NOVEMBER 2011[1]

Report of the G20 Study Group on Commodities under the chairmanship of Mr. Hiroshi NAKASO

[1] This report was based on data available as of May 2011

November 2011

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Executive summary

Recent commodity prices raise important policy challenges

The past decade was characterized by large fluctuations in commodity prices. A boom in commodity prices until 2008 was followed by a steep decline during the height of the financial crisis. Since early 2009, prices of major groups of commodities – including energy, food, and base metals – have risen to levels close to or even above the peak reached in 2008. Commodity price movements are typically more pronounced than those of manufactured goods and services. But for some commodities, the speed and amplitude of recent price swings have been large by historical standards.

These commodity price movements present important policy challenges worldwide. In the near term, policymakers need to deal with the macroeconomic consequences of high and volatile commodity prices, including inflationary pressures and real income losses, which tend to be especially severe in lower-income commodity importing countries. Over the longer run, the key issue is to ensure that commodity supply growth keeps track with the needs of a growing and more integrated global economy. Meeting this challenge is a precondition for sustained improvements in economic and social welfare worldwide.

A fundamental shift in supply-demand balances

Marked shifts in the physical supply-demand balance for major commodities have been the main driver of the price fluctuations over the past ten years. For many commodities, the expansion of supply has fallen short of buoyant demand growth. As a consequence, inventories and spare capacities have fallen, increasing the exposure of commodity markets to shocks.

Rapid global economic integration and growth has been a major factor behind stronger commodity demand. The rapid expansion of manufacturing activities in emerging economies combined with growing urbanization and related changes in consumption behaviours have boosted demand for energy and base metals as well as for some agricultural commodities. From this point of view, strong demand for commodities is an integral part of the current phase of economic globalization. It may well persist for an extended period of time.

Shocks and a long period of underinvestment have constrained supply growth. Shocks to major food and raw materials markets – including more frequent weather-related disruptions and geopolitical uncertainties – have triggered commodity price fluctuations in the short run. More fundamentally, low investments in commodity production and infrastructure for a long time have reduced the ability of commodity producers to respond to growing commodity demand.

Domestic policy responses have repercussions on global commodity markets

Many countries have taken measures to mitigate the domestic economic and social impact of rising food and energy prices in particular. Especially during the run-up in commodity prices in 2007-08, a large number of countries provisionally reduced (or eliminated) import tariffs, imposed export restrictions, made more active use of official stocks or increased precautionary holdings of commodities. A number of countries have also subsidized domestic consumption to cushion the impact of rising world market prices for food and energy on vulnerable populations.

Domestic policy measures often have repercussion on international markets. Ad-hoc measures – including tariffs and export restrictions as well as subsidies – can lead to market imbalances, add to price volatility, and weaken international trade as a stabilising

mechanism.[2] In the longer run, distortions in domestic and global markets are likely to lead to resource misallocation and suboptimal supply.

Policies promoting biofuel production could strengthen the linkages between energy and agricultural markets. Together with the growing energy intensity of food production and distribution, the use of agricultural commodities for biofuel production – mainly supported by mandated consumption targets and dedicated policies – could be a factor which strengthens the pass-through from energy markets to food prices.

Growing presence of financial investors in commodity markets

Participation of financial investors in commodity-related financial markets has grown significantly since the mid-2000s. While commodity derivatives contracts have existed for a long time, the past few years have seen a much greater variety of investors, instruments and investment strategies in commodity markets.

Greater investor participation can be expected to enhance the functioning of markets by adding depth and liquidity. This should help producers and consumers to hedge price fluctuation risks. Greater participation of financial investors can also aid the development of long-term commodity futures, which would facilitate risk management and planning over longer time horizons. More generally, participation of well-informed financial investors may enhance the quality of price signals. However, large financial flows associated with herding behavior of financial investors can sometimes amplify commodity price movements and may sometimes cause prices to deviate temporarily from values consistent with physical supply and demand conditions.

Assessments of the impact of financial investors on commodity prices remain inconclusive. Large changes in physical supply and demand provide plausible explanations for commodity price trends over the past several years and existing literature finds limited signs of investors causing sustained deviations from "fundamentals". At the same time there are views that greater investor participation has at times affected commodity price volatility and correlations between commodity and stock markets.

Stronger global growth has been a major driver of commodity prices. In addition, accommodative global monetary condition could also have contributed to the rise in commodity prices especially during the period since 2009. First and foremost, monetary policy has affected aggregate demand for all goods, including commodities. Other channels may also have been at work and have affected commodity markets. Considering global, in addition to domestic monetary conditions, appears to be important for a full understanding of the linkages between monetary policy and commodity prices.

Rising commodity prices have had important macroeconomic consequences

Rising commodity prices dampen economic growth in the near term in many commodity importing countries. However, strong growth in emerging market economies (EMEs) mitigates the impact on the global economy. The long-term implication on growth could be significant both for commodity exporters and importers especially if very volatile prices create pronounced planning uncertainty and a risk of capital misallocation.

Rising food and energy prices have had severe effects on income distribution and poverty especially in low-income economies. The loss in real income as a result of higher food prices is

[2] In their June 2011 meeting, G20 Agriculture Ministers agreed that "a stable, predictable, distortion free and transparent system for trade allows the unrestricted flow of food and agricultural commodities, contributing to food security" (http://agriculture.gouv.fr/IMG/pdf/2011-06-23_-_Action_Plan_-_VFinale.pdf).

a particularly acute problem for low-income countries where households spend a large share of their income on food. A situation in which the poorer population cannot afford to buy food due to higher prices can be a cause of social instability.

Higher commodity prices have added to inflationary pressures globally. This is particularly visible in emerging market economies with a high share of energy and food in consumption baskets and limited economic slack. Avoiding second round effects of commodity price increases on general inflation is important.

Supporting the proper functioning of global commodity markets is a policy priority

The proper functioning of commodity markets is key for sustained global economic growth. In the short run, it is important to deal with tight supply-demand balances and to aim at a policy environment that facilitates a market-driven supply response to high prices. Perhaps even more importantly, well-functioning markets are a precondition for creating incentives to invest in commodity production and ensure adequate supply in the long run.

Greater transparency and better information can enhance the price discovery and risk transfer function of commodity markets. Strengthening these functions can enable producers and consumers to make well-informed decisions and thereby contribute to efficient allocation of resources, as well as support long-term investment and consumption planning. Further efforts to enhance the availability of timely and comparable data will promote better functioning of markets at the international level. Greater market transparency and expected recommendations from IOSCO on regulation and supervision of commodity derivatives markets will also strengthen confidence in the integrity of these markets.

Given the key economic and social role of commodity prices especially in low-income countries, social policy considerations need to be taken into account in the design of policies. Targeted policy measures may help to avoid unintended consequences on market functioning and resource allocation in the longer run.

Potential financial stability implications warrant analysis

A better understanding of the evolution of commodity-related financial markets as well as the linkages between physical markets and financial markets is also important from a market stability perspective.

Greater participation of financial investors in commodity markets increases market liquidity and diversity of opinions. This helps to accommodate the hedging needs of producers and consumers. At the same time, closer analysis and monitoring of the impact of these structural changes on the exposure and risk management of financial institutions and on the overall development of commodities markets is warranted.

Commodity market developments call for a global perspective in policymaking

Ensuring the effective functioning of commodity markets and properly assessing the economic implications of commodity market developments requires an international perspective.

Regular information sharing and exchange of views at the international level is one precondition for avoiding unintended consequences of domestic policies. A global perspective may be required to fully appreciate the implications of domestic policy responses for growth and inflation.

Introduction

In March 2011, the G20 established a Study Group to analyze recent commodity market developments. The Study Group is chaired by Hiroshi NAKASO (Bank of Japan). G20 countries have actively participated in this group.

The Study Group's mission was to conduct a fact finding exercise in order to understand the evolution and drivers of commodity price fluctuations and their economic consequences. The goal of the Group was to prepare the ground for subsequent policy discussions by Deputies and Ministers. To this end, the group's report provides in-depth analysis and set out broad policy implications. It neither aims at formulating policy recommendations nor proposing concrete regulatory measures.

For these, the analysis in the study group report covers (i) analyses covering both short- and long-term perspectives, (ii) economic and financial factors on a macroeconomic level, and (iii) market transactions and structures on a microeconomic level.[3]

The report covers the following commodities: (i) major energy commodities and metals with relatively large markets including derivatives (crude oil, natural gas and copper); and (ii) food commodities which have particular socioeconomic relevance as basic staple foods and feed grains (corn, soybean, rice and wheat). Important mineral resources without derivatives (e.g., coal, iron ore) are considered to compare with those with developed financial markets.

Chapter 1: Overview

(Key price trends over the past decade)

The past decade was characterized by large fluctuations in commodity prices (Graph 1.1). Prices started rising with the global recovery in 2003. The increase in commodity prices accelerated in the first half of 2008, followed by a steep decline during the height of the financial crisis in the fourth quarter of 2008. Since the first quarter of 2009, commodity prices have recovered, and prices of all major groups of commodity markets (energy, metals, food) have reached the highest levels since the early 1990s in real terms[4]. Notwithstanding the drop in May 2011, prices of most of the commodities considered here remain close to or above the peaks reached in 2008.

Energy and metals have been the main drivers of changes in aggregate commodity prices. For instance, crude oil prices increased more than double from end-2007 until August 2008, then dropped by almost 70% until the end of 2008, and have risen by almost 150% since then. Food prices have also been on an upward trend since the early 2000s, although cumulative nominal increases (and spikes) have been smaller.

[3] The Study Group has benefited from the discussions in various other fora, including the G-20 Workshop on Commodities held in Buenos Aires on May 2011.

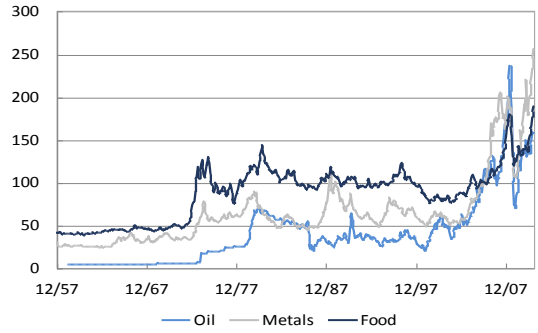
[4] In this chapter, world export prices are used as deflator when calculating real commodity prices.

Graph 1.1 Long term nominal commodity prices[1]

Average 2005 = 100

Total

Major commodity groups



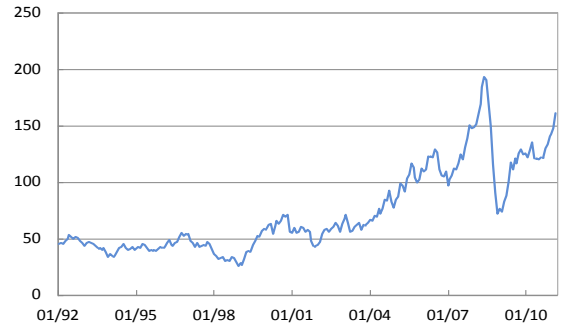
1 In US dollar terms real; average 2005 = 100 unless otherwise stated.

Sources: IMF, *International Financial Statistics*

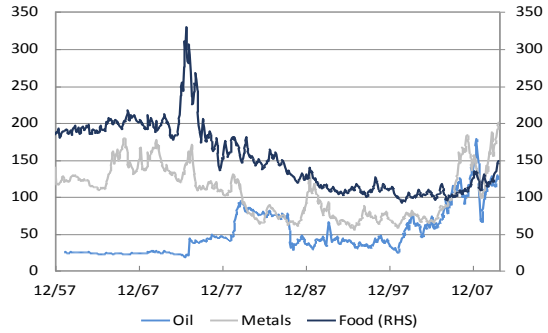
Long term real commodity prices

Average 2005 = 100

Total



Major commodity groups



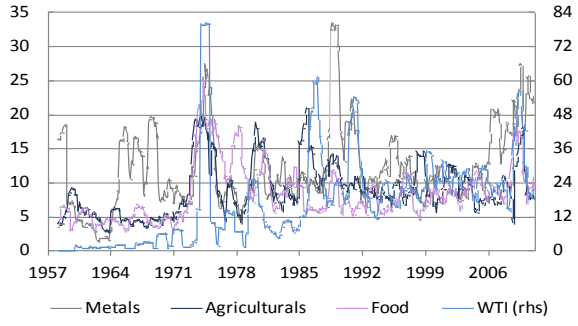
1 In US dollar terms: deflated by world export prices; average 2005 = 100 unless otherwise stated.

Sources: IMF, *International Financial Statistics*

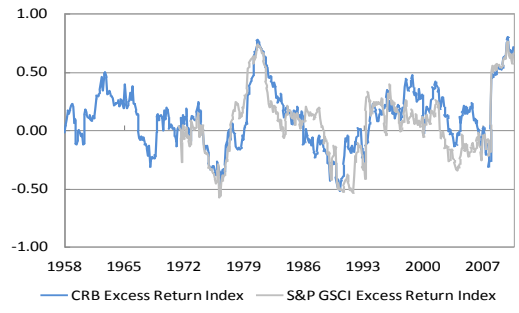
The large swings in commodity prices over the last five years have been associated with heightened short-term volatility. In particular, volatility rose sharply during the fall in commodity prices in 2008. Moreover, there have been some increases in the correlation between equity and commodity prices since 2008 (Graph 1.2).

Graph 1.2 Commodity price volatility and correlations

Rolling one-year volatility of daily returns[1]



Rolling two-year correlation between commodity and equity on monthly returns[2]



1 In per cent, annualized historical volatilities calculated from percent changes (in real terms) of IMF Commodity indices over specified sample periods. 2 Correlations calculated from percentage changes of S&P GSCI excess return commodity indices and S&P500 price return index over specified sample periods.

Sources: IMF, Global Financial Database, Bloomberg

(Recent price movements from a long-term perspective)

Recent trends in the price level and volatility of major commodity groups appear less unusual in a long term perspective. In real terms, the level of many commodities is still below their averages in the first decades of the post-war era and well below their historical highs and it is not clear whether the recent increase marks an end, or even a reversal, of the secular decline in real commodity prices observed during the last century (Table 1.1). For instance, real food prices are still lower than during the 1970s, notwithstanding the increase of about 50% since end-2008. One notable exception is oil prices, which are historically high in real terms. Oil prices have risen most (they tripled compared to the 1970s), followed by base metals.

Table 1.1 Real commodity prices
Base 100 = January 2000

	Oil	Metals	Agriculturals	Beverages	Food
Average values:					
1957-1969	43.43	181.42	99.06	226.01	209.52
1970-1979	80.03	192.99	107.99	295.42	243.75
1980-1989	124.20	120.05	97.81	207.79	164.94
1990-1999	76.20	101.74	114.88	125.79	126.38
2000-2009	149.67	129.33	88.91	99.90	106.58
2010	202.36	213.71	90.70	144.79	126.08
Coefficient of variations :					
1957-1969	8.31	44.85	17.34	69.78	16.50
1970-1979	160.17	44.60	61.12	149.43	77.33
1980-1989	121.17	85.85	57.12	76.50	49.14
1990-1999	70.72	47.90	34.69	78.57	32.28
2000-2009	128.40	127.03	33.83	63.02	40.84
2010	95.00	77.56	32.99	44.60	34.62
most recent value *(1)*	243.47	239.52	114.77	169.30	144.56
Memorandum items :					
Historical peak	314.62	300.53	158.45	717.55	396.93
	June 2008	April 1974	Dec. 1973	March 1977	Feb. 1974
Historical minimum	36.91	75.39	65.02	69.94	90.08
	June 1973	Oct. 2001	March 2009	Sept. 2001	Jan. 2001
2001-2002 (local) minimum	71.00	75.39	86.45	69.94	90.08
	Dec. 2001	Oct. 2001	Oct. 2001	Sept. 2001	janv.-01
2007-2008 (local) peak	314.62	231.45	95.37	132.30	143.29
	June 2008	May 2007	Feb. 2007	Feb. 2008	March 2008
2008-2009 (local) minimum	108.92	122.56	65.02	110.13	108.06
	Feb. 2009	March 2009	March 2009	Feb. 2008	Nov. 2008

Source: IMF
(1)March 2011

A long-term comparison also shows that recent price fluctuations are not unprecedented for individual commodities [5]. For oil, in particular, while price volatility also increased

[5] See Calvo-Gonzalez, et al. (2010) and Jacks et al. (2009).

remarkably in 2008, it remained well below the spike reached in the early 1970s. The recent episode is also consistent[6] with the fact that commodity prices are typically much more volatile than those of manufactured goods or services because of their low demand/supply elasticity and their sensitivity to macro-economic conditions.

However, what seems to be different from earlier commodity price cycles is the large amplitude of price swings for a broad range of commodities[7]. For some commodities, the speed and amplitude of recent price swings have been large by historical standards[8]. The subsequent cyclical contraction was very deep and intense for most commodity groups. The coefficient of variation reached 128.40 for oil and 127.03 for metals during the 2000-2009 period, compared to 70.72 and 47.90 during the 1990-1999 period.

The movements of commodity prices in the past decades have been against background of large changes in physical demand and supply conditions, which are discussed in the following chapter. Moreover, the structure of commodity markets has changed. In many commodity markets, the composition of participants in physical markets has changed along with new global production patterns and the progressive integration of the former centrally planned economies into the global economy. Also, investments in commodity-related financial instruments have grown steadily over the last decade, which is analyzed in Chapter 3 of this report.

Chapter 2: Drivers of Physical Supply and Demand

2.1. Supply-Demand Balance

The price fluctuations over the past ten years have been associated with marked shifts in the supply-demand balance for major commodities. In many cases, demand has grown faster than supply. Global demand for energy, food and industrial metals has risen rapidly, only briefly interrupted by the financial crisis.[9]

A deteriorating supply-demand balance and declining stocks amplified the impact of supply shocks to particular commodities, including disruptions to oil supply, droughts and floods that hit food crop harvests and policy actions including agricultural commodities export bans. The sharp price increase in 2007-08 triggered some positive supply response, for instance in the production of wheat and corn. However, due to production lags, the supply response to the strong prices of the mid-2000s is yet to come for some commodities.[10] Partly as a consequence, global stock levels for many commodities were lower in 2010 than at the start of 2000 (Graph 2.1).

This shift in supply-demand balances raises several important questions. First, is the rise in commodity demand structural, or is it a cyclical phenomenon? Second, how severe are supply

[6] See Jacks, et al. (2009).

[7] See Baffes and Haniotis (2010).

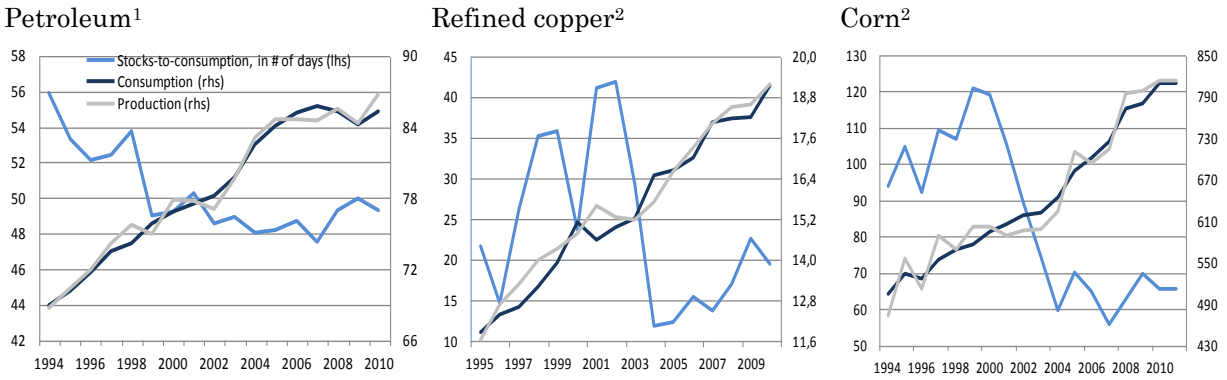
[8] The latest cyclical expansion had above-average magnitude for food and metal prices while for oil the magnitude of the rebound was in line with historical average but at a higher speed.

[9] According to the World Bank, global energy demand increased by about 25 percent between 2000-2010, 10 percentage points more than during the ten years before. As for food consumption growth, global grain consumption has increased by 22 percent since 2000.

[10] It should be noted that global wheat production in 2008 increased by 12%, at least in part in response to higher wheat prices. Such supply responses helped bring wheat prices down from their 2007/08 price peaks. However, the supply response in wheat was concentrated in a relatively small number of countries. At the same time, the supply response in rice was extremely modest given the prices prevailing during 2007/08. All of this reinforces the importance of ensuring that policy facilitates the transmission of international price signals and a domestic supply response.

constraints? Will investment in commodity production ensure adequate supply going forward? And will addressing supply constraints become more costly, e.g., because of resource exhaustion, investment constraints or climate change? And are inventories adequate?

Graph 2.1 Supply, consumption and stocks of selected commodities



[1] Supply and consumption in millions of barrels per day; stock in billions of barrels. [2] Millions of metric tons.

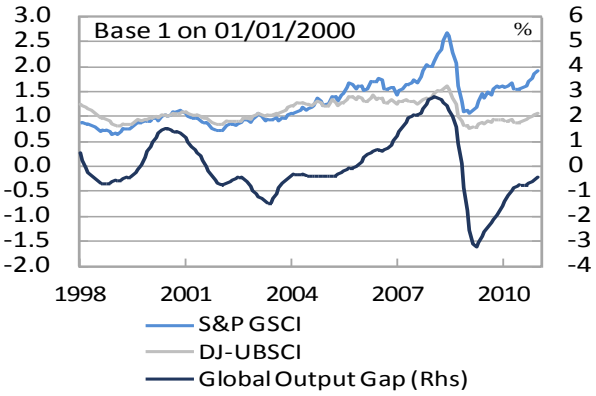
Sources: Bloomberg, Energy Information Administration

2.2. Demand-Side Drivers

2.2.1 Global economic growth and Commodity Prices

Global economic growth has been a key driver of rapidly rising demand for commodities. The period from 2003-2007 witnessed the strongest global economic recovery for more than 30 years. And the collapse in commodity prices coincided with the global recession of 2008, representing thus a stiffer global economic shock than those of the 1950s and 1970s. Real commodity prices have moved roughly in tandem with the global economic cycle (Graph 2.2). One factor explaining this relatively close co-movement is that demand for commodities as intermediate inputs into production closely tracks output growth in manufacturing and construction. Second, commodity prices are more sensitive to changing macroeconomic conditions than those of manufactured goods or services.

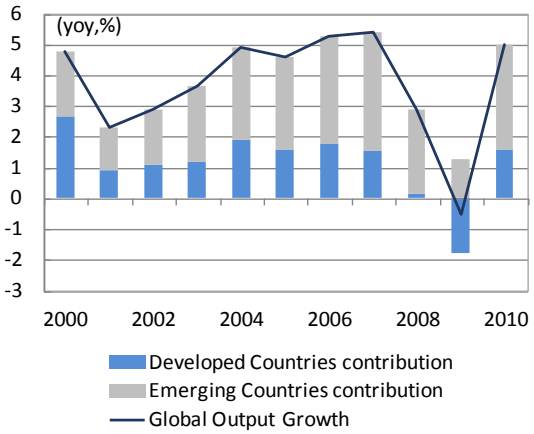
Graph 2.2 Global economic activity and commodity prices



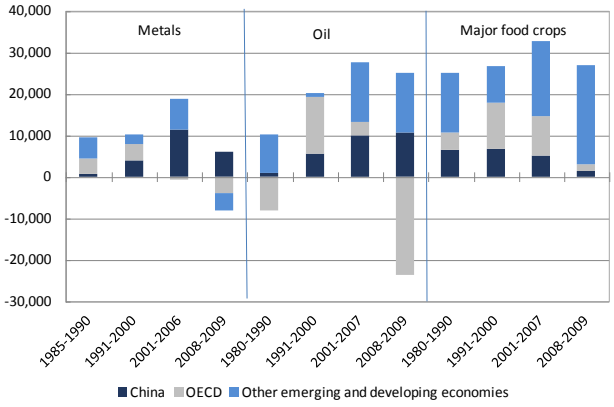
Note: S&P GSCI and DJ-UBSCI are shown as relative prices to the global headline CPI.

Furthermore, global economic integration in the form of economic catching up of emerging market economies (EMEs) has contributed to increasing underlying demand for commodities[11]. Demand growth for metals, oil and major food crops in the 2000s was largely driven by EMEs (Graph 2.3). For instance, world oil demand accelerated in the early 2000s, largely reflecting buoyant demand mainly from Asia and the Middle East. On the contrary, in OECD countries, oil demand has leveled off and even fell over 2006 to 2009.

Graph 2.3
Contribution to the GDP growth and to the annual average consumption change



Source: IMF



Source: USDA, World Bureau of Metal Statistics, BP

Taken from ECB (2011)

Note: Metals (aluminum and copper) are in hundreds of thousands of metric tons. Major food crops—corn, rice, soybeans, and wheat—and oil are in thousands of metric tons. The bars show the average annual increase in consumption over the period shown.

Buoyant commodity demand generating from EMEs reflects two related factors. First, output grew much faster in EMEs than in advanced economies in the past decade. The strength of EME growth and the resulting demand for commodities have been consistently underestimated in the last decade.[12] In fact, increases in commodity prices tend to take place

[11] See IMF (2008).

[12] See Kilian and Hicks (2009).

at times when EME growth expectations are revised upwards. Even in 2008-2009, when the global economy was in recession, EME demand for commodities continued to grow.

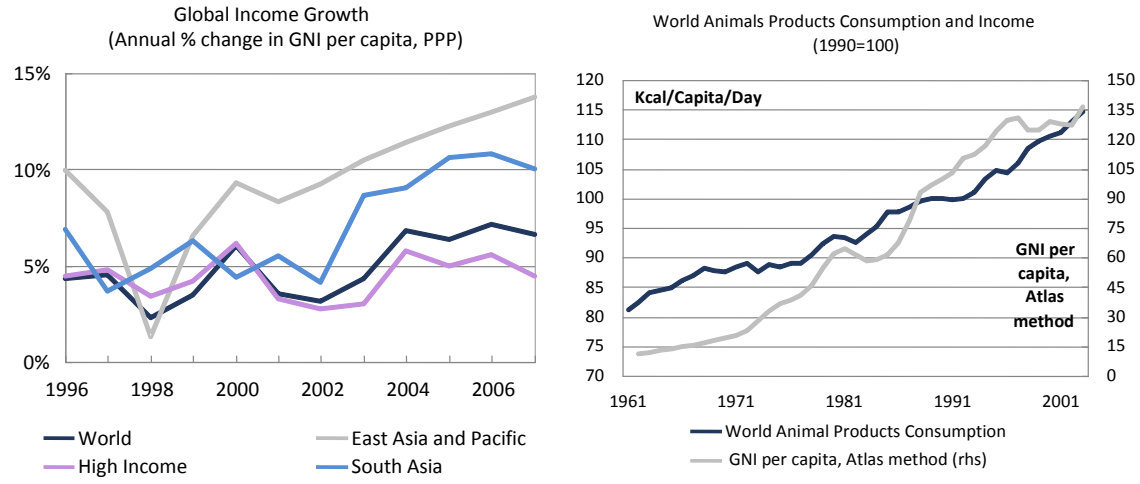
Second, rapid EME growth has also been relatively commodity-intensive. One aspect of this is that changes in global production chains in the past decade have involved a shift of manufacturing activities to EMEs, increasing their demand for energy and metals. Viewed from this angle, rising commodity prices are a reflection of growing integration of the world economy and the ability to exploit the benefits of globalisation.

2.2.2 Increasing income and progressing urbanization in emerging market economies

Rapid income growth in EMEs has been associated with far-reaching changes in dietary habits and a structural shift in the demand for food commodities. Growing per capita income has been associated with a shift in food consumption from traditional agricultural commodities such as grains and oilseeds towards higher-quality food items such as meat and dairy products (Graph 2.4).

The rising demand for such food items has implied a quickly-increasing demand for grain and protein feeds used as intermediate inputs to raise animals. The World Bank estimates that a 10 percent increase in income per capita leads to a 6 percent rise in grain demand in low-income countries. This effect becomes weaker as incomes increase. Indeed, a similar rise in the incomes in high-income countries sees no material growth in direct demand for grain products. The strong demand for agricultural commodities has contributed to rising food prices since the early 2000s[13]. At the same time, demand for land to be used for producing crops has also increased.

Graph 2.4 Global income growth and world food consumption



Source: World Bank
"High Income" are countries where GDP/capita is least USD12,196/year

Source: FAOSTAT, World Bank
The purpose of the Atlas conversion factor is to reduce the impact of exchange rate fluctuations in the cross-country comparison of national incomes

Growing populations in many EMEs amplify the demand effect resulting from higher per capita income. While the world population is expected to grow more slowly from now on than in the recent decades, it is still expected to increase by over 70 million annually (World Development Indicators 2010).

[13] See FAO (2008).

It should be also noted that the demand for oil and base metals also rises with higher income owing to growing demand for manufactured goods such as automobiles. Moreover, the fast pace of urbanization and industrialization in emerging Asia and elsewhere has brought about a rapid expansion in infrastructure investment. Again, these changing consumption patterns can be viewed as integral part of the current stage of global economic development.

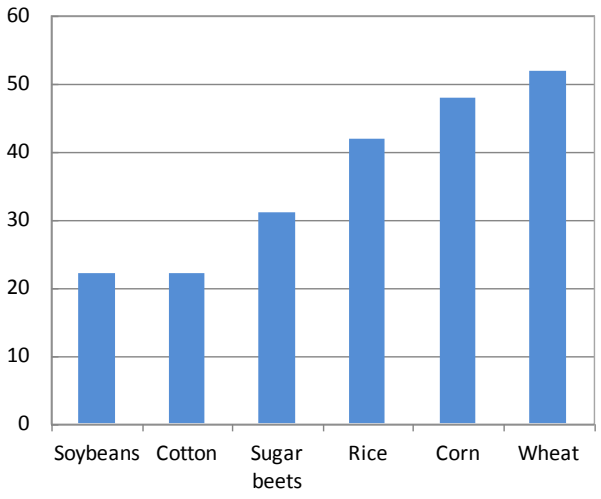
2.2.3 Closer relationship between the demand for energy and food commodities

In the past decade, the linkages between demand for energy and that for food commodities (soybeans, corn, wheat, rice, etc.) have become closer. One side is the (growing) energy intensity of food production. Energy is a major input into the production and distribution of agricultural commodities, and is a major cost component of food production as well (Graph 2.5). Energy input is an even more important determinant of the price of high-protein foods, such as meat or dairy products.

The other side is a growing use of agricultural commodities for biofuel production. The global production of biofuels has quadrupled in the past decade (from about 18 billion liters in 2000 to around 86 billion liters in 2010 for ethanol alone). While it still remains to be a small share of worldwide agricultural production, the growth of biofuel production has raised the demand for some agricultural products, and could be a factor which increases price linkages between agricultural commodity and energy markets if biofuel production becomes profitable.

Graph 2.5 Energy costs of food production and biofuel production

Energy costs as a share of total production costs (%)

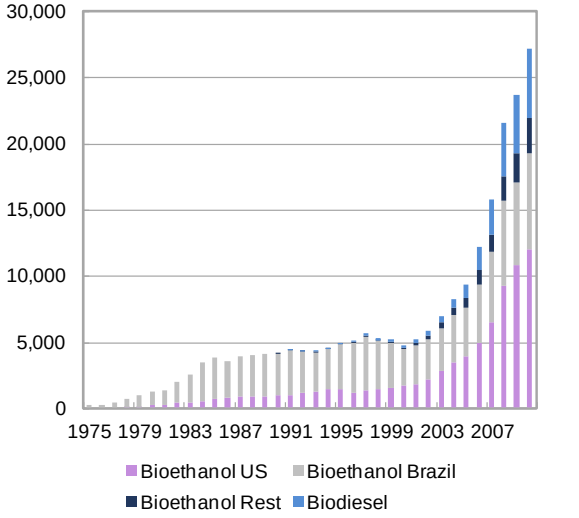


Source: USDA

Taken from ECB (2011)

Note: Data refers to the costs of fuel for transport and fertilizer costs.

Global production of biofuels (millions of gallons)



Source: FO-Licht

Taken from ECB (2011)

2.3. Supply-Side Drivers

2.3.1 Factors affecting supply growth

A number of factors have weighted on commodity supply growth in the past decade or so. First and foremost, investment in exploration and production was in many cases low in the years prior to the commodities price boom because of the prolonged period of low commodity

prices in the 1990s together with moderate global demand growth. In Australia, for example, investment and new exploration fell in the mid-2000s to their lowest levels (as a share of the economy) in 25 years, due to the low prices of the late 1980s and 1990s and the accompanying reduced global investment in research and development, exploration and production.

Domestic support measures (in the form of subsidies or special allowances, discussed in 2.4) to maintain low prices domestically in some countries[14] and protective trade policies may also have played their part. By implicitly putting a cap on food prices, such measures could create disincentives to increase local production capacities or improve productivity. In agriculture, production growth has generally remained stable since the late 1980s due to the previous weak prices and reduced aids from official sectors in developing countries.

A second related factor constraining supply growth has arguably been rising costs of commodity production. Geological constraints limit the production of mineral resources, and as oil and mining fields mature marginal costs of production increase. Major oil fields have already passed their peak output, and newly discovered reserves can often only be exploited at much higher production costs. Overall, nominal investment increases were offset by rising exploration and maintenance costs.

Rising costs of energy production have had knock-on effects on the production cost of metal and food. Higher transportation costs have been a major cost driver in many emerging economies, and higher costs of machinery usage, fuel, heating, and fertilizer have raised production costs in mining and agriculture worldwide.

Market structures can also adversely affect supply. A geographic concentration of natural resources and large lump sum investment needs may favour oligopolistic or even monopolistic market structures[15].

Climate-related supply disruptions have had a growing impact on food supply. Fluctuations in agricultural output due to adverse weather are not new, and often good and bad harvests have leveled out across regions during one season at least to some extent. Yet weather-linked production losses have become more frequent, possibly from climate changes. In the 2000s, twice as many occurrences of droughts, floods and extreme temperature were reported than in the previous decade (Graph 2.6). Expansion of agricultural production, for instance by cultivating land in more extreme climate regions, may increase the exposure of food supply to adverse weather events.[16]

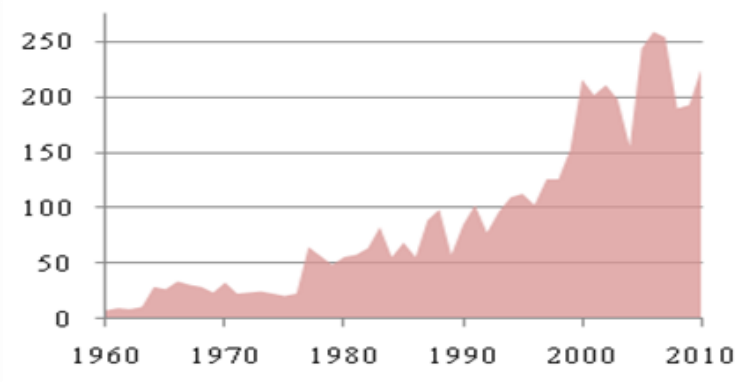
[14] See Beghin et al. (2002), and Hertel et al. (2006).

[15] The rice market for example is a very thinly traded market with a highly concentrated production, and a very price inelastic demand because of entrenched food habits. Total rice traded account for only around 7 percent of world's output compared to around 20 percent for wheat and 12 percent for corn, and the top five exporters - Thailand, Vietnam, Pakistan, US and India - accounted for more than 80 percent of total world rice trade in 2010.

[16] The greater importance of the Black Sea region in cereals production where yields are more volatile than in other major cereal production areas may also be adding to the increased price volatility.

Graph 2.6 reported droughts, floods and extreme temperature

Number of reported[17] occurrences of droughts, floods and extreme temperature



Source: International Disaster Database (EM-DAT)

2.3.2 Inventories and short-term supply

Stocks offer some protection against supply or demand shocks. Inventory adjustment can help to buffer a shock and mitigate commodity price volatility by making supply more price elastic in the short run. The relatively low growth of supply compared to demand, combined with partial dismantling of price support and intervention purchase schemes in some countries, however, has led to a reduction of inventories for many commodities.

One example is crude oil. In the mid-2000s, existing global oil production capacity was insufficient to satisfy the rapid increases in demand. In reflection, OPEC's spare capacity remained low from 2003 to 2008. Furthermore, while OPEC's spare capacity has remained broadly stable in absolute terms[18] after a sharp increase from late 2008 to early 2009 due to demand reduction from the global recession and global capacity expansion[19], it has declined relative to global oil demand (Graph 2.7)[20].

Agricultural commodities are another case in point. For rice and corn, global stock-to-consumption ratios have fallen to the lowest levels in 40 years (Graph 2.7). Global supply fell short of rapid increases in demand, which exerted pressure on stock levels. A series of policy reforms to reduce grain stocks in the US and the EU as well as a substantial decline in Chinese stocks worked in the same direction[21] [22].

[17] Events are reported by the International Disaster Database (EM-DAT). For a natural disaster to be entered into the database, at least one of the following criteria must be fulfilled: ten or more people reported killed, hundred or more people reported affected, declaration of a state of emergency or call for international assistance.

[18] According to the IEA report (12 May) total OPEC spare capacity reached 4,7Mbd in April 2011 in the wake of events in Libya.

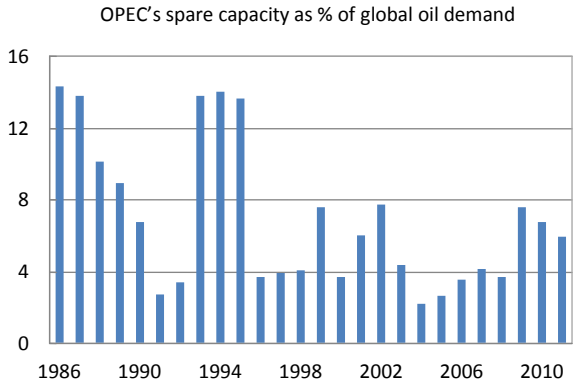
[19] Former Soviet Union states, Brazil, Canada and West Africa have expanded their oil capacity in recent years.

[20] Note that for oil, it may not be the case that spare capacity can always be drawn down to respond to a supply shock. While OPEC indeed has spare capacity, its oil is generally sour heavy and, as such, more difficult to refine into the desired products such as low sulphur diesels whose demand has increased for environmental purposes. Thus, replacing oil supply in one region may not always fully compensate for the supply shortfall in other regions because oil quality differs.

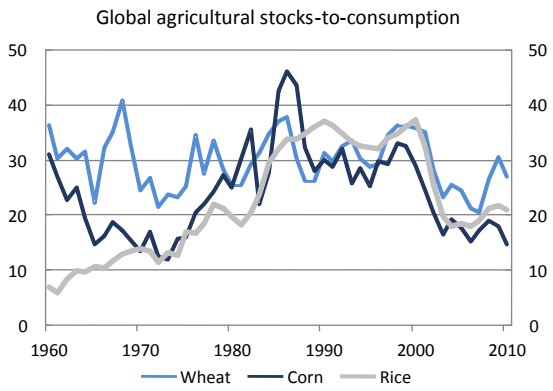
[21] For example, in the US, levels of government-owned stocks for corn and wheat were high in the early to mid-1980s, but were reduced through government programs in an effort to steer the sector toward greater market orientation.

[22] See Wiggins and Keats (2010).

Graph 2.7 OPEC Spare Capacity and Stocks of agricultural commodities



Source: "The price of fear", the Economist, 3 March 2011



Note: stocks are at end of period. Totals for world consumption reflect total utilization, including food, seed, industrial and waste. Rice refers to milled rice.
Source: USDA, Australian Treasury

Inventory levels of commodities vary considerably across countries. Some of the large exporters keep very low levels of stocks in relation to the volume of their exports, while others export relatively minor amounts in comparison with total projected year-end stocks. The resulting differences in the availability of such stocks affect their ability to act as a buffer in case of a shock.

2.3.3 Determinants of longer-term supply

Meeting growing commodity demand in the longer run faces a number of challenges. One such challenge is enhancing productivity and efficiency, which is fundamental for increasing supply in the long run for both exhaustible and renewable commodities.

There are some ongoing efforts to increase oil production, although the increase is relatively modest due to oil field maturations. For example, the total number of rigs in the United States has increased more than double since 2000 and has contributed to production increase in the region. Non-OPEC oil supply growth has also exceeded many analysts' expectations. As such, higher prices have had a certain impact in increasing oil production, but concerns for the longer term ability to expand the supply base persist.

Under such circumstances, unconventional oil [23] may become more important. Unconventional oil is expensive to exploit, requiring significant upfront capital investments along with an expectation of high long-term market prices. In addition, long lead times may be necessary in expanding capacities by developing new fields. Environmental assessments, locational challenges (physical and geopolitical) and land claim issues may also add to the lead time. Nonetheless, unconventional oil is expected to play more important roles and its resources could actually be several times larger than conventional oil resources.

Natural gas is expected to play an increasingly important role in meeting global energy needs during the coming decades. Given its significant supply capacity, natural gas may substitute for crude oil and other fossil energy sources (see Box 1).

Underinvestment in the agricultural sectors has prevented the growth in food production to keep up with the growth in demand. The last three decades have seen a continuous decline in multilateral and public investment in agricultural sectors of developing economies, which might have contributed to the low production capacity. This has exacerbated the impact of

[23] This category includes tar sands, deep-water fields, extra heavy oil, coal-to-liquids, gas-to-liquids, oil shale, etc.

the recent sharp food price increases on low income countries. Indeed, it is necessary to increase investment in agricultural sectors [24] to achieve increased and sustainable agricultural production growth. Rural infrastructures for cultivation, technological developments, extension services and research, all matter, especially in developing countries. Without continuous improvements in yields, more land would need to be cultivated to achieve the same increases in output.

The size of arable land[25] and the availability of water also constrain the expansion of food supply. With respect to water availability, the FAO forecasts that water scarcity will become acute in much of the developing world during the first three decades of this century, thereby limiting the future expansion of irrigated agriculture.

Waste has been identified as an important issue which affects the underlying supply-demand balance for food. Waste occurs due to inadequate infrastructure, poor storage facilities, under-developed markets, etc. Reducing waste is relevant in improving food security while reducing environmental and resource pressures.

Increased supply in response to the strong prices of the mid-2000s is yet to come for most commodities due to production lags.

(BOX 1) Significant supply growth in natural gas

For natural gas, supplies have grown significantly in recent years, from a combination of rising unconventional sources and strong investment in supply.

The rapid and largely unanticipated growth of supply was boosted by technological developments in the sector of unconventional gas, rendering now exploitable, especially in the US. Unconventional sources include shale gas, coal bed methane and tight gas (Graph 2.8). The IEA estimates that more than one-third of the increase in global gas production up to 2035 will come from such sources.[26]

US production stepped up in 2006, and boomed in 2008, despite the advent of the financial crisis. Shale and other unconventional reservoirs now meet half the US demand. From a major importer of LNG, North America now enjoys a surfeit of natural gas and does not need to purchase LNG anymore; it has enough gas under its soil to inspire dreams of self-sufficiency.

In addition to increased production, estimated reserves have also jumped in recent years, increasing by about 38 percent from 2000 through 2009. New shale prospects can be found all across North America. Some analysts have said that shale gas supplies in the US will last 100 years; many think that this estimate is conservative.[27] Thanks to this rich seam of unconventional gas resources, the US has overtaken Russia as the world's biggest gas producer. As a result, North American gas prices have slumped from more than USD 13 per million British thermal units in mid-2008 to less than USD 5 in 2010. Moreover, the IEA has said that China and India could have reserves far greater than the conventional type. China has set itself a target of producing 30 billion cubic metres (bcm) a year from shale, equivalent to almost half the country's demand in 2008.

[24] In order to increase productivity and put uncultivated arable land to productive use, wherever feasible.

[25] Arable land reserves vary widely across countries. Some countries have almost no potential to expand cultures, while others have much leeway, with ratios of cultivated to total suitable area as low as 20%. Africa alone has 550 million hectares of unused arable land.

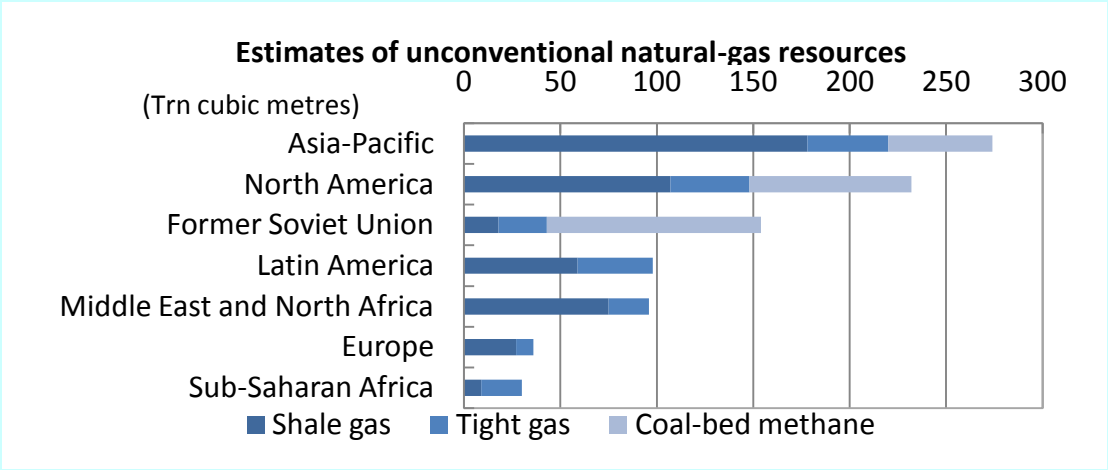
[26] See IEA (2010).

[27] Northeast Gas Association Issue Brief: Supply Outlook, January 2011 and IHS CERA, Fueling North America's Energy Future: The Unconventional Natural Gas Revolution and the Carbon Agenda, 2010.

As a result, the supply of natural gas has significantly increased, and prices have declined substantially. The IEA estimates that the current glut totaled 130 bcm in 2009 and will climb to 200 bcm in 2011. It expects the glut to last for as long as 10 years[28].

Just as unconventional gas started its ascendancy, the surge in LNG capacity has further exacerbated the global gas glut. New projects coming on-stream in 2010 added another 80million tons per year (tpy) to global supply, 50 percent more than in 2008. Qatar, the global leader in LNG export, alone produced 77million tpy at end 2010. New suppliers are also emerging: Southeast Asia, especially Indonesia and Malaysia. They were ranked among the top 20 natural gas producers in 2009. Singapore and Thailand are constructing conventional land-based LNG terminals while Indonesia and Malaysia are converting existing LNG carriers to floating storage units. Australia, which will double its LNG capacity by 2015 to become a major exporter, with AUD 200billion of proposed export projects in the pipeline.

Graph 2.8 Estimates of unconventional natural gas resources



Source: "Natural Gas: An unconventional glut", The Economist, 11 Mar 2010

2.4. Policy Drivers

Public policy has always taken a particular interest in commodity markets. A long history of government intervention underlines the key economic role that public policy assigns to these markets. Government protective and preferential measures for domestic agricultural, energy, and mining industries, such as trade barriers and tariffs as well as subsidies, have been taken in both developed and developing countries in some way and another. On the one hand, there are some who have views that these measures can help to secure domestic food and energy security. On the other hand, there are also some who have views that government intervention can distort price signals and resource allocations both domestically and internationally.

Since the mid-2000s, a large number of governments have adopted measures to alleviate the socio-economic impact of rising world market prices for oil and food commodities in particular. Some major producers of agricultural commodities restricted exports while importers reduced restrictions to counter rising domestic food prices in 2007/2008 and

[28] See IEA (2010).

2010/2011. A range of commodity importing countries, at the same time, have taken resort to measures to limit the pass-through of rising world market prices to the domestic economy. Specifically, governments have (re-)introduced or extended price subsidies and price controls, for petroleum and related products, but also for agricultural commodities.

2.4.1 Trade policies for agricultural commodities

In the wake of growing price pressures in staple grain markets in 2007/2008, a significant number of countries engaged in ad-hoc policy responses such as export restrictions, temporary reductions in import restrictions and sales of stocks at subsidized prices. As regards corn, 5 countries representing 31.2% of global exports have introduced export bans or restrictions in response to the 2007/2008 food price spike. Similarly, 7 countries responsible for 50.3% of global rice exports and 6 countries for 20.7% of global wheat exports have implemented such measures. Several countries released stock nationally at a subsidized price: 3 for corn, 6 for rice and 3 for wheat, that are respectively exporting 14.2%, 76.7% and 3.8% of global amounts[29] (Table 2.1). In 2007/2008, 25 countries restricted or banned exports[30] and 43 countries reduced import duties on staple food products. For example, the EU suspended import tariffs on grain in 2007/2008. Most Asian countries aimed at stabilizing the domestic price of rice by using buffer stocks and imposing trade restrictions. Reactions to rising prices also included attempts by some governments to increase their stocks. Such measures have affected grain markets.

Table 2.1 Exports as percent of global total and percent of national stock

Largest dozen Corn exporters 1998/99 – 2007/08				Largest dozen rice exporters 1998/99 – 2007/08				Largest dozen wheat exporters 1998/99 – 2007/08			
	A	B	C		A	B	C		A	B	C
US	63	63	130	Thailand	29	29	390	US	26	26	160
Argentina	15	77	2,100	Vietnam	15	44	410	Canada	15	41	220
China	8.6	86	10	India	15	59	32	EU	14	54	86
Brazil	5.2	91	150	US	11	70	330	Australia	13	67	340
Sth. Africa	1.4	93	84	Pakistan	8.8	79	700	Argentina	9.2	76	1,200
Ukraine	1.4	94	120	China	6.2	85	3	Russia	6	82	220
India	1	95	310	Egypt	2.7	88	150	Kazakhstan	4.6	87	370
Paraguay	1	96	93	Uruguay	2.5	91	1,600	Ukraine	3.1	90	250
EU	0.87	97	17	Argentina	1.4	92	260	India	1.7	92	15
Canada	0.51	97	36	Burma	1.2	93	33	Turkey	1.7	93	120
Thailand	0.39	98	130	Australia	1.1	94	170	China	1.5	95	3
Serb Mtn	0.32	98	67	EU	0.89	95	28	Pakistan	0.57	95	28

§ A = Exports as a % of global exports
§ B = Cumulative % of global exports
§ C = Exports as % of stock

Source: Wiggins and Keats (2010)

In 2010/2011, fewer countries have resorted to export restrictions. Higher production in developing countries has helped avoid so far a price spike in the very thin[31] global market for rice and local staples markets in much of Africa, a major difference from 2007/2008.

[29] See Wiggins and Keats (2010).

[30] See Demeke et al. (2009).

[31] Thin market refers to the small number of sellers and volumes traded.

Trade policies for agricultural commodities aim at securing relatively low domestic food prices to the population. However, by the same token, such policies weaken international trade as a stabilizing mechanism[32]. The resulting reduction in global supply adversely affects other countries. In essence, imposing trade restrictions amounts to a supply shock and can be a source and amplifier of price volatility. This is the case especially when restrictions are introduced by economies that have a large share in world commodity trade, in an ad-hoc manner and open-ended.

Trade policies also have important second round effects. First, they undermine confidence in the ability of international markets to ensure safe food supply. Second, they distort prices in domestic and global markets and reduce the responsiveness of domestic producers to price signals in the global markets. The consequence may be a significant misallocation of resources and suboptimal supply in the longer run.

Reductions in import tariffs promote trade and, if permanent, deepen international markets. However, while strengthening international markets in the longer-term, large and abrupt reductions in import tariffs may add to demand and price pressures in global markets in the short run, especially if a number of importing countries pursue the same policy.

The policy responses to the recent world food price increases seem to have exacerbated price tensions in the global market. While the impact of these measures on world market prices is difficult to assess with precision, most analysts agree that trade policies have added upward pressure on international prices in 2007/2008 and were the principal cause in the case of rice.[33] Some research findings estimate that export bans and tactical reductions in import duties[34] accounted for an estimated 45 percent of the world price increase for rice and 29 percent of the increase for wheat[35] in 2008. An aggressive build-up of grain stocks in the face of high and escalating prices in 2008 by some governments seems to have compounded these effects[36].

2.4.2 Subsidies

A range of countries have subsidized consumption of commodity products to cushion the impact of rising world market prices on vulnerable populations. For example, fossil fuel subsidies have increased in many low and middle income countries in particular, keeping domestic oil prices significantly lower than those in international markets.[37]

Certain types of government subsidy may spur investment in commodity production and distribution, especially if they facilitate planning for producers over longer time horizons or improve producers' access to capital and technology. This kind of policy measures[38] has had positive effects on productivity in developing countries with high productivity reserves. Such reserves may come from technological innovation, such as the "green revolution" (improved

[32] While export bans imposed by larger exporting countries with a readily available surplus have a greater impact, all export bans have a market impact as it leads to a perception of larger-than-actual shortages and could result in beggar-thy-neighbor actions.

[33] See von Braun (2008), Mitra et al, (2009), Headey (2011) and Slayton (2009).

[34] Reducing import tariffs as part of a program of overall liberalization should be pursued under the Doha Round of WTO negotiations, which would help limit the negative externalities of selective temporary reductions in tariffs for the rest of the world.

[35] See Martin et al. (2010).

[36] See Dawe (2010).

[37] Such subsidies can lower the price elasticity of demand. Yet, symmetrically, sales taxes can also affect demand elasticity.

[38] See World Bank (2008).

seeds, high yield varieties), better access to capital, or the provision of public infrastructure, irrigation facilities.

However, subsidies can distort world markets. They may discourage investment elsewhere while, if poorly designed, also fail to increase domestic supply. Similar to trade policies, they can be harmful in particular if adopted in an ad-hoc manner. In addition, subsidies can lead to the negative second round effects mentioned above. Phasing-out such subsidies can be expected to have positive effects in the long run, and should, in particular, help reduce economic distortions. Measures directly targeting poverty reduction may achieve the objective of supporting low incomes more effectively.

The Uruguay Round Agreement on Agriculture has started a process of agricultural support reductions. The majority of countries embarked on policies that reduce agricultural support and progressively decouple this support from the level of production[39]. Agricultural export subsidies and support schemes still account for large shares of income transfers in developed countries[40].

The size of subsidies and the effects of phasing-out are estimated in some cases by international organizations. For instance, fossil fuel subsidies for consumers amounted to USD 557 billion in 2008 and USD 312 billion in 2009 (IEA, 2010) and those for producers may well be in the vicinity of around USD 100 billion per year (GSI, 2009). According to IEA (2011), if all fossil fuel consumption subsidies were phased-out by 2020, global primary energy demand would be reduced by 5 percent and oil demand would be cut by 4.7 million barrels per day: phasing-out fossil fuel consumption subsidies could also lead to a 10% reduction in global greenhouse gas emissions by 2050 compared with business as usual[41]. OECD (2010a) suggests that unilateral fossil fuel consumption subsidy reforms would benefit most countries economically. Multilateral reforms can have different distributional impacts across countries depending on trade effects and on how saved expenditures are recycled.

2.4.3 Biofuel policies

Following the rise in crude oil prices since the mid-2000s, several economies have adopted policies to promote biofuel production and use. Generally, biofuels are seen as a means of diversifying energy supplies and reducing dependency on concentrated fossil fuel exporters (GBEP, 2010), thereby reducing exposure of biofuel producing economies to price increases and supply disruptions in crude oil markets. Biofuel policies have also been promoted for environmental reasons originating from climate change concerns[42].

Biofuel policies often take the form of mandatory quantitative targets; either blending obligations or numerical targets for production/consumption (see Box 2). Overall, the contribution of biofuels to energy supply is still modest. A large-scale substitution would require a huge amount of land. According to the United States Department of Agriculture (USDA)[43], the biggest uncertainty for the future of biofuels is the extent to which the land intensity of current biofuel production can be reduced[44].

[39] See Butault (2011)

[40] OECD, Agricultural Policies in OECD Countries: At a Glance, 2010, Table 1.1, p.14-15.

[41] See OECD (2010a).

[42] For instance, in the EU, biofuels development aims to achieve objectives such as climate change commitments, an environmentally friendly security of supply and to promote renewable energy sources.

[43] See Coyle (2007).

[44] The amount of biofuel that can be produced per hectare of land varies from 900 liters for EU rapeseed to 3750 liters for US corn and 6200 liters for Brazilian sugarcane.

There is a broad consensus that biofuel production has added the demand for specific agricultural crops. The existing literature, however, disagree on the price effect, especially the impact in 2007/2008 increase in agricultural commodity prices. In addition, it is not clear to what extent biofuel production has affected the link between the prices of energy and agricultural commodities. Recent increases in the demand for biofuels have been importantly driven by mandatory use. Markets linkages could become stronger as biofuel production becomes more profitable[45]. In principle, quantity-based inflexible mandates would tend to increase demand, irrespective of price levels.

The production of biofuels may have positive externalities on the agricultural industry. The co-products can be used as feedstuff.[46] In addition, producing biofuels can stimulate investment in agricultural infrastructure.

(BOX2) Main biofuel policies in major biofuel producing countries

For this commodity-dependent industry, government support to reduce profit uncertainty has been a common theme in the US, the EU and Brazil, where biofuel production has been most significant (USDA, 2007).

United States

Bioethanol production uses about one third of total U.S. corn production which means US biofuels policies are likely to have an impact on international corn prices.

US biofuel policy is set out in the US Energy Independence and Security Act (EISA). The US is the only important producer of corn-based ethanol and as such the corn-based ethanol consumption mandate acts as an effective US production mandate. Aside from these biofuel consumption mandates, US biofuel policy also includes tax reliefs and tariffs on imported ethanol. The Blenders' tax reliefs provide oil companies with an incentive to blend gasoline with ethanol. In addition, imported ethanol is subject to a 2.5 percent ad valorem tariff. US ethanol imports from non-Caribbean Basin countries are subject to a USD 0.143 per liter additional tariff. All ethanol blended with gasoline in the US qualifies for the Blenders' reliefs, no matter the country of origin of the fuel ethanol.

European Union:

In the EU, biodiesel produced from oilseeds is the major source of biofuels. The EU accounts for more than half the global biodiesel production. Policy in the EU is mainly driven by concerns over climate change and the environmental impacts of fossil fuel use.

The Renewable Energy Directive (2009/28/EC) sets national indicative targets for the proportion of renewable transport fuels and obliges a 10 percent share of renewable energy in transport fuel by 2020. Tax reliefs are by far the largest share of financial support used by Member States. The EU also imposes import tariffs on biofuels. The EU import tariff on bioethanol is EUR 0.102 per liter for denatured ethanol and EUR 0.192 per liter on un-denatured ethanol. The EU import tariff on biodiesel is an ad valorem tariff of 6.5 percent.

Brazil

Brazilian ethanol is produced from sugarcane. Brazil is the second largest producer and leading exporter of ethanol. Brazilian biofuel policy mandates that all gasoline must contain

[45] For further discussion, see FAO, OECD et al (2011).

[46] For instance, for every ton of corn entering an ethanol plant, one-third of a ton of Distillers Drain Grains is produced which, if not a straightforward replacement for feed grains, is a high protein feed, and as such can replace to some degree oil meal consumption. In the case of ethanol from sugar cane, by-products can be used to generate energy or as fertilizers.

between 20 and 25 percent of anhydrous ethanol[47]. In addition, Brazilians can also use pure hydrated ethanol (E100) instead of the gasoline blend. The introduction of Flex Fuel Vehicles (FFV), which represents around 40% of the country light vehicles fleet, plays an important role in the country's biofuel usage. In fact, Brazilian ethanol consumption is much larger than the government mandated amount, corresponding to more than 50% of the total fuel consumed by the light vehicle fleet[48]. Furthermore, in December 2004, Brazil introduced a biodiesel production and consumption program that established blending mandates for biodiesel in fossil diesel and has raised the level of the mandatory blending (currently at 5%). Ethanol imports are not subject to any tariff. There is a tax relief for ethanol for final consumers.

Chapter 3: Financial factors

The rises in commodity prices during the past few years have occurred against the backdrop of growing participation of financial investors in commodity markets and highly accommodative monetary conditions worldwide. This chapter discusses the possible impact of these factors on commodity markets.

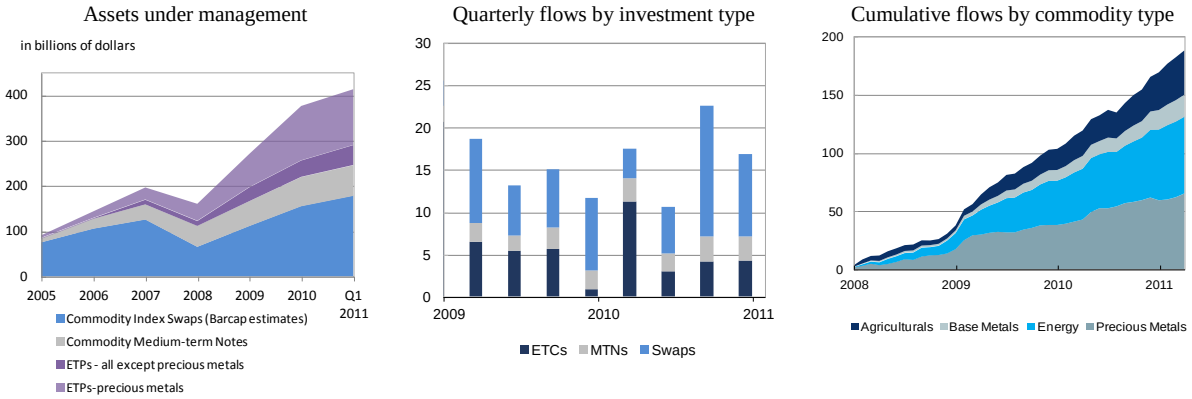
3.1 The role of financial markets

Investments in commodity-related financial products have risen markedly since the mid-2000s. The estimated market value of commodity-related assets under management has grown significantly since 2005 and has reached more than 410 billion USD in the first quarter of 2011 (Graph 3.1). This compares with nearly 270 billion USD when commodity prices peaked in mid-2008. Inflows into commodity-related investments have been strong since 2009, averaging about 15 billion USD per quarter. Cumulative inflows into instruments related to energy and agricultural commodities have been sizeable, consistent with the view that investors are treating commodities other than precious metals[49] more and more as an individual asset class.

Graph 3.1

Total commodity assets under management and inflows by instruments and commodities [1]

In billions of dollars



[1]The numbers in the left panel take into account valuation effects, thereby factoring in commodity prices fluctuations.

Source: Barclays Capital

[47] A provisory measure by the Brazilian government has recently allowed for the anhydrous ethanol blend to vary between 18 and 25%.

[48] This technology advance represents 42% of the light fleet and the majority of new cars.

[49] Instruments relating to precious metals account for about one third of the cumulative inflows since 2008 (markets for precious metals, where financial investment has traditionally played an important role, are not subject of this report).

As financial activity in commodity markets grows, the question arises whether and how the activities of financial investors affect market functioning and outcomes.

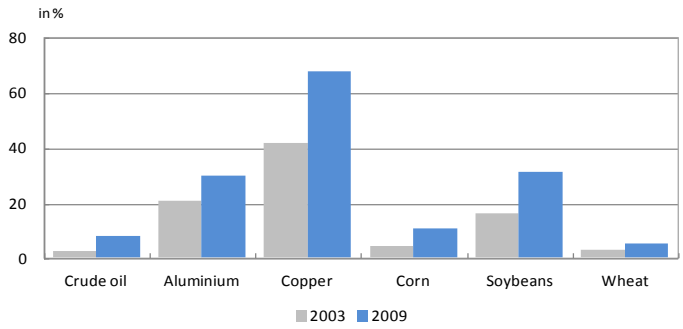
3.1.1 The changing nature of instruments and market participants

Financial contracts on commodities have existed at least since the 18th century.[50] As discussed in the Overview, commodity price volatility, and the associated uncertainty about price movements, has always been an issue. Producers and consumers therefore started writing contracts on the future delivery of commodities to hedge against the risk of price fluctuations. Subsequently, profit opportunities attracted specialised commodity investors, which provided some liquidity to such derivatives instruments.

As a consequence, derivatives markets for many commodities had already developed before the rapid expansion of commodity-related financial products since the mid-2000s, with significant variation across commodities. For instance, relative to annual production, the volume of commodities traded on major commodity derivatives exchanges was already high especially for base metals in 2003 (Graph 3.2).[51] This rough indicator of the relative size of overall financial activity remains relatively low for food commodities and crude oil, in the former case probably reflecting the large variety in food qualities which makes standardisation of contracts difficult, and in the latter case reflecting the important role of OTC contracts tailored to the needs of producers and consumers of specific grades of oil (Bank of England (2006)).[52]

Graph 3.2

Indicators of financial activity relative to world production for selected commodities[1]



[1] Financial activity divided by world production for the respective commodities. Financial activity is defined as the volume of exchange-traded contracts multiplied by contract size for the particular commodity.

Sources: Bloomberg, Commodity Research Bureau, *The CRB Commodity Yearbook*, Energy Information Agency

The diversification of instruments and players in commodity markets has increased since mid-2000s.[53] One particularly rapidly growing area has been commodity-linked portfolio instruments. Typical products include commodity index-linked mutual funds, total return index swaps and commodity-linked medium-term notes. Reflecting this, inflows in the form

[50] Standardised trading of commodity futures contracts originated in 18th century in the rice market in Japan (See Kolb et al (2007)).

[51] A shift from OTC derivatives to organized markets since 2008 may have contributed to the increase since 2003.

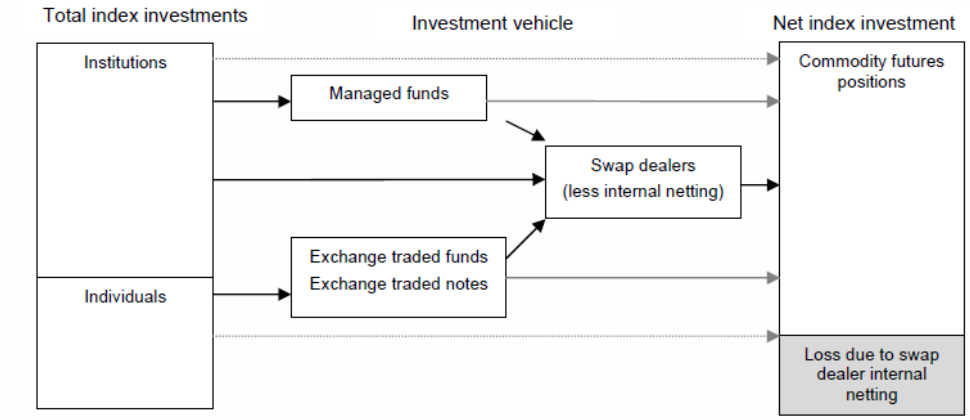
[52] Such tailor-made contracts facilitate risk management, for instance by reducing basis risk compared to standardized contracts. The commodity OTC markets are estimated to be around 3 trillion USD at present.

[53] The US Commodity Futures Trading Commission (CFTC) publishes positioning data for managed money investors and swap dealers on a weekly basis. By end-March 2011, for instance, the net long positions of money managers accounted for 15% of total open interest and those of swap dealers for 12%, with a large variation across markets.

of commodity index swaps have been particularly strong (Graph 3.1). The past two years have also seen a rapid expansion of exchange-traded funds and notes (ETFs and ETNs)[54].

Graph 3.3

Flow of index investments into commodity futures markets



Source: Based on Irwin and Sanders (2011) and Stoll and Whaley (2010).

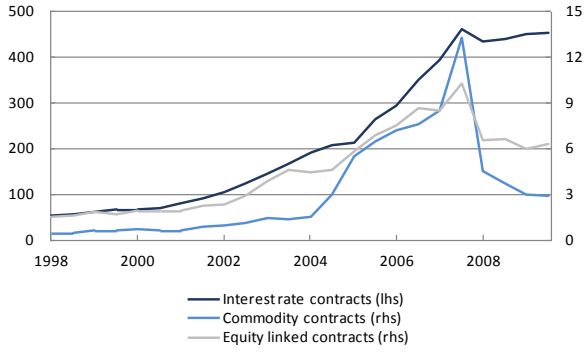
Dashed lines represent less used avenues for commodity index investment. Darker lines suggest heavier avenues for investment. Positions that are "lost" due to internal swap dealer netting are often limited in agricultural futures markets, where very little non-index trading occurs over the counter. Conversely, these amounts can be quite large in energy and metals.

Index-linked investments typically flow into commodity futures markets through different investment vehicles (Graph 3.3). For instance, institutional investors such as insurance firms or pension funds channel a commodity index investment via managed funds, over-the-counter (OTC) swap agreements or commodity-linked notes. Individuals, on the other hand, mainly invest in exchange-traded products.

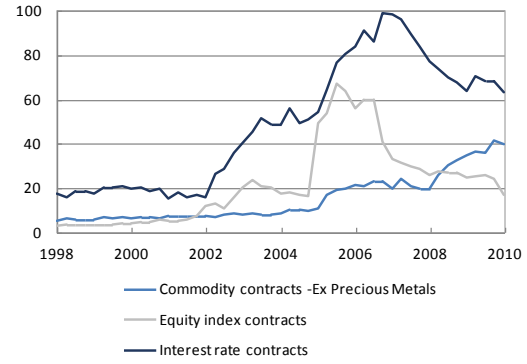
Graph 3.4

Indicators of the volume of OTC and exchange traded derivatives linked to commodities[1]

OTC derivatives[2]



Exchange traded derivatives[3]



[1] Commodities excluding precious metals. [2] Notional amounts outstanding, in trillions of US dollars. These are deflated by GSCI commodity, MSCI (All Country World) and Merrill Lynch Global one to three year Government bond indices respectively. Indices used to deflate OTC derivates rebased to 1998 = 100. [3] Number of contracts outstanding, in millions.

Source: BIS IBFS

Partly reflecting index-linked flows, the number of outstanding commodity futures contracts has doubled since the beginning of 2008. It is now larger than that of equity-index futures

[54] ETFs are essentially mutual fund shares that trade on a stock exchange in the same manner as stocks on individual companies, and are designed such that the share price tracks a designated commodity index. ETNs are debt securities where the issuer promises to make payouts based on the value of the underlying commodity index.

(Right-hand panel of Graph 3.4). At the same time, while still large, the volume of OTC derivatives contracts on commodities remains well below the 2008 peak (Left-hand panel of Graph 3.4). These changes in volume indicators appear consistent with a broader trend towards derivatives trading through organised markets. It is important to note that the comparability of statistics is limited: first, OTC statistics do not take account of netting, and secondly, coverage of the statistics may be incomplete.

In the past few years, the universe of commodity market participants has grown well beyond specialised commodity investors, such as commodity trading advisors (CTAs) and commodity hedge funds. Index investors, including index and other dedicated commodity funds, have been important new entrants into the market. According to index investment data by CFTC, net investment position by index investors in the United States amounted to 256 billion USD as of April 2011. More recently, ETF sponsors have become more important players. Hedge fund participation also has broadened, including for instance macro funds as well as arbitrage funds. Finally, proprietary trading desks of commercial banks broker-dealers and trading units of large non financial corporate also actively trade in commodity derivatives.

Along with a wider range of participants, investment and trading strategies have become more diverse. In particular, the nature of index investment seems to have evolved over time beyond taking long positions only in commodity futures included in major indices (see Box 3). ETF sponsors may take long positions in commodity futures, but also use total return swaps and other techniques to replicate portfolio returns. Hedge funds typically take both long and short positions for arbitrage purposes or based on macro-economic views. CTAs trade in futures markets and often employ technically-based trading strategies (such as trend following strategies). More recently some CTAs have become increasingly involved in algorithmic high frequency trading (HFT).

The rationale behind investing in commodities is as diverse as the investor base. Against the backdrop of a historically positive correlation between commodity returns and inflation, investors perceived storable commodities as an effective inflation hedge. Moreover, institutional investors with a long-term investment horizon may have been attracted by diversification benefits for portfolio rebalancing. In addition, some investors may view commodity investment as a way to gain exposure to rapidly growing EMEs. A limited range of investable assets in many EMEs may encourage the use of commodities as proxy for such investments. Finally, investors may have been attracted by arbitrage opportunities arising from new trading strategies and markets.

BOX 3 Market participants and strategies in commodity futures markets: Highlights from discussions with market participants

To supplement the Study Group's analysis, some members conducted interviews with commodity market participants in London and New York. These interviews provided anecdotal evidence of ongoing evolution and differentiation of investor participation and strategies in commodity markets. This box highlights some of the observations made during the interviews. See Annex 1.

Market participants describe passive long-only index investors as the most important new entrants to commodity markets in recent years. Index investors directly or indirectly (e.g., through an index swap with a dealer) take long positions in a range of commodity futures, often based on indices. However, the nature of index investments has evolved over time in response to shifts in the shape of futures curves and a crowding of investor activity in the front end of the curves.

While a significant fraction of investment is still tied to published indices, which are typically based on rolling positions in near-term futures, index managers are increasingly

adopting "enhanced" strategies that involve a broadening of the range of invested futures beyond those included in major indices and an extension of investments along the futures curves.

Growing retail and institutional investor interest in commodities has also supported growth in investment in exchange trade funds (ETFs). ETFs account for a significant share of activity in precious metals, particularly gold and silver, and are an important channel for retail and some hedge fund flows into these commodities. To date, ETFs have not had a significant impact on energy, industrial metals or agricultural commodities.

Non-commodity hedge funds were said to have also increased their activities in commodities, typically as a way to express directional macro views or hedge exposures in other assets.

Interviewees suggested that a number of commercial and investment banks have also been significantly scaling up their commodity sales and trading operations. Some of these firms have built a presence in physical markets, including energy, oil and oil products, which they view as enabling them to provide more efficient and effective intermediation between client needs in the physical and financial markets.

3.1.2 Impact on the functioning of commodity markets

The impact of the growing presence of financial investors on the functioning of commodity markets is a subject of ongoing debate. The discussion centers around two related questions. First, does increased financial investment alter demand for and supply of commodity futures in a way that moves prices away from fundamentals and/or increase their volatility? And second, does financial investment in commodity futures affect spot prices?

(Impact on commodity futures markets)

Greater participation by financial investors in commodity futures markets can bring important economic benefits by improving market functioning. More specifically, markets become deeper to the extent that financial investors take offsetting positions to other market participants or engage in market making. Enhanced market liquidity can also help to accommodate the hedging needs of producers and reduce their hedging costs.[55] Moreover, growing financial activity can promote the development of markets for longer-term futures, facilitating risk management and planning of commodity producers and consumers over longer time horizons.[56]

Growing participation of financial investors suggests that commodity prices may become more sensitive to their decisions and position-taking. In principle, financial investors can be expected to improve the price formation process in commodity markets to the extent they devote resources to the analysis of new information affecting physical supply-demand balances over different time horizons.

The literature suggests two related mechanisms that can cause commodity prices to deviate from values consistent with "fundamentals" (i.e., actual and expected physical supply-demand conditions). One is (temporary) market imbalances caused by financial in- or outflows that are very large relative to the market. This may be the case too, if increases in liquidity or balance sheet constraints facing financial investors, or if swings in risk appetite of them can trigger changes in their positions.[57] Another is that investors just follow price

[55] See Till (2009).

[56] See Büyükşahin et al. (2008) and Brunetti et al. (2010).

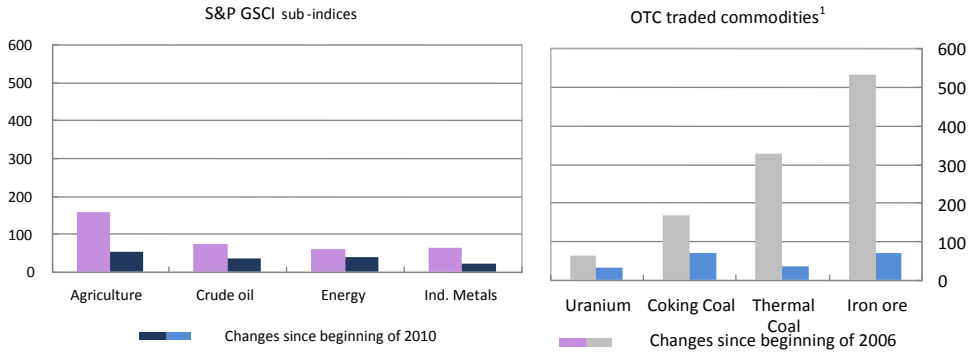
[57] Price pressures created by a large investment fund's transaction can remain and be amplified if it has the second round effect of affecting final investors' behaviours (See Vayanos and Woolley (2010)). Limits of arbitrage originating from liquidity or balance sheet constraints facing arbitrageurs can prevent their efficient arbitrages (See Gromb and Vayanos (2010)).

movements ("herding behaviour").[58] Herding may occur, for instance, if market participants just extrapolate a series of recent price increases reflecting better "fundamentals".[59] Such amplification mechanisms are common phenomena in financial markets, and its persistence depends on how quickly offsetting forces come into play. In general, price movements away from fundamentals should be less likely, the more diverse the investor base and the longer the time horizon of investors.

Graph 3.5

Price increase for selected GSCI sub-indices and OTC traded commodities

In per cent



[1] For uranium, U308 USD/LB; Hamburg Institute of International Economics coal index; Metal Bulletin Iron Ore Index.

Sources: DataStream, Hamburg Institute of International Economics, Metal Bulletin, S&P GSCI, Ux Consulting Company, IMF, BBG, Energy Publishing

Identifying to what extent growing presence of financial investors has actually moved commodity prices away from "fundamentals" is challenging. The large changes in physical supply and demand conditions (discussed in Chapter 2) provide plausible explanations for commodity price swings observed during the past couple of years. Moreover, the prices of commodities that are only traded OTC and not included in the standard commodity indices -- such as coal and iron ore -- have risen as much as major commodity index components (Graph 3.5). This may suggest that changes in physical demand and supply, rather than growing financial investments, have been the main drivers of commodity prices. Correlation patterns provide another example of how difficult it is to identify the drivers of commodity price movements. The correlation of commodity futures returns with those of other assets has risen since 2009 (Graph 3.6). Some view this as evidence of increased financial investments due to improvement in investors' risk appetite, others as a reflection of the post-crisis recovery that boosted return expectations for all real assets.

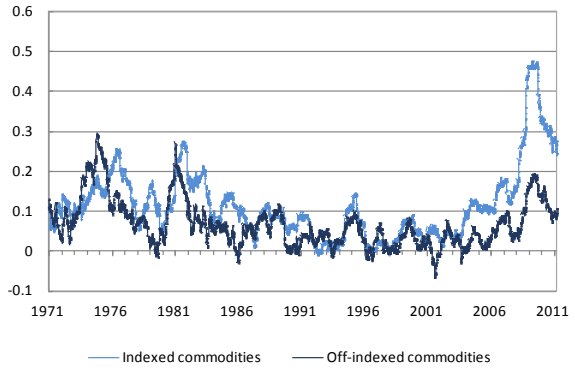
[58] For a more detailed discussion of herding behaviour in commodity markets, see UNCTAD (2011). For empirical studies about herding behaviour in commodity market, see Boyd et al. (2010).

[59] Price movements can assume the Keynesian aspect of "beauty contests" when different investors have different information and expectations made by investors regarding other investors' expectations are of importance (See Allen et al. (2006), and Bacchetta and Wincoop (2008)).

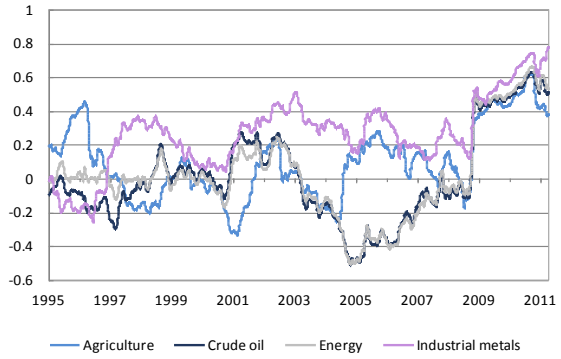
Graph 3.6

Commodity price correlation[1]

Average correlations of indexed and off-indexed commodities[2]



Rolling two-year correlation on one-month returns[3]



[1] Correlations calculated from percentage changes of S&P GSCI total return commodity indices and S&P500 total return index over specified sample periods. [2] One-year rolling correlations of daily returns on indexed and off-indexed commodities. [3] Rolling 22 business day percent changes.

Sources: Standard & Poor's, DataStream, Bank of Japan, BIS calculations

The results of empirical studies are inconclusive regarding the impact of financial investors on the level, volatility and correlation of commodity prices (see Box 4). There is limited evidence that financial investments have had a persistent impact. However, a growing body of research supports the view that financial investors have affected price dynamics over short time horizons. Some episodes of large and sudden commodity price movements are consistent with the view that amplification mechanisms familiar from other financial markets -- such as liquidity constraints resulting from margin calls[60] -- can also affect commodities futures markets.

(The futures-spot market relationship)

A final issue is to what extent the growing participation of financial investors in commodity futures markets affects spot markets. Futures and spot markets are linked through various mechanisms. First, spot market participants may respond to price signals from futures markets -- by adjusting inventories, but also production and/or consumption, depending on their interpretation of the observed price movement[61]. Second, trade practices and contractual arrangements strengthen the link in some cases; for example, in spot trades of oil, prices of listed futures such as WTI are widely used as benchmark or as basis in contractual arrangements. Third, there is arbitrage between spot and futures markets, and a growing presence of financial intermediaries in some physical markets may strengthen this linkage.[62] In principle, the combination of these three mechanisms can be expected to work into the direction of spot and futures prices reflecting the same information.

[60] Experiences during the financial crisis underline that large margin calls (reflecting unexpected asset price movements or tightening of risk management standards) can exacerbate asset price movements in a procyclical manner (see, e.g. Tarullo (2009), CGFS (2009); and for a theoretical discussion of the relevant mechanisms Brunnermeier and Pedersen (2008)).

[61] There are also cases that futures market participants respond to price signals from spot markets.

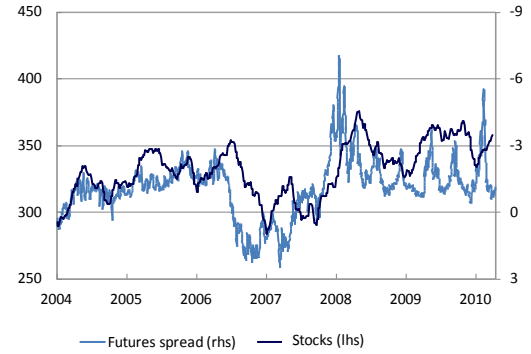
[62] Physical constraints in storing commodities and pecuniary costs of holding inventories could impose limits on inventory accumulation.

Graph 3.7

Crude oil prices and inventory levels

Spot and futures prices[1]

Inventory level[2] versus slope of futures curve[3]



[1] 2005 = 100; fourth and 25th generic futures and S&P GSCI crude oil spot price index. [2] Weekly ending US crude oil stock excluding SPR, in millions of barrels. [3] Fourth month futures contract minus second month futures contract.

Sources: Bloomberg, US Energy Information Administration

These considerations are consistent with the typical behaviour of futures and spot commodity prices and inventory levels. Deviations of near-term futures prices from spot prices are relatively small. As can be seen from the right-hand panel, there has been a tendency for US oil inventories to increase when longer-term futures prices are higher than those of shorter futures contracts,[63] although this relationship seems to have become less stable during the last couple of years.[64]

Taken together, these patterns support the view that (i) effects that the behavior of financial investors may have on (near-term) futures markets are also transmitted to spot prices; and (ii) that large and persistent deviations of futures prices above "fundamentals" can be expected to lead to rising inventories.

Box 4 Debate* over the financialization of commodities markets and its impact on the price formation of commodities

The growing presence of commodity investments by financial investors has encouraged empirical research on its impacts on commodity prices. There is insufficient evidence to admit general and persistent impacts of financialization on commodity prices, and improving data will contribute to more conclusive research.

For example, Masters (2008) argues that mounting investment flows by index-funds caused the surge in commodity prices during the commodity booming period between 2006 and 2008. Similar arguments are made by Mayer (2009, 2011), who shows that trading positions of index investors affected commodity price fluctuation, in particular in the agricultural area. Recently, Singleton (2011) presents empirical analyses which show a statistically significant effect of financial investors' trading positions on futures price, even after controlling the effects of various other explanatory variables. In connection with the issues of increasing index-linked investments, Tang and Xiong (2010) show that the correlations between the commodities belonging to the major commodity indices for financial investors are significantly larger than those of the other commodities not in the indices. The correlation in

[63] See Fama and French (1987) and Gorton et al (2007).

[64] It should also be kept in mind that inventory data suffer from the following shortcomings: (i) the absence of a common database, (ii) currently, data are available only for inventories held at delivery points, while there are no data for inventories that are held off exchange but could be made available economically at the delivery point at short notice, (iii) information about inventories is often published with a time lag and subsequently revised.

return between commodity and stock markets has been a topic of discussion as well. Büyükşahin and Robe (2011) show with the CFTC proprietary micro-data that the correlation between commodity and stock indices increases with the weight of hedge funds active in both of the markets, while secondary in effect to that of macroeconomic and market-specific fundamentals. In addition, Kawamoto et al. (2011) provide quantitative evidence with macro-data analyses that cross-market linkage between commodity and stock markets has been equally caused by the growing presence of financial investors, as well as by the large fluctuations in the global economy during the financial crisis.

There is a long list of counter arguments against these views as well. For instance, Irwin and Sanders (2010) find no statistically significant relationship between index-fund positions and agricultural commodity prices, with Granger causality tests over the observation period between 2006 and 2009. The empirical analysis made by Hamilton (2009) indicates that speculative forces alone cannot be a determinant for the surge in oil prices during the mid-2008, pointing out the importance of fundamentals, including a low price elasticity of demand and the supply constraint. The analysis made by Kilian and Hicks (2009) indicate that large upward revisions of expectations of growth in emerging economies mainly explains the surge in oil prices during the mid-2003 to mid-2008 period. In relation to the issue of co-movement between the commodities in the major futures indices and those not included in the indices, Korniotis (2009) shows that the correlation of prices changes between the commodities with futures and those without futures markets are stably high in the metal area, denying the impact of speculative financial investments in futures markets on commodity price formation.

As suggested by the literature, the lack of long time-series of granular data for financial investors' position poses a major challenge to the making of credible empirical analyses. In this respect, the CFTC has started to provide Index Investment Data, a monthly data concerning index investment in the U.S. futures markets, which date back to December 2007. The accumulation of credible data of this kind will enrich and augment discussions.

** Major arguments put forward: the above is not necessarily an exhaustive list of studies.*

3.2 Global monetary expansion

3.2.1 Monetary policies during the recent run-up in commodity prices

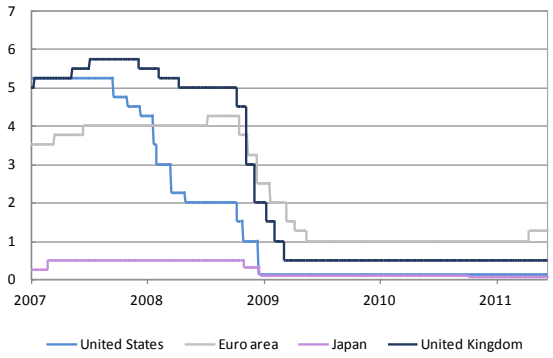
The rise in commodity prices since 2009 has occurred against the backdrop of highly accommodative global monetary conditions. Central banks worldwide progressively eased monetary policy in the last quarter of 2008 and afterwards to counter deflationary pressures and financial system instability. Central banks did so by lowering policy interest rates and using a range of unconventional policy measures. By early 2009, nominal policy interest rates were at, or close to, zero in major advanced economies and had reached relatively low levels in many EMEs (Graph 3.8).

Graph 3.8

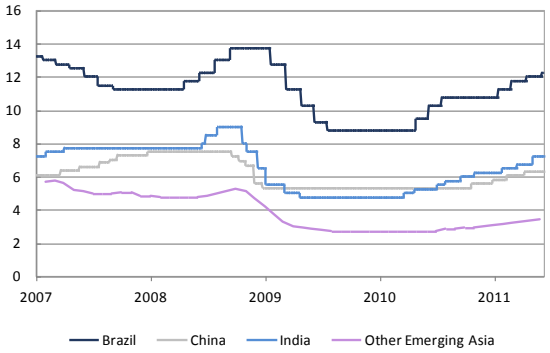
Policy interest rates[1]

In per cent

Major advanced economies



Emerging market economies



[1] For the United States, target federal funds rate; as of mid-December 2008, midpoint of the target rate corridor (0–0.25%); for the euro area, minimum bid rate up to October 2008 and fixed rate of the main refinancing tenders thereafter; for Japan, target for the uncollateralized overnight call rate; as of October 2009, midpoint of the target range (0–0.1%); for the United Kingdom, Bank rate; for Brazil, target SELIC overnight rate; for China, benchmark one-year loan rate; for India, repo rate; for other emerging Asia, weighted average of Chinese Taipei, Hong Kong SAR, Indonesia, Korea, Malaysia, the Philippines and Thailand based on 2005 GDP and PPP exchange rates.

Sources: Bloomberg, national data

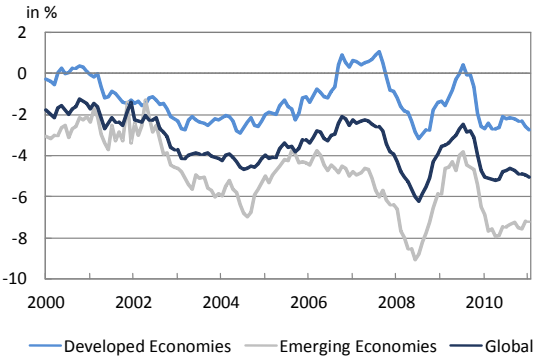
Policy interest rates in many advanced economies are still low and many unconventional measures remain in place. Monetary authorities in EMEs have started to tighten monetary policy in the face of increasing inflationary pressures. Elevated headline inflation in EMEs reflects the impact of high commodity prices on the food and energy components of consumer price indices (see Table 4.1 in the next Chapter). At the same time, many EMEs have taken a cautious approach with regard to the pace of tightening against a backdrop of strong capital inflows and concerns about domestic economic growth.

Global monetary conditions differ from those prevailing during the commodity price boom in 2007-08. Central banks in some advanced economies had begun to reduce interest rates in the second half of 2007 and in early 2008. The second phase of monetary easing since late-2008, however, has been much deeper and broad-based for both advanced and EMEs. Global monetary conditions remain highly accommodative, irrespective of whether measured as global interest rate gap or global growth of the money stock M1 (Graph 3.9). The question is whether global monetary conditions have had a stronger impact on rising commodity prices since 2009 than during the previous boom. The effect of the monetary policy stance on commodity prices may depend on how the monetary stance is transmitted via the financial system, which can vary over time reflecting a variety of factors (bank capitalization, asset valuations, attitudes toward risk, market and funding liquidity).

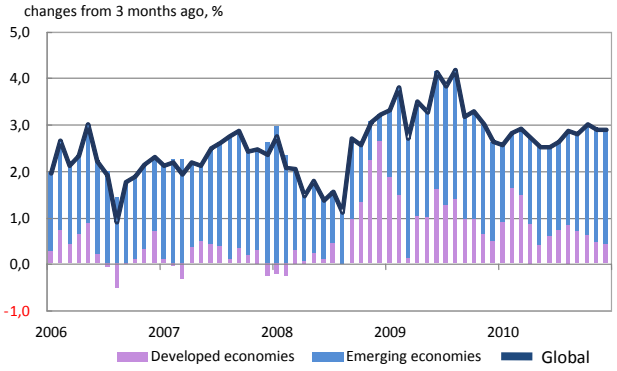
Graph 3.9

Indicators of global monetary conditions

Global Interest Rate Gaps



Global M1



Note: Interest rate gaps are estimated with relevant data published by the International Financial Statistics and the World Economic Outlook of the International Monetary Fund.

3.2.2 The relationship between commodity prices and accommodative monetary conditions

Monetary policy can affect commodity prices through multiple channels. The traditional interest rate channel of monetary policy works through aggregate demand and inflation. Lower real interest rates stimulate demand for all goods including commodities and lower opportunity costs of holding inventories disincentivise producers to extract exhaustible resources, which may affect supply and demand balances in commodity markets.[65]

Monetary policy can also affect commodity prices by changing the expectations of commodity market participants about future growth and inflation. This "expectation channel" works through both changes in monetary policy and central bank communication about the macroeconomic outlook and possible future policy actions. In this channel, commodity prices may change faster than the prices of manufactured goods or services do, due to their less sticky properties.

In addition, there is a question as to whether accommodative global monetary conditions may have affected commodity prices through changes in the behaviour of commodity market participants independent of actual or expected changes in aggregate demand and inflation. For example, lower interest rates on safe assets may encourage financial investors to shift their portfolios into riskier assets (portfolio-rebalancing). Moreover, low funding costs may create incentives to generate extra returns by borrowing short-term at low interest rates and investing in higher-yielding assets (carry trade), possibly including commodities.

Assessing the significance of these channels is challenging. A first issue is identifying which channels are actually at work. The monetary transmission mechanism is complex and the different channels described above interact in various ways. For instance, adjustments in investors' portfolio allocation in response to monetary policy actions will often reflect a combination of changes in macroeconomic expectations and risk appetite. Another issue is that causality is not clear. Lower policy interest rates may lead to higher commodity prices,

[65] Other channels which also affect aggregate demand and inflation work through the impact of changes in policy interest rates on collateral values and balance sheets (credit channel and bank lending channel).

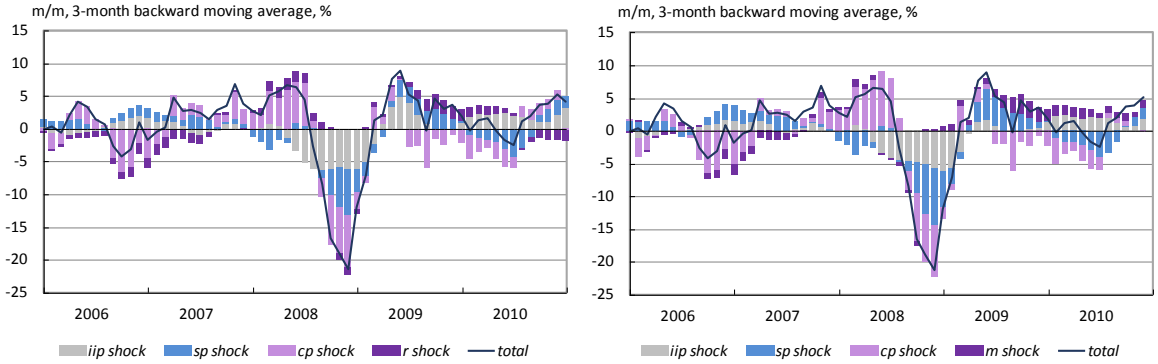
but central banks in turn will take into account changes in commodity prices in their monetary policy.

Against this backdrop, empirical studies often rely on models that allow for dynamic interactions of economic variables.[66] Because prior formulation of how shocks will spread among the variables (the "identification" problem) is required, it is important to interpret results carefully. Such models have also been used to capture the relationship between monetary policy and commodity prices, although there are at present only a limited number of studies conducted on the issue.

A recent working paper from the European Central Bank and the Bank of Italy suggests that accommodative monetary policy can exert a statistically significant impact on commodity prices although this effect only accounts for a small fraction of commodity price fluctuations and work primarily through an increase in expected demand and inflation.[67]

Graph 3.10

Decomposition of changes in commodity prices



Another study by the Bank of Japan considers the impact of global monetary policy on commodity prices (Graph 3.10).[68] The analysis confirms that changes in global economic activity (approximated by global industrial production, grey <iip shock>), the global economic outlook and risk appetite (approximated by global stock prices, blue <sp shock>) and physical supply conditions (pink <cp shock>) are the main drivers of commodity prices in particular over longer time horizons, but also during the run-up in commodity prices in 2007-08, the subsequent collapse, and the rise since 2009. The results also suggest that the rapid growth of global M1 (purple, <m shock>), and, to a somewhat lesser extent, global short-term real interest rates (purple <r shock>), explain a certain part of the increase in commodity prices since 2009, together with the changes in global economic activity (iip shock).

While these findings need to be considered against all the caveats mentioned above including the fact that the variables chosen probably only provide a rough approximation of the underlying channels, the results may suggest the potential relevance of also considering global (rather than solely country-specific) monetary conditions when analysing the relationship between commodity prices and monetary policy.

[66] So-called Vectorautoregressive (VAR) models. VAR models treat all variables as endogenous and allow indentifying how changes in one model variable affect all other model variables over time, taking into account their endogenous relationship.

[67] See Anzuini et al. (2010). For further results, also see Frankel, J. and A. Rose, (2009).

[68] Bank of Korea also shows an empirical result that global liquidity gap has a significant impact on the prices of some commodities.

Chapter 4: Consequences of commodities markets developments

This chapter reviews the consequences of changes in commodity prices for individual countries (4.1.) and the global economy as a whole (4.2.).

4.1 Economic consequences for individual countries

4.1.1 Economic growth

A rise in real commodity prices represents, other things being equal, a shift in their price relative to other goods and services. As such, it implies a redistribution of income from commodity consumers to producers and from importers to exporters. This income transfer occurs through a reduction of the purchasing power of consumers and importers. In turn, commodity exporters can purchase more goods as the rise in commodity prices improves their terms of trade.[69] Overall, rising commodity prices tend to boost economic growth in net exporting countries and dampen it in net importing ones.

Obviously, the macroeconomic significance of such effects depends on country-specific factors such as the country's net position in terms of commodity imports and exports, shares of the various commodities in trade, or the size and duration of price movements. Net importing low-income countries may be most affected by rising commodity prices since deterioration in terms of trade can aggravate their already weak economic situations.

(Short-term effects)

An assessment of the consequences of rising commodity prices for economic growth requires a closer look at the drivers of price movements. The discussion in Chapter 2 suggests that there may be significant forces offsetting each other. First, if commodity prices rise in response to a positive demand shock, such as stronger growth of the global economy, stronger demand for exports (a positive income effect) may partly offset the negative terms of trade effect for commodity importers. This is a key difference to a rise in commodity prices in response to a negative supply shock. For example, simulations with the Federal Reserve Board's open economy model, SIGMA, show that after a 30 percent increase in the real price of oil reduces US output 0.8 percent below baseline after two years if the rise in oil prices is driven exclusively by an exogenous contraction in foreign oil supply, but output barely contracts if about 1/3 of the oil price hike is due to a stronger-than-expected growth in foreign trading partners.

Moreover, to the extent that part of the increase in commodity prices reflects the rapid expansion of manufacturing activities in emerging economies, the impact of the rise in commodity prices on household income may be mitigated by lower prices of manufactured goods.

Finally, it is important to consider second round effects. Ultimately, the macroeconomic impact depends on how commodity exporters use their additional income. To the extent that this additional income is spent, commodity importers may again benefit through rising export demand for consumption and investment goods. To the extent that additional income

[69] In practice, some countries specialize in selling (exporting) a certain type of commodities while at the same time buying (importing) other types, and as such, the net effect of commodity price changes is not straightforward and may vary according to the composition of the various commodities in trade.

is saved, investment of revenues in international financial markets may ease financing conditions in major financial markets or even globally.

A change in commodity prices can have a significant impact on current accounts, and consequently, on real exchange rates for both commodity exporters and importers. An increase in commodity prices induces appreciation pressures on the currencies of commodity exporters in real terms. If resisted, this can fuel an increase of capital inflows, leading to further stimuli of the economies possibly with asset price booms.

(Long-term impact)

Large and persistent increases in the level of real commodity prices can have a significant impact on economic growth for both commodity importers and exporters in the longer run. Higher prices of commodity inputs increase the costs of production and may make parts of the existing capital stock unprofitable.

Commodity exporters facing price increases while benefiting from higher national income, may be subject to the so-called Dutch disease, whereby their increased income puts appreciation pressure on the real exchange rate, leading to the marginalization of manufacturing sectors with the largest scope for productivity gains.

In addition to the effect of changes in the level of prices, the volatility of commodity prices has its own consequences. Higher price volatility of production inputs (such as energy and metals) and a larger uncertainty about future price levels could hamper investment in both commodity production (see discussion in Chapter 2) and in industries that are heavily reliant on commodity inputs. As a consequence, the capital stock (and potential output) may be lower both in commodity exporting and importing countries, impacting negatively the level of economic activity. Volatile prices can also harm producers' access to credit and futures markets, and these prevent them from buying inputs and expanding their production, especially in low-income countries. In 2008, many of the world's smallholders did not fully reap the benefits of the food price increases because they lacked access to credit.[70]

4.1.2 Income distribution and poverty

In addition to the differences between net exporters and net importers, the domestic impact of higher international commodity prices can vary according to the extent to which such higher international prices are transmitted to local prices. Furthermore, there may be large differences across households within a country. For example, even in net commodity exporting countries, consumers that do not derive their income out of commodity production see their real income decrease. Even wage earners in commodity-producing sectors can suffer from temporary losses in real income as wages do not rise in tandem with the cost of living. In the case of agricultural prices, poor farmers often cannot access the market so easily, so that the gains from higher prices are captured by intermediaries. In the recent agricultural price boom, higher prices of fertilizers added to the adverse effects.

The decrease in consumers' real income as a result of higher food prices is a particularly acute problem for low-income countries where households spend a larger share of their income on food. According to the World Bank, the 2010-2011 food price spike has resulted in an estimated net increase of 44 million more people in poverty, with 68 million net food buyers falling below the extreme poverty line, and 24 million net sellers being able to escape

[70] See Ivanic, M. and W. Martin (2008).

poverty.[71] This lower real income induces lower spending on non-food items, such as education and health, and leaves the poorest households with no other choice as to decrease their overall food consumption. Higher food prices also have a substitution effect whereby households shift their consumption to less nutritious food. Even mild forms of undernourishment weigh on current and future economic growth, through increased mortality and susceptibility to diseases, lower adult productivity, declines in cognitive development and reduced school performance for children. Adverse effects tend to be particularly strong for poor urban households.

A situation in which the poorer segment of the population cannot afford to buy food due to higher prices can be a cause of social instability.

4.2. Overall perspective

4.2.1 Consequences for markets

As discussed in chapter 2, recent movements in commodity prices have been associated with large shifts in supply-demand balances. In such a case, an increase in commodity prices indicates increased demands for and/or insufficient supply of commodities. It provides an important signal to market participants to adapt their consumption and production behaviors to reach an efficient allocation of resources. If market mechanisms are working effectively, higher commodity prices would put downward pressure on the demand (e.g. through substitution) and induce increases in supply (through investment and productivity gains), leading to the downward pressure on commodity prices in the medium term.

Such mechanism can be seen to have been in play regarding the wheat market in 2008 when wheat production increased by 12% in response to higher wheat prices. This could be an example demonstrating that supply responses may be strengthened by further allowing market signals to reach producers. On the other hand, if the signaling role of prices is weak, market information may send confusing signals to producers, consumers and investors, which may lead to unnecessary disruptions or increased volatility in the markets.

4.2.2 Consequences for macroeconomic policies

Changes in commodity prices have an impact on inflation. Higher commodity prices directly lead to higher actual (headline) inflation, the size of the effect depending on the share of commodities in the consumption basket. The share of commodities in consumer price indices -approximated by food and energy components - is typically higher in EMEs and low-income countries than in advanced economies (see Table 4.1).

[71] See World Bank (2011).

Table 4.1
Headline inflation and its contributors in 2010 [1]

	Headline [2]	Food [3]		Energy [4]		Non-food non energy	
		Weight [5]	Contrib [6]	Weight [5]	Contrib [6]	Contrib [6]	Actual [2]
Australia	2.7	11.7	0.3	6.1	0.4	1.9	2.5
Canada	2.4	11.9	0.2	9.3	0.9	1.3	1.4
Euro area	2.2	15.3	0.3	9.6	1	0.9	1.1
Japan	0	19	0.2	7.4	0.3	-0.5	-0.7
United Kingdom	3.7	11.8	0.8	8.7	0.7	2.2	2.9
United States	1.5	7.8	0.1	8.3	0.7	0.7	0.8
Industrial economies [7]	1.9	12.8	0.3	8.2	0.7	0.9	1
South Africa	3.5	18.3	0.3	5.8	0.7	2.4	3.4
Turkey	6.4	27.6	1.9	11.5	1.3	3.2	5.2
China [8]	4.6	34	4	9	0.5	0.1	1.7
India [9]	9.4	24.3	2.6	14.9	1.5	5.3	9.1
Indonesia [10]	7	22.4	3.6	5.9	0.4	2.9	4.8
Korea	3.5	14	1.5	9.1	0.5	1.5	2
Brazil	5.9	15.2	1.7	9.2	0.2	4	5.4
Mexico	4.4	18.9	1	9.6	0.6	2.8	4
Emerging economies [7]	4.5	21.8	1.6	9.4	0.7	2.2	3.5

1 End-2010 to end-2009 contributions and components may not sum or average to reported totals due to rounding.
2 Change in consumer prices, in per cent. 3 Food and non -alcoholic beverages (purchased for consumption at home) (COICOP 01). 4 Electricity, gas and other fuels (COICOP 04.5), and fuels and lubricants for personal transport equipment (COICOP 07.2.2). 5 As a percentage of headline CPI. 6 Contribution, in percentage points. 7 Unweighted averages of the economies shown. 8 For China, food includes meals away from home. 9 For India, wholesale prices. Weight for food includes food in primary articles (14.3 percent) and food in manufacturing items (10 percent). 10 For Indonesia, energy includes only energy for housing: fuel, electricity and water.
Sources: OECD, CEIC, DataStream, national data

One key issue for monetary policy is to what extent higher commodity prices lead to increases in the prices of other goods, services and wages. In the case of energy and metals, higher costs of inputs can also lead to higher core inflation to the extent that producers and distributors pass them on to consumers. The pass-through of commodity prices to consumer prices also depends on market and industrial structures in each country and the policy framework in place. For example, the existence of large subsidies to fuel consumption in some countries can shield most consumers from the effect of oil price fluctuations.

Temporal increases in the price level of commodities should only have a transitory effect on inflation if medium- to long-term inflation expectations remain anchored. A key concern in this regard is that a prolonged period of elevated headline inflation following commodity price increases (first round effects) may unhinge inflation expectations, leading to nominal wage increases and higher future inflation (second round effects). Thus far, inflation expectations appear largely unaffected despite commodity price increases over the past

decade. Wage indexation is also a factor for some countries. A crucial factor in the reaction of inflation expectations is the credibility of central banks to ensure long term price stability.

In the current period, inflationary risks from rising commodity prices may be in particular severe for emerging and developing economies than for a number of large advanced economies, where significant economic slack persists. Monetary policy in many EMEs was tightened both in 2007-2008 and in 2010 in response to rising commodity prices. This can create new policy challenges. Higher interest rates can encourage capital inflows, causing upward pressure on the exchange rate and, in certain cases, nurture domestic asset price booms. In terms of actual monetary policy formulation, assessment of the extent to which changes in commodity prices entail a risk of second round effects plays a key role.

Changes in commodity prices also have a fiscal impact. They affect food and energy tax revenues or subsidy expenditures, income from possible state-owned commodity exporters, and expenditures on mitigating measures, such as social protection programs or changes in import and export tariffs.

The volatility of commodity prices may also weaken fiscal positions of commodity-exporting countries because adjusting fiscal expenditures to changes in external environment is inflexible in general. This would be the case more for countries in which the size of fiscal revenues is highly dependent on the level of commodity prices and therefore fiscal positions are vulnerable to commodity price fluctuations. Volatile commodity prices have led some countries whose fiscal resources strongly depend on commodity exports to set up stabilization funds.[72]

Subsidies can become fiscally unsustainable in episodes of prolonged energy price increases. Income support programs are an alternative to consumption subsidies. They are set up to help poor families and can be incorporated into social security systems.

Chapter 5: Policy implications

Drawing on the analysis in the previous chapters, this section discusses key policy challenges raised by commodity market developments (5.1) and sets out broad policy implications (5.2-5.4).

5.1 Policy challenges arising from commodity market developments

Three key commodity market developments over the past ten years appear to be of particular significance from a public policy point of view.

First, as discussed in chapters 1 and 2, the current phase of economic globalisation, characterized in particular by rapid growth in EMEs, has been associated with a fundamental/structural shift in the supply-demand balance in major commodity markets. Supply growth has not kept pace with demand growth for major commodities, implying that markets have become more vulnerable to shocks. Increased investment in commodity production is essential to match sustained demand growth going forward.

Second, as discussed in chapter 3, commodity market structures are changing. This is true for physical markets, but also for the markets for commodity derivatives. The expansion of commodity-related financial transactions has increased the flow of funds of financial investors into the commodity derivatives markets. Greater investors' participation can bring

[72] For example, in 2000, Mexico created an Oil Revenue Stabilization Fund (Fondo de Estabilización de los Ingresos Petroleros, FEIP) to conduct an oil hedge strategy.

benefits by reducing hedging costs and developing long-term futures markets, facilitating planning for producers and consumers, and improving the price formation process. However, there are differing views about the effects on market stability and short-term price dynamics.

Finally, as discussed in chapters 2 and 4, the rapid rise and large fluctuations in commodity prices have triggered domestic policy responses to mitigate adverse effects in domestic markets, including use of subsidies, export restrictions, etc. In part, this reflects that the recent rise in commodity prices and volatility has disproportionately affected low-income countries and low-income households. While such policy responses may be adequate from a domestic perspective, they entail the possible risk of impairing the functioning of global markets and amplifying commodity price fluctuations, especially if pursued by a number of countries.

These developments point to three policy areas that warrant particular attention going forward: (i) Strengthening the functioning of commodity markets to support efficient allocation of scarce resources, and especially investment in commodity production to strengthen long-term supply capacity; (ii) Making sure that markets themselves are robust enough to earn the full benefits of wider participation of financial investors in commodity markets; (iii) Taking into account the international dimension of domestic policies related to commodity markets.

5.2 Ensuring that commodity markets fulfill their role efficiently

Well-functioning commodity markets are a precondition for addressing growing resources pressures at the global level. Measures that support the proper functioning of commodity markets facilitate an efficient supply response to meet growing demand. This is even more important when taking into account that commodity markets tend to be inherently volatile because they are vulnerable to supply shocks such as climate changes and geopolitical factors, and that production of many commodities is often geographically concentrated.

One element relates to improving data transparency.

Such measures can enhance the price discovery function of commodity markets, enabling producers and consumers to take well-informed decisions and thereby contribute to efficient allocation of resources. Improving the quality and timeliness of information on conditions in physical markets, including global production, processing, consumption, inventory levels and trading would be one important step. Currently, such data is often incomplete, inconsistent and published in a non-synchronized manner.[73] Enhancing physical commodity market transparency will also improve the reliability of price discovery in the financial markets (i.e., futures and OTC derivatives markets).

Improving data transparency can also strengthen the price discovery and risk transfer function of commodity derivatives markets and could help reduce risk premia, hedging costs and volatility. Enhanced comparability of data internationally could add to these benefits. Such developments would support longer-term investment or consumption planning.

Improving data availability for commodity market transactions is also a precondition for further understanding the impact of increased financial investments in commodity markets, including the impact on price levels and volatility in commodity futures markets, correlation among commodities, and linkages between spot prices and futures prices.

Finally, greater market transparency would strengthen confidence in the proper functioning of commodity markets more generally. Such confidence has sometimes been affected by

[73] International initiatives addressing these issues include JODI- oil and AMIS (agricultural products).

questions about market integrity. In that respect, ongoing work at IOSCO is important regarding "recommendations on regulation and supervision [...] especially to address market abuses and manipulation, such as through formalized position management powers including the authority to set ex-ante position limits where appropriate, among other powers of interventions"[74].

Sharp rises in commodity prices can be especially detrimental to low-income households and countries. This may create the case for domestic policy interventions targeting commodity markets. Measures to enhance the transparency and market functioning of global commodity markets provide better basis for evaluating the need for such measures.

Another element that would support commodity market functioning more indirectly is measures to deepen financial markets in rapidly growing economies. To some extent, commodity markets seem to be serving as a proxy for investments in rapidly growing EMEs. Indeed, in many EMEs the range of investable assets is limited as capital markets are still at an early stage of development. Measures to broaden and deepen local bond and equity markets in those economies would channel resources more directly to efficient uses.

5.3 Enhancing the stability of commodity markets

The aforementioned initiatives will be instrumental in enhancing the functioning of commodity markets in general. Moreover, a better understanding of the evolution of commodity-related financial markets as well as the linkages between physical markets and financial markets is important from a market stability perspective.

In this regard, it is important to assess the potential financial vulnerability arising from increased exposures of financial investors. Total financial exposures to commodity markets appear small at the moment compared to assets under management by institutional investors, for instance. This does not preclude, however, that concentrated exposures and unexpected spillovers among markets may create pockets of instability that may affect individual financial institutions and could have repercussions on the wider financial system. In this context, it should be noted that a growing portion of end investors comprises institutional investors such as pension funds. Significant losses of such investors could have adverse effects on market stability and public confidence.

The expansion of market participants in commodity markets increases market liquidity (including in longer term contracts), thereby accommodating the hedging needs of producers and consumers. On the other hand, diversity and complexity of financial instruments and players in the commodity markets call for closer monitoring of their impact on the risk management of financial institutions and on the overall development of commodities markets. The increased correlation of commodity derivatives markets and other financial markets suggests a higher risk of spillovers.

These developments should be thoroughly and regularly analyzed. Further research could be implemented in that direction as market participants' strategies and instruments continue to evolve. Such research would also shed more light on how financial investments affect commodity markets. The growing presence of financial investors in commodity markets may imply that tools similar to those already employed in financial markets should be considered, and that the G20 agenda[75] for OTC derivatives should also apply to OTC commodity derivatives markets. FSB's recommendations for implementing OTC derivatives market

[74] Statement of G20 Finance Ministers and Central Bank Governors Meeting in Washington April 2011.

[75] At the Pittsburgh Summit, G20 Leaders agreed that all standardised OTC derivatives contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties (CCPs) by the end of 2012. They also agreed that OTC derivatives contracts should be reported to trade repositories.

reforms were endorsed[76] in Seoul by G20 leaders. In addition, the FSB has noted that "reforms to commodity derivatives markets are an important part of overall OTC derivatives reforms"[77].

5.4 Adopting a global perspective in policy making

Ensuring the effective functioning of commodity markets and properly assessing the economic implications of commodity market developments requires an international perspective.

For example, individual countries may adopt trade policies and subsidy policies in the belief that they can help achieve food and energy security or to improve productivity in specific sectors. At the same time, however, if collectively pursued, such policies may adversely affect the global supply-demand balance and distort market functioning. In the extreme, such unintended consequences may even undermine the effectiveness of the initial domestic measures. Thus, considering the repercussions of domestic policies on international markets appears important for designing optimal policies.

In the context of macroeconomic policy, it is necessary to take into account the role of commodity markets in the monetary transmission process and the possibility that the rise in commodity prices may be partly an endogenous reaction to globally accommodative monetary conditions. If such price increases are considered as fully exogenous supply shocks, inflation risks may be underestimated on a global basis.

These examples illustrate the case for G20 member countries to consider the implications that their policies may have on global commodity markets. Such an approach appears consistent with the G20 Framework for Strong, Sustainable and Balanced Growth. Information sharing and exchanging views among G20 members, which represent almost 85% of global GDP, can help to avoid unintended negative consequences of individual countries' policies.

[76] This report can be found at http://www.financialstabilityboard.org/publications/r_101025.pdf. Some of the recent and future works at CPSS-IOSCO stem directly from the FSB report and its recommendations.

[77] FSB 5 April 2011 statement, http://www.financialstabilityboard.org/press/pr_110405.pdf.

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Glossary

Agriculturals: also called agricultural raw materials. Include cotton, hides, rubber, timber, wool.
Algorithmic trading: automatic trading strategies determined by systematic rules that can be described by an algorithm. Such strategies aim at executing orders while minimizing their costs of transaction.

Backwardation: see Futures curve.
Base metals: common non-ferrous metals excluding precious metals, e.g. copper.
Beverages: include coffee, cocoa, tea.
Biofuel: a type of fuel which has a biological origin, e.g. sugar or vegetable oil.

Carry trade: An investment strategy in which an investor borrows in a currency with a low interest rate to buy assets in a currency with a higher interest rate.
Cereals: also called grains. Include barley, corn, rice and wheat.
Coal bed methane: a form of natural gas which is extracted from coal beds.
Coking coal: a form of coke which is produced from coal and mainly used as a fuel and as a reducing agent in smelting iron ore in a blast furnace.
Contango: see Futures curve.
Convenience yield: The benefit captured by some market participants (generally producers and consumers) from holding physical inventories, for example by avoiding disruption in production processes in case of shortage. A high convenience yield is a cause for backwardation in the future curve, as inventory owners are willing to receive a negative return on their stocks to be able to actually hold the physical commodity.
CTAs: Commodity Trading Advisors. Refers to pooled amounts of money invested in commodity futures markets, following mainly technical or fundamental trading strategies.

DJ-UBSCI: Dow-Jones UBS Commodity Index is a proprietary Commodity index whose methodology is privately owned by UBS and calculated by Dow Jones. It also refers to an entire array of other Commodity indices also owned by UBS. Rules for inclusion of financial instruments in a given index and their corresponding weights are determined by the methodology of UBS. Such indices are considered as benchmarks of commodity markets.
Dairy products: food produced from milk.

Energy: includes coal, crude oil and natural gas.
ETFs, ETCs, ETNs, MTNs: investment vehicles that vary in terms of regulation. All those vehicles can give direct or indirect access to commodity markets. Exchange-Traded Funds (ETFs) are equivalent to a listed Mutual Fund with a secondary market. Exchange-Traded Commodities (ETCs) are perpetual debt products issued by a Special Purpose Vehicle and are much less regulated than ETFs. Exchange-Traded Notes (ETNs) and Medium-Term Notes (MTNs) are unsecured unsubordinated debt securities issued by a financial institution.
Excess return: the excess return on a financial instrument is the excess of the total return on that instrument over the risk-free rate of return. An investment in a commodity future contract can be decomposed as the sum of two components, the return on the future and the return on the collateral posted by the investor on its account. Since the return on the collateral is generally the risk-free rate, the excess return on a commodity future is equivalent to the future price variation only.

Food: includes cereals, meat, seafood, sugar, vegetable oils and meals, and other food (IMF classification).
Front-month or near-month contract: see Futures curve.

Futures curve: at any given point in time, the curve formed by plotting the futures prices for all maturities available at that point in time, from the nearest maturity (called the front-month contract) to the farthest contracts available (e.g. nine years ahead for oil futures). An upward-sloping curve (the price increases with maturity) is said to be in contango while a downward-sloping curve (the price decreases with maturity) is said to be in backwardation.
Futures: Standardized contracts traded on an exchange, specifying the exchange of a given quantity of commodities, with a given quality, at a given date in the future for a price agreed today. At maturity, futures contracts can be settled in cash or by the delivery of the physical commodity.

Global output-gap: A measure of the global capacity utilization. A negative output-gap corresponds to a situation in which factors of production are not used at their full potential, a positive output-gap to a situation where they are used more intensively than normal.
Grade: differences of quality within a given commodity. For instance, the oil category includes different grades which vary according to their viscosity. Grades for oil include light, medium, heavy and extra-heavy.
Grains: see cereals.

Headline inflation / core inflation: Headline inflation refers to the increase in the price of the average basket of consumption goods. Core inflation refers to the increase in the price of a basket of consumption goods excluding the more volatile items such as food and energy. Core inflation is less sensitive to temporary price movements of volatile commodities and is often used as an indicator of underlying longer-term inflation, while headline inflation better reflects the actual prices paid by consumers.
Hedging costs: the easiness with which a market participant can execute a hedging strategy using derivative instruments. Hedging costs include explicit costs, such as commissions and taxes, and implicit costs, such as the bid-ask spread, market impact and opportunity costs.
HFT: High-Frequency Trading. Refers to trading strategies that employ very powerful computers to execute orders at a very high speed, based on market conditions.
Hoarding: accumulation inventories of a given commodity.

Index rebalancing: trades implemented by an index-tracking fund to rebalance the weights of the basket of financial instruments in its portfolio following a change in the weights of the index it is tracking. Those changes are generally triggered according to the index provider methodology.
Industrial metals: include aluminum, copper, iron ore, lead, nickel, tin, uranium zinc.
Institutional investors: institutions that pool money of individual investors for various purposes, and usually have to invest that money in financial markets to manage or meet the claims of the individuals. They mainly include insurance companies, pension plans, endowments, foundations and banks.

LNG: liquefied natural gas. Natural gas converted into a liquid form.

Margin calls: when a position is initiated on a derivative instrument such as a future, an initial amount of money (the initial margin) is sent by the investor on a margin account. Variations in the market value of the instrument can create a liability to the exchange, and the investor will receive a margin call to put an additional amount of money on its account, in order to eliminate potential counterparty risk to the exchange.
Market abuse: refers to situations where an investor is at an unfair advantage with respect to other investors that he derives from the possession of material non public information or from the manipulation of the characteristics of a financial instrument (price, volume, available information).
Metals: include copper, aluminum, iron ore, tin, nickel, zinc, lead, uranium (IMF classification).

Oilseed: plants grown to produce oil (e.g. soybeans, sunflowers, rapeseed).

OTC contracts: Over-the-counter contracts negotiated between two parties, outside of an exchange. Contrary to futures, they can be highly specific as to the quality, the quantity, the pricing formula, and the delivery spot. Producers and final consumers of commodities are often engaged in OTC contracts with financial intermediaries, as their needs are too specific to be accommodated by standardized futures contracts.

Petroleum: synonym for crude oil.
Physical / financial commodities market: The physical commodity market refers to exchanges, usually over-the-counter, of physical quantities of commodities. The financial commodity market refers to transactions of financial derivatives (such as futures, swaps, or options) either on organized exchanges or over the counter. In practice, the distinction is not as clear as futures contract can settle by the delivery of the physical commodity, and producers or final consumers can buy or sell the physical commodity to a broker-dealer engaged in the financial market.
Position limits: a quantitative limit imposed by a derivatives exchange or a regulatory authority on markets participants on the amount of derivatives contracts that each participant can hold. The position limits can be defined by a percentage of the outstanding contracts on the market (relative positions limits) or by a predetermined number of contracts (absolute positions limit).
Precious metals: as opposed to base metals. Valuable and rare metals. Mainly include gold and silver.
Price-elasticity of demand: Sensitivity of demand to prices variation. For example, with a price-elasticity of 2, a 10% increase in the price of a commodity leads to a 20% decrease in its demand. When the price-elasticity of demand is low, a small change in supply requires a large variation in the price to adjust demand.
Price return: during any given period, the return on an asset can be defined as the sum of two components, namely a capital appreciation/depreciation component, and an income component (mainly in the form of a cash dividend or a coupon). When the return on this asset is calculated only from the capital appreciation/depreciation, it is said to be a price return.

Rolling positions: Financial investors generally trade commodity futures contracts in order to achieve a desired exposure on a commodity. Since futures contracts eventually expire and call for physical delivery, positions must be periodically rolled in order to keep the desired exposure. This is achieved by selling a futures contract before expiry and buying a new one with a more distant maturity.

S&P GSCI: Standard & Poor's Goldman Sachs Commodity Index. The S&P GSCI is a proprietary index from Goldman Sachs, calculated by S&P. For further details, see the definition of DJ UBSCI.
Shale gas: a form of natural gas which is produced from shale.

Tight gas: natural gas which is difficult to extract.
Total Return Index Swaps: an OTC derivative contract whereby one participant receives from another the performance (total return) of an asset (here, an index) against the performance of another asset.
Trend-following strategies: trading strategies whereby a trader follows a trend, by buying when prices increase and selling when prices decrease. Momentum strategies are a category of trend-following strategies.

Unconventional oil: crude oil that is produced or extracted using non conventional methods due to particularly complex production process (e.g. bitumen, shale oil or tar sands).

Vegetable oils and meals: includes fishmeal, groundnuts, olive oil, palm oil, rapeseed, soybean, sunflower (IMF classification).

Annex 1 Discussions with Market Participants

On May 5 and 6 in London, and on May 24 in New York, representatives of the G20 Study Group on Commodities met with senior professionals from the trading, investment, and research and strategy sides of leading firms active in the commodities area. The interviewed firms included commercial and investment banks, hedge funds and other investment managers, producers, advisory firms, and exchanges. The meetings were organized by the Bank of England and the Federal Reserve Bank of New York, respectively, for the benefit of the Study Group.

The aim of the meetings was to provide a high-level update on developments in rapidly-changing commodity financial markets. Much of the discussion focused on the key characteristics and recent evolution of the commodity markets in terms of instrumentation, volumes, relative importance and strategies of different types of participants (e.g. commercial investors, index investors, CTAs, ETF investors, hedge funds, etc.), and the implications this evolution carries for the price and volatility of commodities. Participants also discussed how investors view and manage the potential benefits (e.g. diversification, yield enhancement, inflation hedging, etc.) and risks of commodity investing.

Evolution of market participation and strategies

Financial market participation in commodity markets has risen rapidly in recent years, and turnover has grown significantly as the range of investors has widened. Several participants described the commodity markets as relatively neglected by most investors during the 1980s and 1990s. During this period, trading activity in the commodity markets mostly involved commercial investors (producers and some consumers or intermediate users) hedging or taking directional views on the physical market, and specialist investors, particularly commodity-dedicated hedge funds and commodity trading advisors (CTAs). Commodity hedge funds were characterized as fundamentals-oriented investors who made directional investments, both long and short, based on short-term (often with a one to six month horizon) expectations for individual commodities or the shape of commodity curves; it was suggested that they often play a key role in the price discovery process, along with commercial firms. CTAs trade in futures markets and often employ technically-based trading strategies (such as trend following strategies); more recently, CTAs have become increasingly involved in algorithmic and high frequency trading.

The growth of index investing

Passive long-only index investors were viewed by contacts as the most important new entrants to the markets in recent years. Typically, index investors indirectly or directly take long positions in a range of commodity futures, frequently based on indices (or other pre-established schemes) and weighted by factors such as shares of global production and/or liquidity of the underlying futures contract. Early on, investments typically were at the front end of curves, and were passively rolled into the next contract each month. Often the investor would gain exposure through an over-the-counter index swap with a dealer, which would in turn hedge the swap position in the exchange-traded futures market. This vehicle was given life in the early nineties with the development and marketing of the S&P GSCI index but only gained significant traction with investors in the mid-2000s.

Commodity index investing has largely been marketed to investors, particularly institutional investors, as a vehicle for long-term portfolio diversification with inflation hedging properties. Proponents cite research that suggests that over long periods, benchmark commodities indices have generated significant positive returns, with high volatility but low correlation with returns on stocks and bonds, and moderate positive correlation with inflation, particularly changes in inflation. Because of the low historical correlation with other financial assets, investors could in principle improve the risk/return profile in their investment portfolios by adding index exposures to commodities in their investment portfolios. However, some participants suggested that higher correlations between commodities and other assets in recent years weakened the case for passive long-only investing.

Reflecting their long-only positioning and formulaic weights, index investors do not express views or earn return on the relative performance of individual commodities. It was argued that historically the positive returns from indexing largely reflected risk premiums (e.g. so-called "normal backwardation" and "convenience yield") effectively paid by commercial players hedging their production. Because of these premiums, commodity index investments could produce positive total returns even in time windows over which commodities do not register significant trend movements.

Index investing also provides a means for investors to gain positive returns from "unexpected" broad increases in commodity prices. It was suggested by several participants that some investors were attracted to the strategy (as well as other long commodities strategies) as a vehicle to profit from expected rises in global growth or inflation, particularly in the EMEs, which were expected to increase commodity prices. However, it was noted by some that because futures curves already reflect market expectations about the path for supply and demand and prices, along with other factors, index investors do not necessarily benefit from a rising trend in commodity prices. Indeed, since mid 2009, the cumulative return on a benchmark total return commodity index significantly lagged the change in the underlying spot index, reflecting the fact that the front ends of futures curves for many of the constituent commodities anticipated rising prices during much of this period.

Growth in net assets under management in indexed investments has significantly outpaced that of other commodity investment styles, with assets under management at long only passive index funds currently estimated at $260 billion, according to one contact. Assets managed by CTAs and commodity-dedicated hedge funds, have also grown significantly over the past decade, but contacts suggested their share of the overall market has declined.

The nature of index investment has evolved over time in response to shifts in the shape of futures curves and a crowding of investor activity in the front end of the curve. Whereas a significant fraction of investment (30 percent according to one observer) is still tied to published indices, which typically are based on rolling positions in near-term futures, many index managers have adopted "enhanced" index strategies, which entail positions on various parts of the curve and may allow investment in subsets of commodities (i.e., "index funds" that are long and largely passive but that don't attempt to match the widely available calculated indexes). Most positions nonetheless remain on the shorter end of the futures curve, within a 6 to 12-month horizon, where liquidity is concentrated.

Exchange trade funds (ETFs), hedge funds, and banks

Growing retail and institutional enthusiasm surrounding commodities as an asset class has also supported growth in investment in commodity exchange trade funds (ETFs). ETFs were

said to have accounted for around one third of inflows into commodity-linked vehicles in 2010, compared with around 10 percent in the previous five years. Precious metals ETFs, which typically purchase physical stocks, account for the bulk of investment in this sector. ETFs now represent a significant share of financial and physical market activity in precious metals, particularly gold and silver, and are an important channel for retail, high net worth, and some hedge fund flows into these commodities. In contrast, other commodity ETFs, particularly for energy, agriculture and broad indices, more commonly entail derivative exposures. ETFs were characterized as not having had a significant impact to date in energy, the more common industrial metals, or food commodities; some participants expressed concerns about pending ETFs in some niche industrial metals such as rhodium, because they could result in supply being held off-market.

Non-commodity hedge funds have also increased their activities in cyclical commodities, typically as a way to express directional macro views; some participants also relayed anecdotes of non-specialist hedge funds using positions in commodities as risk mitigation tool for exposures in other assets, especially equities.

As the scale of investment in commodities has increased, several leading commercial and investment banks have been significantly scaling up their sales and trading operations. As part of this effort, some firms have developed a significant presence in physical markets, including power, oil and oil products, which they view as enabling them to provide more efficient and effective intermediation between client needs in the physical and financial markets (ensuring price convergence between the two). They also highlighted their market-making role along the forward curve – e.g., intermediating between long-dated hedging demand and shorter-dated index positions.

The evolving role of trading firms and EMEs

Some contacts suggested that changes to the structure of physical markets had important implications for the pricing and volatility of commodities. In particular, a few noted the emergence of several large merchants or trading firms that accounted for very a large share of trading activity in the physical market. It was suggested that these firms can wield significant market power and benefit from informational advantages in some sectors because numerous producers (including some state-owned firms) effectively cede to these merchants the marketing and trading of their physical production. To date, the activity of these large merchants has been concentrated in physical markets, though they were also described as being active in the financial markets. Contacts noted that they tend to be present in a wider range of countries and in more niche markets, compared to large commercial and investment banks. A few participants suggested that recent and pending regulatory changes which could constrain bank-intermediated activities may give merchants a competitive advantage should they choose to become more active in financial markets.

Several participants highlighted the growing market power wielded by major EMEs, which account for the bulk of the growth in marginal demand for most commodities. According to panelists, some sovereigns and state-owned companies have grown more tactically sophisticated – e.g., in their choice of when to consume from imports versus inventories according to their expectations of the trajectory of prices. Contacts noted that EMEs were largely active in the physical space, but that some of the largest participants were evidencing increased activity and sophistication in the financial markets as well.

Drivers of commodity prices

Supply and demand fundamentals

Participants were broadly of the view that the secular rise and current high level of commodity prices has been underpinned by developments in demand and supply. In particular, participants pointed to strong and sustained demand from EMEs and limited spare capacity and high marginal and breakeven production costs for oil and base metals, low stocks and recent bad weather for grains and oilseeds. While the weight on these factors varies across commodity classes, less emphasis was placed on the role played by financial flows in driving trend movements in prices.

Final demand for commodities has accelerated in recent years and the widely held view was that rapid commodity-intensive growth from EMEs has increased the sustainable level of prices. Several contacts also cited developments in biofuels as having also been an important source of additional demand in some agricultural commodity markets. Contacts suggested strong trend demand was one of the main drivers of the price rises observed in 2007/2008. Demand subsequently fell back during the recession, but has picked up since then and, for many commodities, was close to pre-crisis levels. Moreover, the most recent rise in prices was generally thought to have been supported by higher expected demand in the future. Among contacts who expressed a view on longer term prospects, several suggested that the long-term risks were to the upside– particularly relative to the path implied by futures curves – reflecting on-going industrialization in EMEs; however, some contacts expressed skepticism that strong emerging market demand would lead to further strong price rises going forward.

Meanwhile supply growth has been disappointing for many commodities in recent years. A number of contacts noted that during the 1980s and 1990s, the metals and energy sectors had experienced relatively limited investment globally, and that this had left the physical markets with limited capacity to meet the sustained upsurge in commodity demand that has occurred over the past decade. As a result, costs of production have risen, putting upward pressure on prices and increasing the correlation of price movements across different commodities in recent years.

For oil, it was suggested by some that while there was nascent lower cost spare capacity in the market, that spare capacity was much lower than the proportion of global production that is 'high cost' (above $70 per barrel), and therefore probably insufficient to push prices down, especially in the long run. There had been some positive developments: oil refinery expansion meant that there was now more capacity than in 2007/2008, which was reflected in lower refining margins. Against that, unrest in the Middle East and North Africa was expected to constrain supply, with a risk premium built into prices estimated to be of the order of $10–$15 per barrel. For agricultural commodities, the possibility of further weather shocks was a key driver of prices as markets had tightened following adverse weather developments in recent years. For metals, the lead time in bringing new capacity on stream was potentially very long, meaning that supply growth was likely to remain weak for some time to come.

Impact of financial positioning on the level of prices

Contacts cited four key pieces of evidence as to why financial positioning is not seen as an important driver of commodity prices beyond the short term. First, if financial activity was driving commodity prices upwards, the result would be oversupply, increasing physical stocks. But this is not generally observed in practice. Second, it was suggested that the

relationship between price and financial flows is weak in some markets, and generally temporary. Third, rather than providing evidence of financial market speculation, it was suggested by some that recent periods of high correlation of commodities with other asset prices was consistent with the nature of the shocks to the world economy. And fourth, the behavior of non-traded commodity prices has been similar to those traded on financial markets. Nonetheless, a number of contacts noted that episodes of commodity price volatility are sometimes difficult to explain by appealing to underlying demand and supply fundamentals. This is consistent with a short-term impact from financial market activity.

Contacts suggested that the impact of investor flows was more significant and persistent for commodity subsectors in which stockpiling physical assets is easier, especially precious metals. Several panelists emphasized that that there was little evidence outside of precious metals that increased financial activity had led to a significant increase in hoarding of physical stocks. Participants acknowledged that, in some instances, financial market activity had influenced decisions regarding accumulation of physical inventories, e.g., record amounts of aluminum recently had been locked into financing deals, but it was argued that for the most part, the increased long positioning in the financial markets by some investors had been met by increased short positioning by others.

Some participants pointed to the U.S. natural gas market as a counterfactual to assertions that higher investor positioning leads to higher prices; the sharp rise in shale gas production in recent years has paved the way for price declines for U.S. gas despite the more generalized commodity price upswing, and significant presence of index investors and speculative positioning in natural gas.

Participants generally expressed the view that changes in investor positioning, as reflected in net speculative positioning, could and often did appear to be associated with contemporaneous price changes. However, these price moves generally were viewed as likely to be short lived when they were not associated with changes in underlying fundamentals. Several cited in-house and academic studies that demonstrated that price impacts associated with surges in speculative positioning largely faded after one quarter. Nonetheless, panelists broadly noted that understanding flows and positioning was a significant consideration in the investment process for market players with short time horizons.

It was noted by some that price changes in response to changes in well-informed speculative positioning were actually desirable, as they were part of the price discovery process, and aided efficient inventory and production management. Short-term price moves transmit signals to physical markets that influence consumption and production behavior, thus mitigating risks of shortages and gluts, and more exaggerated price moves over the long run. In support of this view, it was asserted that changes in net speculative positions typically track with changes in fundamentals; for example positioning in gold tracks with changes in real interest rates; speculative positioning in agriculture tracks with grain stocks and shifts in harvest expectations; and speculative positioning in energy typically tracks leading indicators of economic activity. However, some contacts highlighted potential problems associated with the fact that some major oil producing states rely on developments in the futures markets in order to price physical crude exports, suggesting the approach could tend to ratify movements in financial markets.

Impact of index investors on the level and shape of the futures curve

Participants expressed a range of views regarding how the entry of long-only index investors had impacted the commodity markets. Participants generally (though not universally)

expressed skepticism that the growth of index investing was playing a significant role in determining spot prices. On the other hand, many contacts expressed the view that the relatively large presence of index investors had had a material impact on the shape of commodity forward curves, though it was hard to establish the precise contribution. Contacts broadly noted that the increase of indexed investment has generally imparted a tendency toward more contango or less backwardation in forward curves, particularly in the front end where the lion's share of indexed positions are concentrated. However, some suggested this effect on the front end may be diminishing as index funds increasingly push further out the curve to mitigate the negative roll yield resulting from front-end contango.

Several participants suggested that these shifts in the shape of the curve could in principle be favorable for commercial producers, because they could imply lower implicit risk premia for hedging activity. Some representatives of leading trading operations suggested that commercial hedging may have risen, with one suggesting a large share of some OTC contracts with indexers can now be offset in the OTC market, as opposed to through laying off the risk in the exchange traded markets. However, others expressed skepticism that producers and end users had significantly increased their hedging of production, investment and consumption decisions. Some noted an increasing tendency of publicly traded commodity producing firms to not hedge their commodity price risk because investors in their shares preferred to be exposed to the associated commodity risk. Also, it was noted that margin requirements can get quite expensive and difficult to fund when commodity prices trend higher.

While the effect of index investors was widely acknowledged, most participants asserted that fundamentals – market tightness and inventories – remained the most important determinants of the level and shape of forward curves. However, some directional investors argued that pricing efficiency may be suffering because shifting positioning by index investors had become an additional complication for successfully executing fundamentally driven trades. They highlighted challenges in ascertaining the decision parameters of index investors, in particular their timing of entry and positioning on the forward curve. These investors also noted that incentives had grown for concentrating on arbitrage opportunities induced by index investors, at the expense of focusing on trading strategies that might aid price discovery.

The impact of global monetary conditions

The recent stance of monetary policy across the globe was cited by a number of participants as having been generally supportive for commodity prices, but it was suggested that it is difficult to quantify the importance of the various channels of transmission. Several contacts emphasized that the impact of the accommodative stance of monetary policy derived from the boost to physical demand. For example, some contacts asserted that that the combination of easy monetary conditions and EME currency policies was impacting commodity fundamentals by boosting real demand for commodity consumption in the EMEs. Contacts also cited the desire by some investors to hedge future inflation concerns, which was viewed as being consistent with the rapid growth in investment in and the prices of precious metals.

Some participants expressed the view that accommodative monetary conditions, by increasing investor flows into commodity markets (as they had into other assets such as equities), had contributed to higher commodity prices and stronger cross-asset correlations in the short-run. However, the financial effect of monetary conditions on prices and correlations was generally thought to be transitory, since money flows were not believed to

be causing stockpiling or hoarding of physical commodities over the medium term, with the possible exception of certain metals.

Impact of increased financial flows on volatility

Panelists generally did not raise concerns that index investors were contributing to significant volatility, and some argued that index investors were a stabilizing force. In particular, it was suggested that rebalancing by index investors tends to moderate moves in commodity prices. For example, index funds typically pare back their long positions in commodities when these positions outperform, and increase their buying when commodity prices decline.

In contrast, participants were somewhat divided on the impact of momentum-based strategies, including algorithmic and high frequency trading. Most agreed that a high and growing share of turnover was attributable to these strategies. Senior traders expressed the view that such activity added liquidity to the markets, and some pointed out that apart from the very high volatility that occurred during the peak of the global financial crisis, volatility in the commodity markets has not changed in recent years compared to longer run trends; prices are registering larger daily movements in dollar terms but not in percentage terms. Others however expressed concerned that embedded trend-following and computer driven opportunistic strategies could be exacerbating volatility, and providing illusory liquidity. For example, one contact asserted that high frequency traders add liquidity, particularly in spread products, when markets are functioning smoothly but absorb liquidity when prices move sharply, and tend to amplify moves. Several non-CTA buy-side participants felt that algorithmic and high frequency traders played an important role in the speed of the drop in crude prices in early May.

Some investors also expressed concern about perceived increased inflows from potentially less well-informed thematic-driven retail and cross-over investors. They argued that a relative decline in view-driven directional investment as a share of total trading had increased the likelihood of short-term price deviations from fundamentals.

Views on market functioning

Most contacts felt that the commodity markets were relatively well-functioning, though several identified areas of concern. It was noted that the financial markets in commodities had handled the 2008 crisis, including the unwinding of Lehman's commodity book, surprisingly well. The arbitrage link between futures and spot prices was reported to be generally robust, with contacts citing the incentive for producers to adjust supply in response to any change between the two. It was suggested by some that observed differences between futures with physical delivery and those without were very small. While futures markets were bigger and tended to be the first to respond to news, spot and futures can best be thought of as being co-determined. Contacts suggested that any deviations between futures prices and the spot price tended to be temporary, and to correct within three months. However, one contact highlighted price convergence dislocations in the wheat market, with contango created by index investors leading to a persistent basis between the physical and futures prices.

Some contacts expressed concerns about proposals by the US Commodity Futures Trading Commission (CFTC) to impose position limits across a range of commodity markets, suggesting that they would only affect the large funds, and would tend to encourage

regulatory arbitrage. As an alternative, some favored policies which managed, rather than limited, positions. Others favored increases in margin requirements. More generally, contacts reported that greater financial regulation would make physically-backed instruments and strategies more attractive than financial positions; some suggested that this could lead to increased inventories and higher prices.

Several contacts highlighted growing weaknesses in the efficacy of two-way signals between prices and supply/demand and data transparency issues. In well-functioning markets, price changes influence consumption and production decisions. However, the responsiveness of demand to prices may have declined in recent years as EMEs, which often employ subsidies and price controls, have overtaken the U.S. as the source of marginal demand for most commodities. At the same time, information on supply and demand conditions helps market participants establish prices reflective of underlying fundamentals. However, EMEs tend to have less data transparency with regard to consumption and inventories, and major commodity producers (particularly in energy) have long been characterized by a lack of transparency. Less complete information on the fundamentals, in turn, creates room for wider interpretation of fair value by marginal price setters in financial markets.

Annex 2 Study Group Terms of Reference

G20 STUDY GROUP ON COMMODITIES

ELEMENTS FOR TERMS OF REFERENCE ON THE COMMODITIES STUDY GROUP

The mission of the study group is to conduct a fact-finding exercise in order to understand (i) the evolution and drivers of commodity price fluctuations; and (ii) their consequences for growth, income distribution, price stability, financial stability as well as economic policies including monetary policy. The study group will neither aim to formulate policy recommendations nor to propose concrete regulatory measures. It will work to avoid overlap with work already being undertaken by other bodies.

The goal of the study group is to lay the groundwork for subsequent policy discussions by Deputies and Ministers, by providing in-depth analysis and setting out broad policy implications.

For these, the study group will combine (i) analyses covering both short-and long-term perspectives, (ii) those covering economy and finance on a macro level, and (iii) those covering market transactions and structures on a micro level. Due to time constraints, (iv) the study group's fact-finding can be with the help of the large body of existing researches.

1 – Orientations of the Project

The study group's fact-finding will be orientated in three directions.

The first is to identify material drivers of supply and demand of commodities over the short- and long-run. This should lead to a better understanding of the trend and cyclical components of commodity prices. It should also lead to offering perspectives on future price developments, thereby shedding more light on whether current rising prices are a temporary phenomenon or perhaps a reflection of long-term trends ('Commodity Super Cycle' theory).

The second is to explain how trading on commodities takes place by studying the microstructures of commodity markets; for example, the activities of key market participants (to be indentified), and recent innovations and changes in physical and financial markets.

The last is to elucidate the consequences of recent commodity price fluctuations on the economy and finance across countries. They may have second-rounds effects on the process of commodity price formation.

Due to time constraints, the scope of study group's fact-finding cannot be exhaustive in terms of commodity items whilst any specific items should not be excluded in advance. In this regard, it would be efficient to start with covering (i) key energy commodities and metals with relatively large markets including derivatives; and (ii) food commodities which have particular socioeconomic relevance as basic staple foods and feed grains. In the sphere of mineral resources, it could be reasonable to focus upon crude oil, natural gas, and copper, with reference to the components of major commodity indices both from the perspective of physical production and financial market transaction. As for food resources, corn, rice, soybeans, and wheat could be considered. Important mineral resources without derivatives (e.g., coal, iron ore) could also be considered to compare with those with developed financial markets.

2 – Areas of Work

The members are expected to contribute in one area or more of the following areas. Interactions amongst different work-areas will be reflected in the final report.

(Area 1) Economic Demand-Side Drivers

A change and an increase in actual and expected growth of the global economy has contributed towards the rises in commodity prices, and grasping its magnitude and impact will be vital. There are other demand-side drivers including demographic trends, dietary habits, elasticity to income growth, increasing demand for biofuels, etc.

(Area 2) Economic Supply-Side Drivers

A broad understanding of global supply capacity of commodities needs to be made, although fully-detailed examination of each commodity item may be unnecessary. Supply-side drivers include mining and agricultural developments, technological progress, physical infrastructure constraints, water availability, climate factors, etc.

(Area 3) Policy Drivers

The impact of trade and subsidy policies on commodity prices will be studied. Government intervention in commodity markets began long ago. The forms of subsidy vary by country and commodity. The impact of the subsidies depends on their substance but generally tends to reduce demand elasticity. The subsidies, on the other hand, may be able to ease constraints via triggering technical progress or shifting demand. Policy actions such as export controls may intensify supply constraints; reduce supply elasticity; or, alter decisions to invest in resource exploitations. Diversion of some food commodities to the production of biofuels can also be distortive, just like trade and import restriction policies. Other policy measures may have impacts on commodity prices as well. The potential influence of geopolitical factors on commodity prices can also be covered in this area.

(Area 4) Financial Driver I: Global Monetary Expansion

The impact of interest rates, global liquidity and monetary policies on commodity prices will be studied. In an environment of accommodative monetary policies in both advanced and emerging economies, demand for commodities may become robust, especially in emerging economies, and global investors may be incentivised to search for higher returns of commodities.

(Area 5) Financial Driver II: Roles of Financial Markets

Financial markets for commodities have been expanding with various market participants having different incentives, such as hedging, short-term speculation, and long-term investment. This will raise an important question of how financial aspects affect the level and volatility of commodity prices. Detailed examinations will be made for major topics as follows: (i) trends and developments in financial markets for commodities; (ii) roles of different types of financial market players and their consequences; (iii) the interplay between physical and financial markets; and, (iv) the overall impact on commodities price developments and market liquidity. In this area, interviewing market participants will be beneficial.

(Area 6) Consequences of Recent Commodity Price Fluctuations

Commodity price fluctuations are having several effects on economies across countries. The impacts may differ between high-and low-income countries as well as between commodities-

exporting and importing countries. The focus should be placed upon economic and financial consequences that have policy implications.

3 - Contributions to be made

The study group will provide Deputies and Ministers with insights about the evolution and drivers of commodity price fluctuations and their economic and financial consequences, thereby contributing to their fuller policy considerations.

The study group may discuss policy implications for relevant macroeconomic policies as well as policy approaches to improve the functioning of commodity markets.

4 - Organization of Work

The report will be developed using the contributions from individual member countries and global bodies, such as the IMF, OECD, World Bank, UNCTAD, BIS, FSB, IOSCO, FAO, IEF, and the IEA.

The chair envisages holding a number of conference calls as well as one face-to-face meeting at least. The date for the first conference call is 17 March, in which TOR will be finalized with reference to discussions then and written comments gathered in advance; and, allotments of fact-finding areas will be discussed and determined. The tentative date for face-to-face meeting is end-June.

5 - Deliverables

The group will report as follows:

- An oral interim report will be delivered to Finance Ministers and Central Bank Governors in April.
- The final report is scheduled for July 2011, in order to leave sufficient time for subsequent discussions.

Annex 3 List of members

Participants List of the G20 Study Group on Commodities

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