI	IFO-BCI	IFO-CCI	EC-CCI
7/12	99.3	103.2	105.0	-4.6
8/12	99.0	102.3	102.7	-8.8
9/12		101.4	101.9	-10.3

Note: OECD-CLI stands for OECD Composite Leading Indicator, EC-ICI (right-hand scale) for European Commission Industrial Confidence Indicator, EC-CCI (right-hand scale) for EC Consumer Confidence Indicator, CB-LEII for Conference Board Leading Economic Indicator, CB-CCI for CB Consumer Confidence Index, UoM-CSI for University of Michigan Consumer Sentiment Index, IFO-BCI for Institute for Economic Research – Business Climate Index, and IFO-CCI for IFO Consumer Confidence Index. [Cut-off date for data: 12 October 2012]

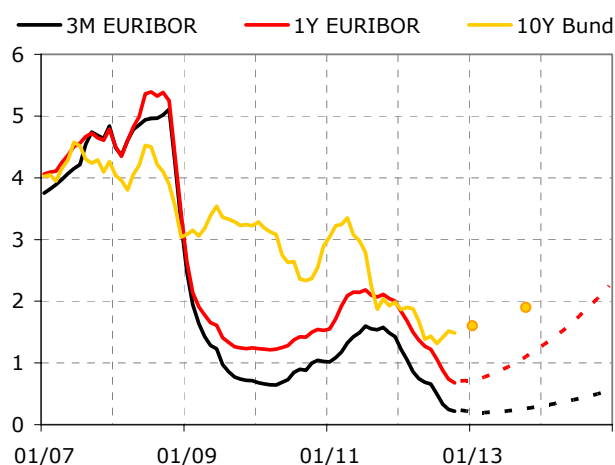
Source: CNB calculation using OECD, EC, IFO and UoM databases.

IV.1 Outlook for short-term and long-term interest rates: Euro area

As in previous months, the 1M and 1Y EURIBOR interbank rates continued to decline, more so at the one-year maturity. In the first half of October, the 3M rate was 0.21% and the 1Y rate was 0.67%. This was due mainly to a sharp rise in liquidity in the banking sector, boosted by a set of ECB measures including a zero deposit rate. The risk premia declined for both maturities as well. The forecast based on implied rates again shifted downwards compared to the previous month, mainly for the one-year rate. The CF outlook for the 3M rate was unchanged; the rate is expected to rise to 0.4% at the one-year horizon.

The ECB's tougher measures to address the debt crisis in September resulted in a decline in risk aversion and thus also an increase in German 10Y government bond yields. The trend reversed at the end of September and the yields fell again. The CF forecast remains unchanged; the yield on the 10Y Bund one year ahead is expected to be around 0.5 pp higher than it is now.

EURO AREA



	09/12	10/12	06/13	12/13	06/14	12/14
3M EURIBOR	0.25	0.22	0.21	0.29	0.40	0.55
1Y EURIBOR	0.74	0.68	0.89	1.23	1.67	2.25
10Y Bund	1.52	1.49	1.60	1.90		

Note: Forecast for EURIBOR rates is based on implied rates from interbank market yield curve (FRA rates are used from 4M to 15M and adjusted IRS rates for longer horizons). Forecast for German government bond yield (10Y Bund) is taken from CF. Dashed lines and points represent outlook. [Cut-off date for data: 8 October 2012]

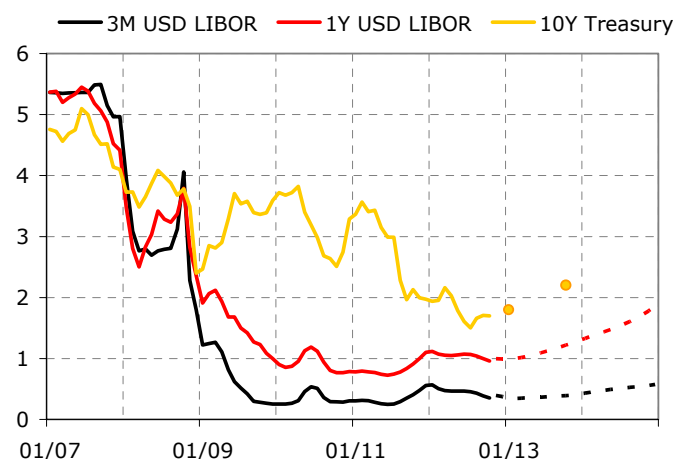
Sources: Thomson Reuters (Datastream), Bloomberg, CNB calculations.

IV.2 Outlook for short-term and long-term interest rates: USA

The 3M and 1Y USD LIBOR rates also continued to fall, standing at 0.34% and 0.94% respectively in early October. The outlook based on implied rates was little changed from the previous month. The 3M rates will remain below 0.5% until mid-2014, while the 1Y LIBOR rate is expected to start rising early next year.

The decline in risk aversion observed in early September also had an impact on US government bonds. The ten-year government bond yield approached the May 2012 level (1.87%) in mid-September. The outlook for 10Y Treasury rates at the one-year horizon is 0.1 pp lower than last month, while showing no changes at the 3M horizon.

USA



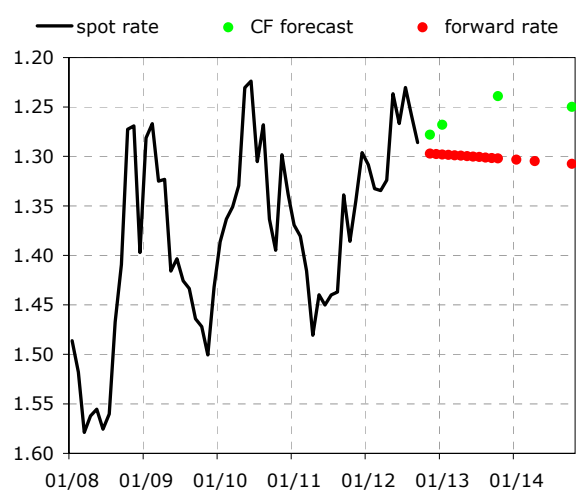
	09/12	10/12	06/13	12/13	06/14	12/14
3M USD LIBOR	0.39	0.35	0.37	0.41	0.50	0.58
1Y USD LIBOR	1.00	0.96	1.09	1.29	1.51	1.86
10Y Treasury	1.70	1.70	1.80	2.20		

Note: Implied LIBOR rates are derived from London interbank market yield curve. Forecast for 10Y Treasury yield is taken from CF. Dashed lines and points represent outlook. [Cut-off date for data: 8 October 2012]

Sources: Thomson Reuters, Bloomberg, CNB calculations.

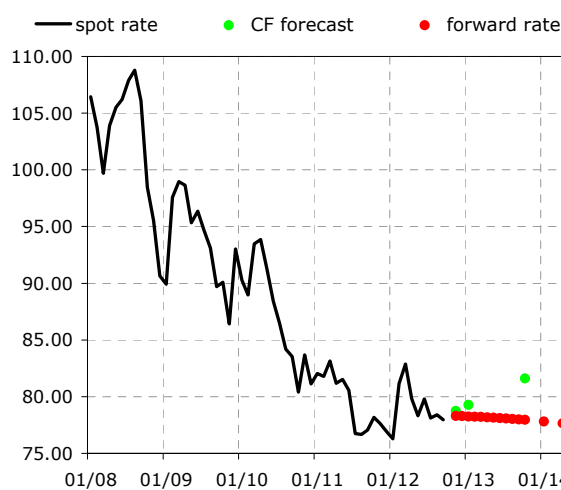
After depreciating against the euro in August, the dollar stabilised in late September. The announcement of another round of quantitative easing by the Fed, weak domestic demand, high unemployment and fiscal uncertainty are acting against appreciation of the dollar. By contrast, the ECB's measures – in particular the OMT programme – supported the single currency, but the worsening political and economic situation (including the problems of Spain) still poses a major risk. Thanks to its safe currency status, the outlook for the dollar remains optimistic, with the October CF outlook expecting it to appreciate to USD 1.24 against the euro at the 1Y horizon. The British pound depreciated against the dollar in late September, with the faltering economic situation increasing the pressure on the central bank to expand its quantitative easing programme. Concerns are also rising that the Bank of Japan is going to significantly weaken its currency, as the latest indicators suggest that the Japanese economy is slipping into recession. The situation in the euro area resulted in the Swiss franc depreciating against the euro below the cap, with the new forecast expecting the exchange rate to be at its current level at the 1Y horizon.

US\$ per Euro



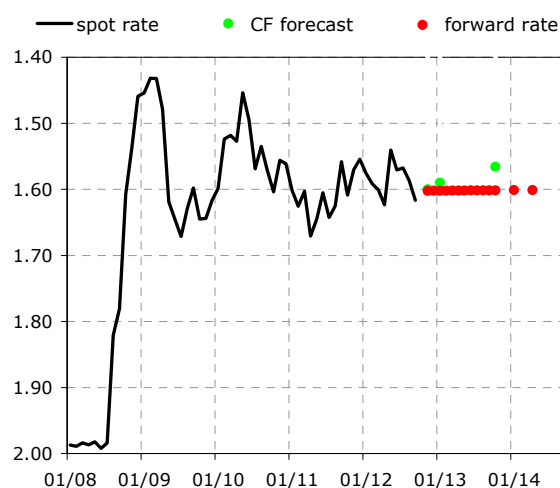
	8/10/12	11/12	01/13	10/13	10/14
spot rate	1.297				
CF forecast		1.278	1.268	1.239	1.250
forward rate		1.297	1.298	1.302	1.307

Yen per US\$



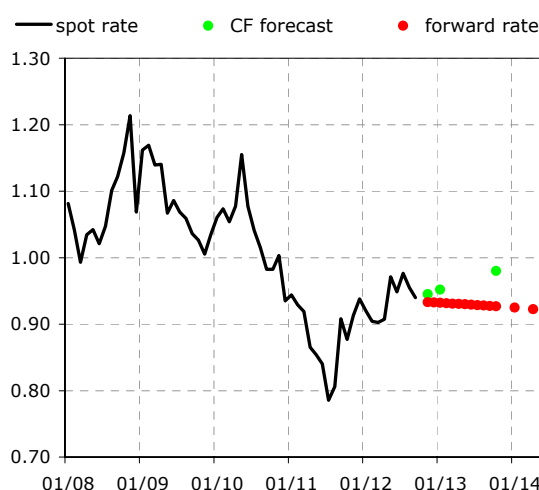
	8/10/12	11/12	01/13	10/13	10/14
spot rate	78.33				
CF forecast		78.73	79.26	81.61	83.90
forward rate		78.31	78.26	77.95	77.32

US\$ per UK£



	8/10/12	11/12	01/13	10/13	10/14
spot rate	1.603				
CF forecast		1.600	1.590	1.566	1.582
forward rate		1.602	1.602	1.601	1.601

Swfr per US\$



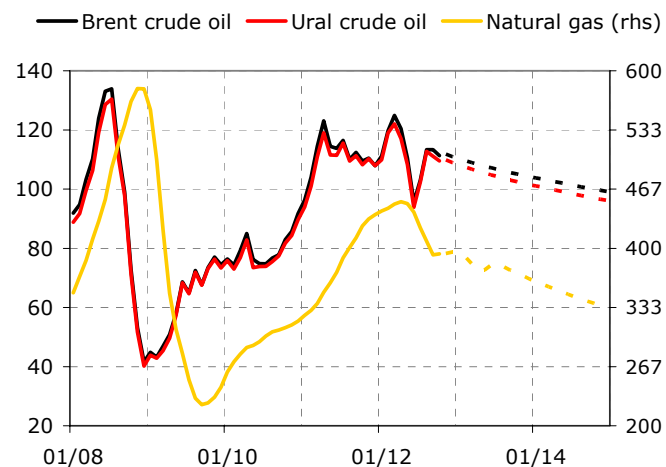
	8/10/12	11/12	01/13	10/13	10/14
spot rate	0.933				
CF forecast		0.945	0.952	0.980	0.992
forward rate		0.933	0.932	0.927	0.918

Note: Increase in currency pair represents appreciation of US dollar; data as of the last day of the 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) possibilities for securing future exchange rate. [Cut-off date for data: 8 October 2012] Source: CNB calculation using Bloomberg and Consensus Forecasts databases.

VI.1 Oil and natural gas

The price of Brent crude oil fell in the second half of September, fluctuating between USD 109 and 114 a barrel. In early October the price was below USD 112 a barrel, i.e. around 17% above the lows recorded in June this year. OPEC reduced its forecast for global oil demand this year due to the greater than expected slowdown of the global economy. By contrast, the 2013 outlook remained unchanged, with demand expected to rise by almost 1%. Subdued demand and higher extraction capacity are also reasons for a decline in the outlook for the oil price, which should be below USD 105 a barrel at the end of 2013 based on futures. The risks to oil prices are broadly balanced. A greater than expected slowdown of the global economy and increasing extraction capacity represent downside risks. By contrast, the tensions in Syria and the situation around Iran are upside risks. Natural gas prices recorded similar movements as oil prices – spot prices and their outlook both shifted downwards.

OUTLOOK FOR PRICES OF OIL AND NATURAL GAS



	10/12	06/13	12/13	06/14	12/14
Brent crude oil	111.4	107.2	104.2	101.6	99.2
Ural crude oil	109.5	104.8	101.6	98.7	96.2
Natural gas	393.6	380.9	365.5	348.2	333.1

Note: Brent oil price in USD/barrel (ICE quotation). Price of Russian natural gas at German border in USD/1,000 cubic m (IMF database). Future oil prices are derived from oil prices. Dashed line represents outlook.

[Cut-off date for data: 11 October 2012]

Source: Bloomberg, IMF, CNB calculations.

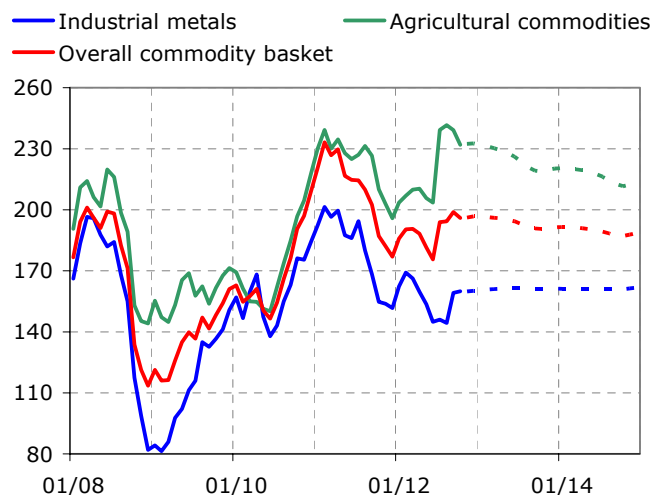
VI.2 Other commodities

The overall non-energy commodity index edged up last month compared to August, but this rise was almost offset by a decline in early October. The outlook for the index shifted downwards at the short end.

Food commodity prices fell slightly in the second half of September, and another, more significant fall was observed in early October. The fall was due mainly to lower prices of soy and maize. The outlook for food commodity prices was also revised downwards at the short end.

The industrial metal index increased by almost 10% in September, with the prices of all its components increasing, aluminium, lead, silver and platinum in particular. The outlook for metal prices remains stable over the entire horizon. Prices of cotton and rubber were flat in September, but the rubber price rose by almost 10% in early October. The outlook for the two commodities is slightly rising.

OUTLOOK FOR OTHER COMMODITY PRICES



	10/12	06/13	12/13	06/14	12/14
Industrial metals	160.0	161.5	161.2	161.0	161.8
Agricultural commodities	231.9	226.1	220.3	217.6	213.9
Overall commodity basket	196.0	194.3	191.4	189.9	188.7

Note: Chart shows price indices, year 2005 = 100. Dashed line represents outlook based on futures.

[Cut-off date for data: 11 October 2012]

Source: Bloomberg, outlooks based on futures.

THE RELATIONSHIP BETWEEN THE OIL PRICE AND KEY MACROECONOMIC VARIABLES¹

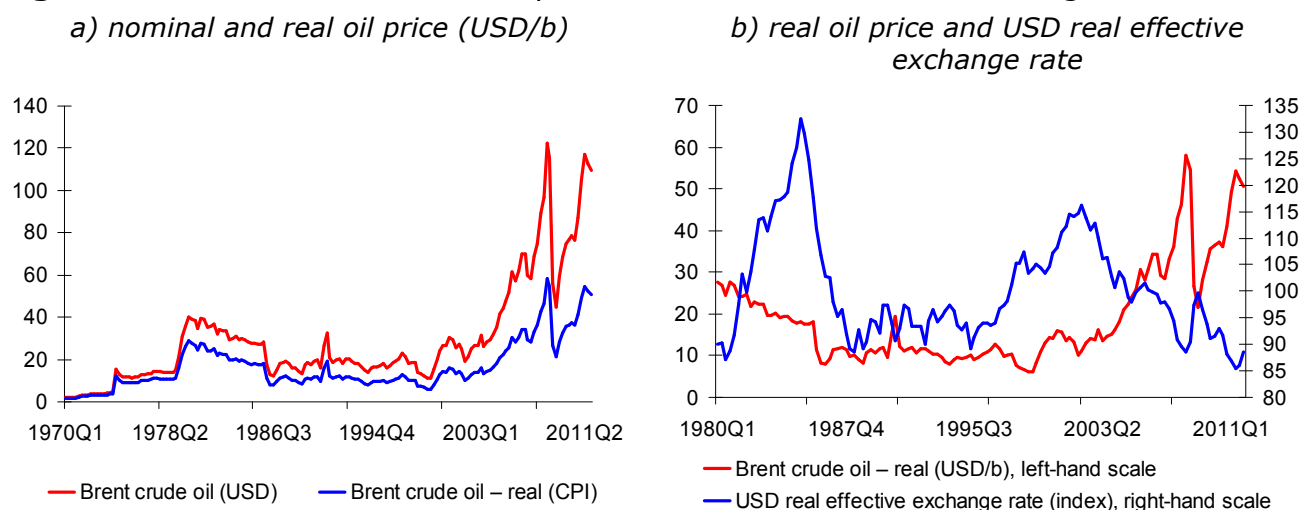
The article aims to uncover the relationship between the oil price and key macroeconomic variables, especially interest rates and the USD exchange rate. We then focus on the relationship between the monetary policy of large central banks and the oil price and discuss the appropriate central bank response to an oil shock.

Introduction

The current debate among central banks is increasingly focused on the role of asset prices in the process of monetary policy decision-making and maintaining financial stability. However, most small open economies have their attention fixed not only on financial market developments (stock and bond prices and exchange rates) and property markets, but also on commodity prices, in particular prices of oil and oil products. The relationship between monetary policy and oil prices is not a frequently addressed topic in the economic literature. This is especially true as regards analysis of the Czech economy.²

Figure VII-1 shows the long-term evolution of the nominal and US-CPI³ deflated real oil price. The real oil price at the time of the first and second oil shocks was not surpassed until the start of 2005. Figure VII-1 also shows that the relationship between the USD real effective exchange rate and the real price of oil (USD/barrel) became clearly inverse at the start of the new millennium (the correlation coefficient for 2000–2011 is -0.91), while in 1980–1999 it was insignificant (with a correlation coefficient of +0.26).

Figure VII-1: Nominal and real oil price and USD real effective exchange rate



Source: Authors' calculations based on Thomson Reuters data.

Figure VII-2 illustrates the relationship between oil prices and key macroeconomic variables. The left part of the figure shows a clear dependence between the oil price and

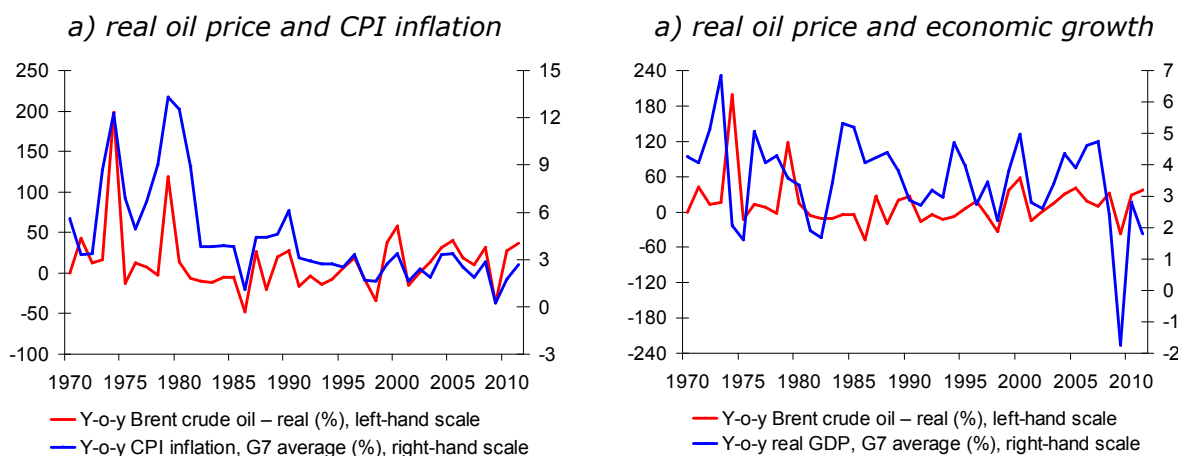
¹ Authors: Jan Hošek (jan2461.hosek@cnb.cz), Luboš Komárek (lubos.komarek@cnb.cz) and Martin Motl (martin.motl@cnb.cz). The opinions expressed in this article are those of the authors and do not necessarily reflect the official position of the Czech National Bank.

² Baláž and Londarev (2006) discussed the role of oil and its position in the globalised world economy. Vašendová and Židek (2006) and Vošta (2009) covered similar ground. None of these papers, however, evaluates the sensitivity of the Czech economy and monetary policy to a potential oil price shock.

³ The US-PPI results were almost identical.

CPI inflation⁴ in advanced (G7) countries. A change in the oil price passes through to inflation almost immediately (the correlation coefficient for annual data in 1970–2011 is +0.55). However, the relationship between the oil price and economic growth (the right panel of the figure) is not clear at first sight. Regression analysis, however, leads to a significant conclusion that faster economic growth in G7 countries results in higher oil price growth with a lag of one year, and vice versa. The inverse causality, i.e. the hypothesis that a higher oil price has a negative impact on economic growth, cannot be ruled out, but is not very significant.

Figure VII-2: Oil price, inflation and economic growth in advanced countries



Note: Average for G7 countries

Source: Authors' calculations based on Thomson Reuters data.

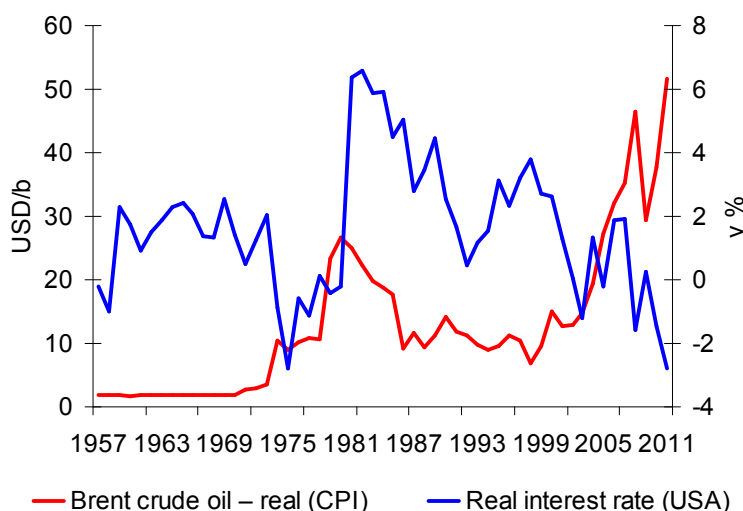
1. Oil prices and interest rates

Figure VII-3 shows the evolution of real oil prices and the real interest rate. Its logic is explained by the Hotelling rule (Hotelling, 1931). This empirically observed relationship describes a negative correlation between interest rates and real prices of natural resources (oil).⁵ Oil owners decide on the basis of the current and expected interest rate whether and in what volume to extract and sell oil or not to extract it (and leave it in the ground). If the oil price is rising so fast that oil in the ground guarantees higher yields than the money obtained by selling it, the owners will prefer to leave it in the ground – they will postpone production in expectation of achieving higher prices in the future. This reduces current supply and increases current prices while increasing future demand and reducing future prices. In a world of certain proprietary rights and perfect information this continues until the estimated price of oil adjusted for extraction costs is rising at a rate equal to the current and expected future market interest rate. If interest rates fall, other things being equal, an impulse to slow down current oil extraction and achieve higher prices will arise. This should generate a negative correlation between interest rates and oil prices. If we put together the rapid demand growth and low real interest rates seen in recent years, then rapid growth in oil prices is a logical result confirming the Hotelling relationship.

⁴ Similar results were obtained when PPI inflation was included.

⁵ A general formulation of this rule is that in equilibrium, the net price (sale price minus extraction costs) of an unextracted unit of the resource (oil) must increase at a rate equal to the real interest rate. The owner of the resource is then indifferent between two variants ensuring identical yields: (i) extracting the unit of the resource today and investing the proceeds at the prevailing interest rate, or (ii) leaving the unit of the resource in the ground and extracting it later, when it will be sold at a higher price. The Hotelling rule applies fully under perfect competition and for the economy as a whole. In reality, resource owners, who know the limits of their inventories very well, will wait for better conditions for the extraction and sale of oil, i.e. they will limit production and conserve the resources in the ground.

Figure VII-3: Empirical relationship between real oil prices and real interest rate (Hotelling rule)



Note: Relationship assumes negative correlation between interest rates (right-hand scale) and real oil prices.

Source: Authors' calculations based on Thomson Reuters data.

2. Oil prices and the USD exchange rate

There is traditionally a negative correlation between the dollar exchange rate and oil prices, although the relationship between the two has undergone major changes in the past (see Figure VII-4). Breitenfellner and Cuaresma (2008) divide the relationship from 1950 to the present into roughly four periods according to the volatility of, and correlation between, the two variables. These periods coincide with regime shifts in oil and money markets.

The first period (1950–1970) was characterised by low oil price volatility and a strong negative correlation (-0.62). The Bretton Woods system of fixed exchange rates was in place. Other characteristics included low inflation, low interest rates and high economic growth. Oil prices were controlled by seven large international corporations that dominated oil production, refinement and distribution.

The following period between 1971 and 1984 was one of high volatility and the negative correlation was not so strong (-0.18).⁶ In August 1971, President Nixon announced the discontinuation of gold convertibility of the US dollar given the deteriorating US balance of payments. This move resulted in a steep depreciation of the dollar against gold and other world currencies. OPEC, whose purchasing power had decreased, was slow to react to the dollar's depreciation. Only two years later, during the Yom Kippur War (October 1973), OPEC cut its oil production and placed an embargo on oil exports to the West. The price of oil quadrupled in a year, while the dollar continued to depreciate. The next oil crisis started in autumn 1978 in the wake of the Iranian Revolution, which led to a temporary fall in oil production in the country. The subsequent growth in oil prices was boosted by a phased decontrol of oil prices by the Carter administration. The price of oil again quadrupled in a year. At the end of the second period (1981–1984) the dollar regained strength sharply as a result of restrictive Fed monetary policy (under chairman Paul A. Volcker) and the price of oil fell slightly despite a decrease in oil supply due to the Iraq–Iran conflict. The strengthening dollar and economic recession in the USA probably played a stronger role.

⁶ The different correlation figure (-0.97) from our calculations for the period may be due to the use of different methods for calculating the EUR/USD exchange rate before 1999.

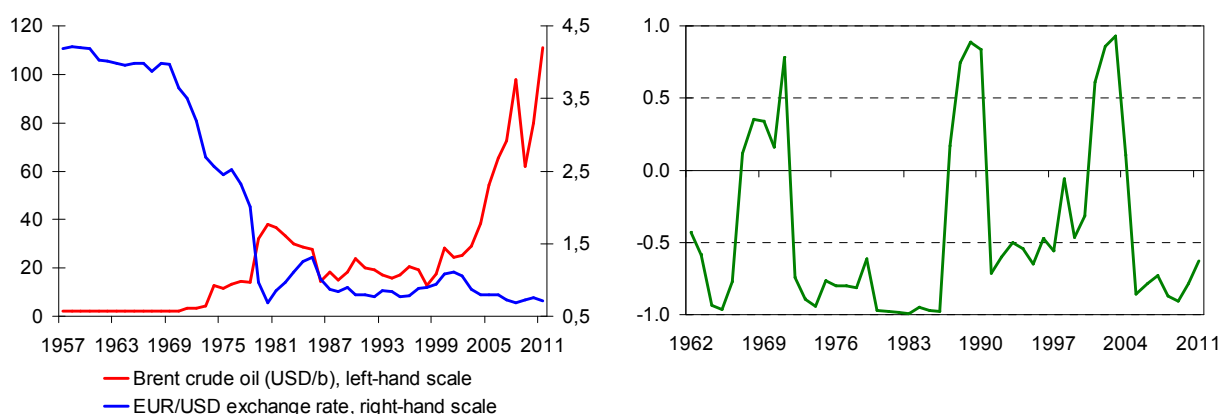
In the third period (1985–1998) both the dollar exchange rate and the oil price were less volatile. The negative correlation turned positive (+0.44). OPEC lost its power to set prices when Saudi Arabia almost doubled its production in August 1985. This was followed by a fall in oil prices. Throughout the period OPEC was unable to take effective action to raise them. In September 1985, the Plaza Accord was signed in the United States with the aim of devaluing the dollar. This was intended to reduce the current account deficit and help the country emerge from recession. Over the following two years, coordinated central bank intervention caused a depreciation of the dollar by more than 50%. The price of oil surged temporarily in August 1990 as a consequence of the Iraqi occupation of Kuwait but subsequently declined almost uninterruptedly. This is put into context with transition-induced recession in the former Soviet Union and in Central Europe. Oil prices reached their deepest level as a result of the Asian crisis (1997–1998).

The last period (since 1999) is marked by high volatility and a renewed strong negative correlation (-0.80). Owing to low investment in the previous periods, oil producers were unable to keep pace with rising oil consumption due to rapid growth in demand in emerging (Asian) economies. Reserve extraction capacity decreased and oil prices started to rise dramatically. As non-OPEC production was already beyond its peak, the oil cartel's price-setting power increased. Fundamentals, geopolitical risks and excess liquidity resulting from easy monetary policy caused an inflow of speculative money into the oil market. This, in turn, bolstered the growth in oil prices and caused a speculative bubble to form. This bubble burst in July 2008 and the oil price temporarily collapsed. However, thanks to the renewed market power of OPEC, the price very soon returned to the level which OPEC considers favourable for both oil producers (in terms of investment efficiency) and consumers.

Figure VII-4: Past evolution of EUR/USD exchange rate and oil price

a) EUR/USD exchange rate and oil price

b) Moving correlation coefficient of EUR/USD exchange rate and oil price (period = 5 years)



Note: Before 1999 "synthetic" euro; before 1979 calculated from DEM/USD.

Source: Calculated using Thomson Reuters and IMF-IFS data.

The negative correlation between the USD exchange rate and the oil price for most of this period is no accident and can be attributed to five channels (see Breitenfellner and Cuaresma, 2008): (i) The purchasing power of oil export revenues on the supply side – oil exporters aim to stabilise the purchasing power of their (US dollar) export revenues in a situation where their imports are mostly paid for in euro. A condition for this channel to function is that oil-exporting countries must – at least partially – have the power to affect oil prices by altering supply. In fact, OPEC's power was highly volatile in

the past, but with soaring demand from China and other emerging economies and with production having peaked in most non-OPEC countries, OPEC's significance has recently increased considerably. (ii) Local prices in non-dollar regions on the demand side – the dollar's depreciation reduces oil prices in countries whose currencies have strengthened against the dollar, thereby increasing demand for oil and the oil price denominated in dollars. (iii) Investment in oil-related markets – the dollar's depreciation reduces foreign investors' returns on US dollar-denominated financial assets, hence increasing the attractiveness of oil and other commodities as an alternative investment for foreign investors. Investment in commodities is also used by US investors to hedge against domestic inflation, the risk of which increases as the dollar depreciates. (iv) Monetary policy and exchange rate regimes – the dollar's depreciation entails an easing of monetary policy conditions in countries whose currencies are pegged to the dollar (including oil exporters and China). In turn, demand – including demand for oil products – rises in those countries.⁷ In such case, however, this may involve only an apparent correlation, with the USD/EUR exchange rate and the price of oil in fact being co-determined by a third variable, namely the real interest rate (if the uncovered interest parity applies). (v) Efficient currency markets – currency markets are possibly more efficient than the oil market and hence anticipate developments in the real economy that affect the demand for and supply of oil.

The above-mentioned channels assume that the causality goes from the dollar exchange rate to the oil price. This is contradicted by a number of studies which also admit the opposite direction of causality, i.e. from the oil price to the dollar exchange rate, and particularly to the exchange rates of "commodity currencies" (the currencies of major global commodity-exporting countries). In the empirical part of their study, Breitenfellner and Cuaresma (2008) find that the direction of causality is unclear, but they also come to a relatively strong conclusion that the inclusion of the EUR/USD exchange rate among their model's explanatory variables improves its ability to predict future oil prices.

3. The effect of large central banks' monetary policy on the price of oil (commodities)

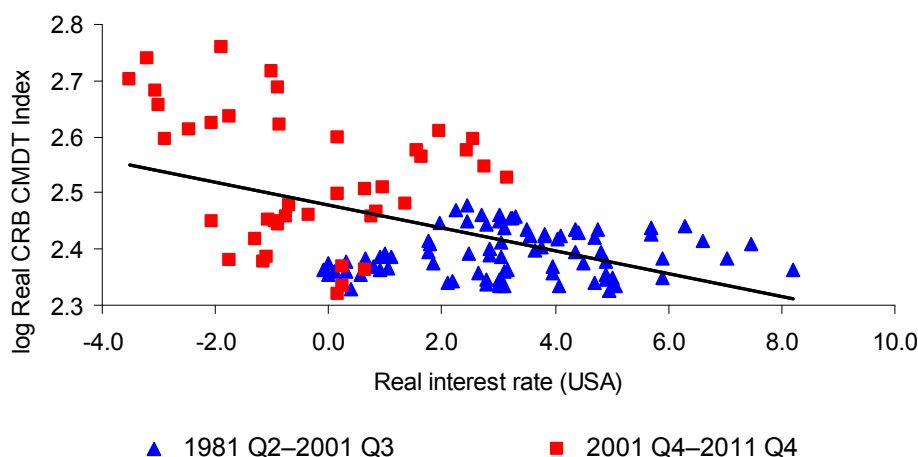
The accelerating growth in the prices of oil and other commodities observed particularly in 2003–2008 has caused many to ask what caused this growth. The sustained economic boom in Asia, growing demand in other emerging economies, political instability (Venezuela and Nigeria; unrest in the Middle East), gradually depleting reserves of oil (and other commodities) and rising extraction costs are usually cited as the main reasons. However, the hypothesis of demand growing too fast is contradicted by developments since 2007, when the global economy started to slide into recession. This situation was aggravated by the fall of Lehman Brothers on 15 September 2008 and by the onset of the global financial crisis. Meanwhile, however, the price of oil surged by almost 100% starting in late 2007. Almost all industrial and agricultural commodities recorded rising prices. A strong correction of oil and other commodity prices occurred only in the second half of 2008. Since 2009, commodity prices have been rising sharply again. The question is what is causing this situation where commodity prices are surging or staying at high levels while the economy is sliding into recession. Are demand and supply factors reflecting economic growth a sufficient reason

⁷ Anchoring oil exporters' currencies to the US dollar is criticised from the perspective of global trade imbalances (oil exporters' current account surpluses largely correspond to the US current account deficit). It is not certain, however, that higher consumption in oil-exporting countries would reduce the US deficit, as these countries import primarily from Europe and Asia. By contrast, higher imports could increase oil consumption in Europe, where oil price growth has not been not so dramatic in the past thanks to appreciation of the euro. Further dollar oil price growth would lead, in turn, to a further deterioration of the US current account deficit.

for the surge in commodity prices? And if global economic growth since 2002 does not explain this surge, where should we look for its causes?

One group of economists⁸ believes that the recent dramatic rise in commodity prices could not have been caused solely by supply and demand (as assumed by the traditional hypothesis), but that it was due largely to “cheap money”. A possible explanation can therefore be found in how monetary policy has been conducted, or rather in the real interest rate level, which is a very important factor underlying real commodity prices.

Figure VII-5: Real commodity prices at times of high and low real interest rates



Source: CNB calculations.

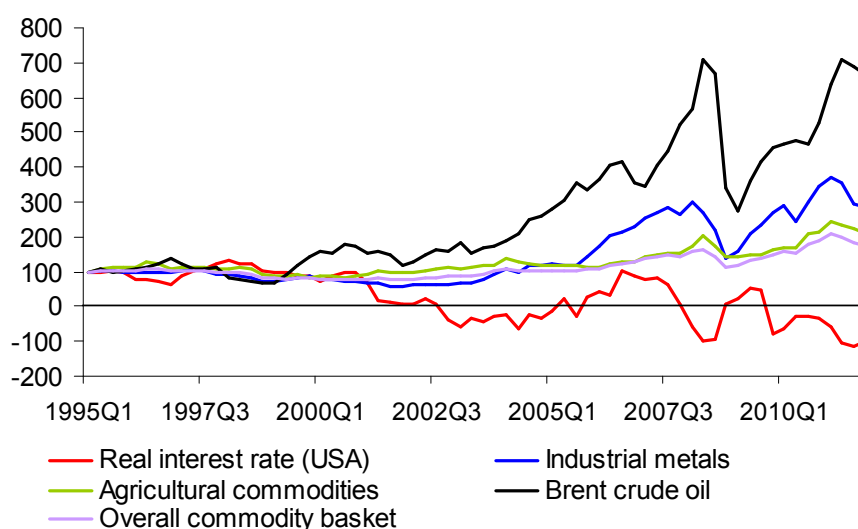
Figure VII-5 describes the relationship between real (CPI-deflated) interest rates in the USA and the Commodity Research Bureau Index⁹ in real terms. Commodity prices have been low at times of relatively high interest rates, i.e. tighter Fed monetary policy (shown in blue), and high at times of relatively low rates. This would suggest that interest rates have a greater impact on prices of oil and other commodities than generally assumed so far.

The current high commodity prices may therefore be a result of the Fed’s long-running easy monetary policy, which started in 2001.¹⁰ A second wave of aggressive cuts started in October 2007. The Fed lowered its key policy rate from 4.75% to only 0.25% at the end of 2008, i.e. over a period of just 14 months. On the one hand, this was a logical consequence of the situation facing the US economy (i.e. the technology bubble, the terrorist attacks of 2001, the economic downturn, etc.). On the other hand the sustained easy monetary policy probably led to overall growth in asset prices, including commodity prices. Figure VII-6 shows the dynamic growth of real prices of individual commodity categories (i.e. industrial metals and agricultural commodities as well as the overall commodity basket), Brent crude oil prices and US real interest rates. In the period of rising rates (i.e. the 1980s and 1990s), commodity prices did not record such high growth as after 2000, when interest rates were falling sharply. The different trends in the two periods are most visible in prices of agricultural commodities (non-storable, perishable) and mineral commodities (storable), i.e. oil and industrial metals.

⁸ See, for example, Frankel (2006).

⁹ The CRB Index describes the overall direction in commodity prices. It is a measure of price movements of 19 basic commodities. The greatest weight is assigned to oil (23%), followed by copper, corn, gold, live cattle, soybeans and natural gas (6%), cocoa, coffee, cotton, heating oil, unleaded petrol and sugar (5%) and nickel, orange juice, silver, wheat and pork (1%).

¹⁰ The key interest rate was gradually lowered from 6.50% on 3 January 2001 to 1.00% on 25 June 2003.

Figure VII-6: Real commodity prices and real interest rates

Note: Index, 1983 Q1 = 100

Source: Calculated using Bloomberg data.

For example, Frankel (2006) states that the effect of real interest rates on the supply of, and demand for, storable commodities can be transmitted through the following channels: i) production, (ii) inventories and (iii) financial speculation.

Production

When interest rates are low, producers leave oil in the ground instead of extracting it and storing it in tanks (see the Hotelling model). In this case it is virtually impossible for excess supply of storable commodities (oil, natural gas, metals) to amass. Prices then rise as new oil deliveries fail to keep pace with growth in global demand. This would mean that some cases of apparent stagnation in oil deliveries as a result of low capacity are merely an illusion – oil producers are able to keep up with rising demand, but low interest rates encourage them to keep more unextracted oil in the ground, thereby creating an impression of stagnating oil supply.¹¹

Inventories

Low real interest rates lead to expectations of rising oil prices in the future. That prompts oil producers to increase their oil inventories, as stored oil can be sold at a higher price later on. Hence, the motivation of companies to transport their inventories to the distribution network weakens, while demand for storable commodities increases. Oil inventories are therefore held in tanks and the decision on how much oil to sell involves weighing the interest rate level against expected future growth in prices. If the rate of return on financial assets is extraordinarily low, it is better to keep oil in tanks than to sell it today and reinvest the proceeds.

Financial speculation

Low interest rates encourage speculators to shift their investment interests (capital) out of relatively risk-free short-term interest-bearing financial instruments (e.g. Treasury bills) to very risky commodity futures contracts, which on the other hand can generate higher returns. Therefore, rational investors (i.e. small investors, banks, pension funds and hedge funds) seeking higher returns in an environment of low interest rates – even

¹¹ This also applies to other storable non-perishable commodities, i.e. how much copper to mine, how much of a forest to log, etc.

if that means taking on a higher degree of risk – are a key factor of speculative growth in commodity prices.

All these three mechanisms can therefore foster growth in real commodity prices. The theoretical model can be summarised as follows: expansionary monetary policy temporarily lowers real interest rates (whether via a fall in nominal rates or via a rise in expected inflation). This stimulates growth in commodity prices in real terms. Commodity prices can then rise until they are widely considered “overvalued”. In that situation, there is a prevailing expectation of a future decline in prices (and other costs, i.e. storage costs, transaction costs, the risk premium, etc.) that is sufficient to offset the low interest rates (and other benefits of carrying inventories – the “convenience yield”¹²). If we imagine the logic underlying, for example, the theory of exchange rate overshooting (see Dornbusch, 1976) and we replace the exchange rate with the price of commodities, then in the long run – when the price level adjusts to the change in money supply – the real interest rate and real commodity price should return to their initial levels.

4. In lieu of a conclusion: What is the appropriate central bank response to an oil shock?

There is a clear consensus across the economic literature that central banks should closely monitor and analyse developments in asset markets (including oil and other commodity markets).¹³ However, in the case of oil prices (as opposed to, say, stock or property prices), the debate is more or less limited to their impact on the consumer price index, and especially the extent to which these supply shocks should be exempted. The experience of recent years suggests that making exemptions from headline inflation, or targeting core inflation, may be a mistake, as commodity price growth forms part of the contrary movements in relative prices and moreover reflects monetary policy settings (i.e. it is not a classic exemptible exogenous shock).

Growth in oil prices – or the second-round effects of such growth on inflation – should lead, *ceteris paribus*, to an increase in the central bank’s rates. It is a negative supply shock. If demand remained unchanged, inflation would have to rise at least temporarily. There are two fundamental problems here. First, we do not usually know whether the shock is permanent or transitory. Transitory shocks (especially those stemming from global demand) can cause input prices to rise, but their effect on consumer prices (via higher prices of fuels, food, etc.) is smaller. If the shock is considered transitory, the central bank’s optimal reaction could be to raise real interest rates slightly in order to moderate demand. If the shock is permanent, it lowers the economy’s potential and, *ceteris paribus*, real interest rates should also rise. However, if expectations of a permanent decline in productivity reduce permanent income, consumption will fall, followed by investment. Ultimately, even temporarily reducing real interest rates in an effort to prevent an excessive drop in demand may be the optimal monetary policy reaction. The reduction can be temporary because net investment should return to its original level after some time (at a lower absolute level of capital). If we add the intertemporal aspect to the equation, the situation becomes even more complicated. A temporary reduction of real interest rates would shift part of demand from the future to the present, thereby only postponing the problems or requiring an even larger reduction of real interest rates in the future. Overall, it is apparent that the optimal monetary

¹² The difficult-to-quantify utility (e.g. of oil processors) from immediate ownership of oil in physical form (in their own tanks) versus uncertain future delivery based on the ownership of futures contracts.

¹³ For more details on this debate see Posen (2006) and Roubini (2006), and for a discussion focusing on transition countries see Frait and Komárek (2007).

policy reaction to an oil price shock is hard to define within the prevailing theory, partly because a significant part of the shock may be endogenous rather than exogenous.

The second problem is that growth in prices of oil or other commodities is not an isolated shock, so the *ceteris paribus* condition does not apply. On the contrary, it takes place amid significant changes in the world economy and, of course, in the Czech economy as well. The latter is undergoing structural changes that are probably raising potential growth. This is an anti-inflationary phenomenon running counter to the effects of rising prices of oil and other commodities. In addition, other significant processes are taking place in the world economy, e.g. a weakening of the US dollar. In small open economies (such as the Czech Republic), this is directly causing a decline in import prices in koruna terms, which has potential first- and second-round effects on inflation. Other important effects also exist. Given the positions of the euro and dollar in Czech exports and imports, the terms of trade will improve, increasing the funds available to the domestic economy. Other effects may ensue from the decline in koruna prices of technology imported from the dollar area. This can be regarded as a positive supply shock, reducing investment costs and increasing the economy's potential. The depreciation of the dollar should also act indirectly via its potential impacts on European exports. Economists differ significantly in their assessment of the strength of this effect. Despite all the problems with identifying the optimal monetary policy reaction,¹⁴ we can show how monetary policy responds to oil price shocks in the CNB's modelling system.¹⁵

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¹⁴ The central bank of a small open economy must also consider the balance of external relationships, i.e. the current account balance in flow terms and net foreign debt in stock terms. In the case of a transitory shock, the reaction should be more restrictive if the country records a current account deficit and higher foreign debt before the oil shock – see Mandel (1992).

¹⁵ However, the modelling system largely ignores the long-term impacts of changes in oil prices on the supply side of the economy; these could be incorporated using expert judgement during the preparation of the real forecast.

BOFIT	Bank of Finland Institute for Economies in Transition
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
ES	Spain
EU	European Union
EUR	euro
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-BCI	IFO – Business Climate Index
IFO-CCI	IFO – Consumer Confidence Index
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
PT	Portugal
RU	Russia
UoM	University of Michigan
UoM-CSI	University of Michigan Consumer Sentiment Index
US	United States
USD	US dollar

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