

Monitoring Commodity Markets

From the Perspective of Understanding Global Financial Market Trends

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The Foreign Exchange Operations Section of the Financial Markets Department of the Bank of Japan monitors the foreign exchange market and other global financial markets. In recent years, the relatively sharp price movements observed on global financial markets have generally been accompanied by risk-cutting activities by global investors, and, it has become increasingly important to monitor trends on markets, such as the commodity markets, that have reacted sensitively to changes in investors' risk appetite in these situations.

The price formation on the commodity markets has changed in recent years as market participants have become diversified and the scale of trading has expanded. By utilizing the expertise that we have accumulated in monitoring major currency markets, we are working to establish a framework of global monitoring for the commodity markets, in cooperation with other central banks. We also aim to improve our monitoring techniques of commodity markets, through exchanges of views with market participants active in Japan.

Preface

The Foreign Exchange Operations Section of the Financial Markets Department of the Bank of Japan monitors the foreign exchange market and other global financial markets. The purpose of the monitoring is to grasp market developments and understand the background and the mechanisms of these movements. And this helps the section discharge its functions as an agent of the Minister of Finance for its foreign exchange operations, and also contribute to the decision making of Bank of Japan's monetary policy and the stability of global financial markets. The information gained through monitoring activities are used as material for discussions with other central banks in international conferences and other fora. One of the important international meetings to discuss financial market trends is the BIS Markets Committee,¹ where the senior officials responsible for market operations at central banks of major economies meet once every two months at the Bank for International Settlements in Basel, Switzerland.

At the Bank of Japan, the Financial Markets Department monitors and analyzes developments in financial markets in Japan as well as overseas. Of these, the markets that the Foreign Exchange Operations Section primarily monitors are the foreign exchange markets, but we also utilize information gathered from other financial markets, because foreign exchange markets tend to move in response to activities in the global financial economy as a whole. Careful monitoring is required of movements of interest rates, stock prices, and other financial instruments on foreign markets after the close of the Tokyo market, because foreign exchange markets continue to operate and trade 24 hours a day. In this context, we pay close attention to the release of economic indicators and comments by national policymakers that may affect markets, as well as other phenomena that would influence the risk-taking activities of a wide range of market participants on global financial markets.

The commodity markets, as discussed in this paper, have drawn growing attention in international conferences and other gatherings, and are becoming increasingly important in our

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monitoring activities. In this paper, we would like to discuss the essential points in monitoring commodity markets as one segment of the global financial market and outline the current issues to work on.

The reasons for monitoring commodity markets

The Bank of Japan has been carefully monitoring commodity markets as part of its efforts to evaluate the macro-economic conditions.

Commodity prices are the “thermometer” of the world economy and are also a factor influencing the domestic economy and prices. In the Financial Markets Department, we have been strengthening our monitoring framework for commodity markets as a component of global financial markets, and in 2007, have incorporated commodity markets within the framework of daily monitoring conducted by the Foreign Exchange Operations Section (for an outline of the commodity markets monitored by the section, see the **BOX** below).

[BOX] Outline of Commodity Markets Monitored

Among the commodity markets which the Foreign Exchange Operations Section of the Financial Markets Department monitors, crude oil, gold, and copper make up large components of the energy, precious metals, and industrial metals categories in major commodity indexes (Box Chart 1). These commodities also have relatively large trading volumes on the exchanges of both the United States and Europe, and are actively traded by a wide range of investors other than physical holders (producers and consumers). Crude oil is primarily traded on the New York Mercantile Exchange (NYMEX) and the ICE Futures Europe (ICE); gold on NYMEX and copper on the London Metals Exchange (LME). These commodities are also traded on the Tokyo Commodity Exchange (TOCOM) and other Japanese commodity exchanges. From broader view of commodity markets as a whole, there are other commodities that are also actively traded, such as natural gas, gasoline and other petroleum products, aluminum and other base metals, and soybeans and other crops.

Monitoring these commodities requires an understanding of their basic nature, in terms of the factors that influence supply and demand and the differences in types of market participants. For example, crude oil prices are influenced by the outlook for oil demand (itself dependent upon world economic conditions), the operating status of refineries, inventory levels, the supply stance of producing countries, geopolitical risks, and other supply-side factors, as well as hurricane forecasts and similar events. While gold prices are largely influenced by the demand for jewelry and by purchases or sales by major players such as central banks, the gold market, like financial futures markets, is highly liquid, and hence, gold prices tend to quickly reflect market participants' views of the market and economic trends. Primary factors influencing copper prices in recent period are demand, mainly from China and other emerging economies, and supply conditions affected by strikes at copper mines or other similar events. Although it is not easy to generalize from simple comparisons because of differences in the structure of the markets, biases in the positions of a limited number of investors tend to have a larger impact on the prices of LME, the main exchange for nonferrous metals, than NYMEX or other major commodity exchanges that have higher liquidity, which make copper prices more volatile than those of gold, for example.

In terms of market participants, while the traditional members were physical holders such as producers and consumers that fulfilled their hedging needs, as well as trading houses and financial institutions that acted as futures traders and brokers, a wide range of non-physical holders has joined the market in recent years. Many institutional investors and hedge funds have begun incorporating commodities into portfolios alongside stocks and other traditional financial assets, which has raised the presence of these investors on commodity markets (Box Chart 2 and page 5).

Box Chart 1: Characteristics of Major Commodities

	Crude oil	Gold	Copper
Exchanges	NYMEX	NYMEX	LME
	ICE	TOCOM	Shanghai
Weight in index (note)	37.2%	2.0%	3.8%

Note: S&P Goldman Sachs Commodity Index. Component percentages as of September 13, 2007.

Box Chart 2: Major Participants in Commodity Markets

Traditional participants	New participants
<ul style="list-style-type: none"> ● Producers ● Consumers ● Traders and Brokers 	<ul style="list-style-type: none"> ● Institutional investors (pension funds etc.) ● Financial institutions (investment banks etc.) ● Hedge funds ● Retail investors

It should also be noted that the section has strengthened its monitoring of emerging-economy markets in light of their growing presence in the global financial market.

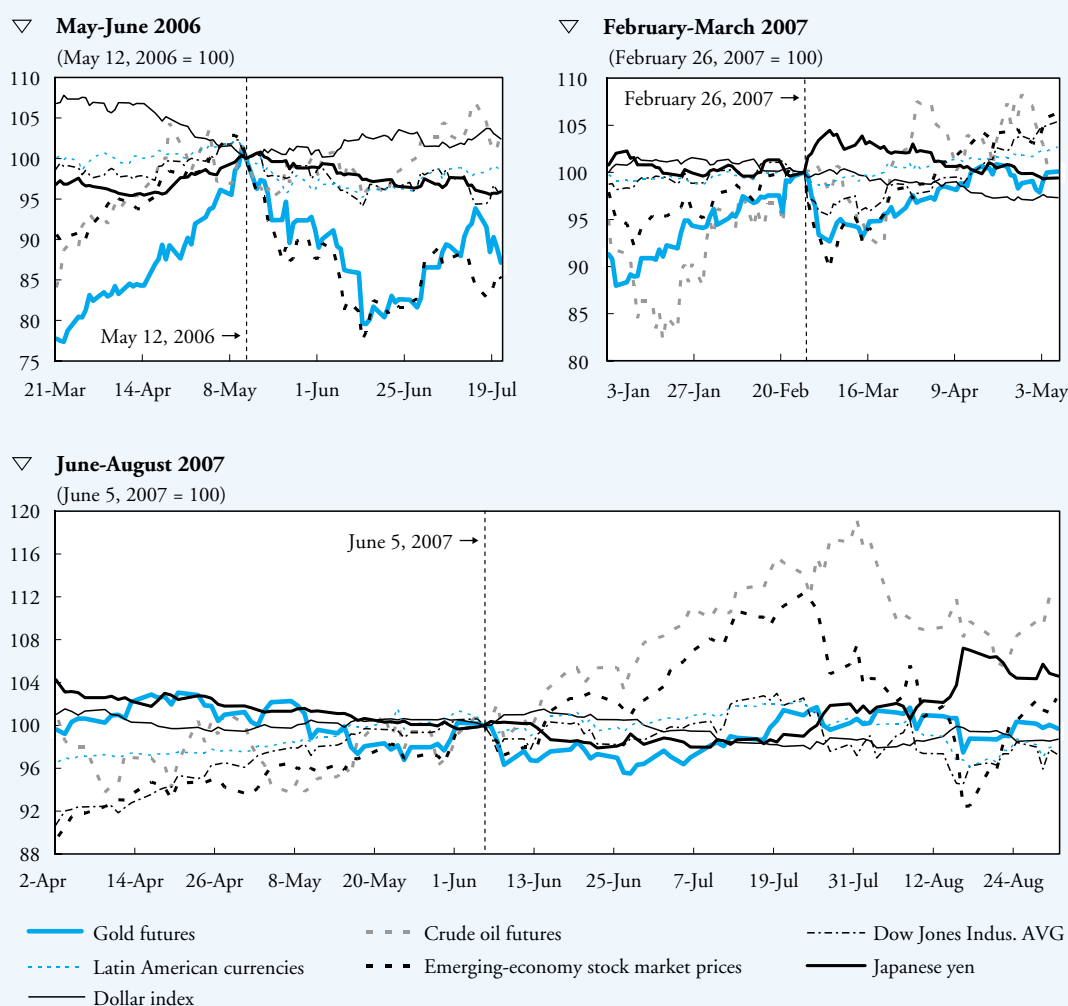
Behind this expansion of monitoring activities to include commodity markets and emerging markets was a judgement that developments in global financial markets could not be accurately captured otherwise. A growing number of global market players invest across a wide spectrum of markets, which makes it more important to monitor commodity markets in conjunction with foreign exchange and other global financial markets. While it is difficult to quantitatively observe changes in investor behavior, one can look at the results of investor surveys conducted by major

investment banks and discover that, in recent years, risk appetite shrank at the times of significant correction in the global financial markets.²

As discussed more fully below, during these corrections phases, prices of commodity markets and emerging markets tended to be more sensitive to the change in investors' risk appetite, possibly because these markets are not as liquid as the major markets. By monitoring trends in these markets, it may be possible to capture the changes of investors' risk appetite in a more timely manner, which indicates its increasing importance for central banks and other market participants.

The global financial markets have experienced three relatively large price corrections between 2006 and 2007 (**Chart 1**).

Chart 1: Market Developments during Global Price Corrections



Note: For gold futures, the leading contract month on NYMEX is used. For crude oil futures, the nearby contract on NYMEX is used. For Latin American currencies, a trading volume-weighted average index of Latin American currencies calculated by J.P. Morgan and Bloomberg is used. For emerging-economy stock market prices, the MSCI Emerging Index is used. For Japanese yen, the nominal effective foreign exchange rate calculated by J.P. Morgan is used. For the dollar index, a weighted average index of the dollar against 6 major currencies as calculated by FINEX is used.

Source: Bloomberg

The correction during May and June 2006 was called “global risk reduction,” because a wide range of investors simultaneously reduced their risk positions. This price correction was triggered by the market participants’ adoption of a more cautious outlook regarding the U.S. economy. The declines were both broad and deep, and it required approximately two months for prices to recover to their original levels. The corrections were particularly large for gold and emerging-economy stocks, which lost nearly 20% of value in about one month. Next largest were the corrections for Latin American currencies and U.S. stocks. Although the decline were only around 5%, it took approximately one month for these markets to bottom out.

During this period, the U.S. dollar made modest gains on the foreign exchange markets reflecting concerns that dollar-denominated interest rates might rise, the concerns of which were presumed to be the prime mover behind the overall correction. The Japanese yen experienced a modest decline. As such, the major currencies did not experience the same sharp price corrections as were seen for other markets. While the corrections for major economy stocks and currencies were muted, they were much deeper on the gold and emerging-economy stock markets, indicating the possibility that these markets had become relatively more overheated prior to the correction.

From the end of February and onto March of 2007, stock markets and some commodity markets (particularly gold and copper) experienced sharp price corrections, while the yen made significant gains due to the unwinding of yen short positions. The fact that the appreciation of the yen was accompanied by a decline in prices of U.S. and emerging-economy stocks and of gold indicates that the speculative positions unwound at this time may not have been limited to high-interest currencies but also included these commodity assets to some extent. This adjustment, however, was smaller and shorter compared with the aforementioned global risk reduction of 2006.

More recently, there was a correction in risk asset prices between early June and August of

2007. The correction began in early June with a price correction prompted by sharp rises in interest rates in the U.S. and other countries. It should be noted, however, that during this period, there were price declines for gold, copper, and U.S. equities, but very little correction for Latin American currencies, and stock prices recovered their pre-correction levels fairly quickly. This indicates that expectations of economic growth in Latin America was so strong that rising interest rates or changes in risk appetite had little impact. During this period, the dollar rose somewhat on the back of rising U.S. interest rates, but was basically flat. Subsequently, in late June and July, the widening impact of the “sub-prime loan problem” triggered price declines for mortgage-backed securitization vehicles in the United States and spread to the entire credit market leading to widespread concern about expanding losses at financial institutions and funds. After the middle of July, U.S. stocks turned down from their record-high levels, and the declines spilled over into emerging-economy stocks and commodities. This was a market correction triggered by declining liquidity in the credit market expanding to U.S. stocks, emerging-economy stocks, and commodities. The fact that price corrections were so widespread indicates that financial institutions and investors, confronted with declining market liquidity, reduced their risk tolerance and became more cautious in their investments in a wide range of assets. During this period, the foreign exchange markets saw corrections to the weak yen trend as investors moved to cut risks. The yen appreciated against other currencies and the dollar/yen rate temporarily fell to the middle of 111 yen/dollar, its lowest level since June 2006.

In all three of these price-correction phases, commodity prices, and particularly gold price, experienced far greater volatility than dollar rates and at some points, showed high correlations to emerging-economy stock prices. In fact, the price movements for gold cannot adequately be explained any longer within the traditional framework, such as negative correlation with dollar trends, the tendency for market participants to purchase gold in times of market turbulence, or

the use of gold as a hedge against inflation. Conceivably, the increase in commodity investment for the purpose of diversification, the inclusion of commodities in the assets purchased by hedge funds, and other similar trends of capital inflows to commodity markets are now having an impact on the price formation of Gold.

Expansion of trading volumes with the participation of global investors in commodity markets

When monitoring commodity markets, we set priority to: 1) understanding how global players invest in commodity markets, and 2) recognizing the influences that these trading behaviors have on global financial markets.

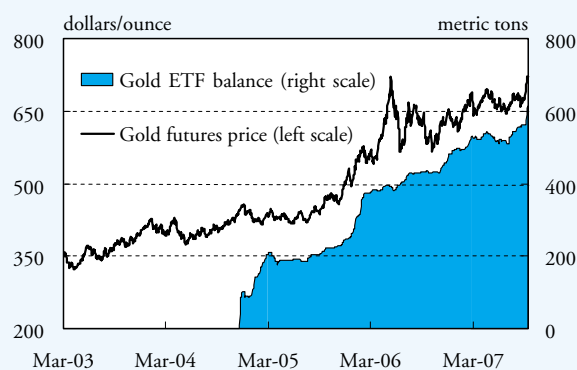
Over the past several years, global market players have begun to include commodity markets in their scope of investment. For global players such as pension funds who have longer-term investment horizons, one of the main reasons to start commodity investment is that, over the long term, commodity prices have low correlation with those of traditional assets. According to a survey conducted by a major investment bank, 55% of long-term investors interested in commodity investments respond that their motivation is “portfolio diversification” (followed by “absolute performance” at 33%).³

Looking at market trends, in 2000 and 2002, commodity markets showed relatively strong performance, while global equity markets were weak (Chart 2). It is believed that investors attempting to earn higher returns in spite of the globally low interest rate environment while diversifying their risks began investing in or expanding their investments in commodities

around 2003. Recent years have seen cases in which the correlation between prices of commodities and equities has increased, and whether investors will be able to continue to enjoy the diversification effect over the long term is somewhat uncertain.

With respect to the inflow of investment to the commodity markets from non-physical holders like pension funds, it is often pointed out that the initial impetus came from the introduction of exchange traded funds (ETF), commodity indexes, and other new commodity investment vehicles. In other words, the low liquidity of commodity markets compared with other financial markets was a barrier to many investors, but with the listing of ETFs of gold, silver, and other commodity-linked securitized products on major exchanges, which enable investors to deal with commodities at lower cost, in and after 2003, as well as the introduction of investment vehicles benchmarked to commodity indexes, commodity markets have increased their liquidity. This has in turn lead to a more robust inflow of money (Chart 3).

Chart 3: Gold Prices and Gold ETF Balances



Notes: 1. For gold futures, the NYMEX nearby contract is used; for gold ETF balance, the total of the New York and American exchanges is used.
2. The New York Stock Exchange listed a gold ETF on November 18, 2004. The American Stock Exchange listed a gold ETF on January 28, 2005.
Source: Bloomberg

Chart 2: Annual Rates of Return

Category	Index	2000	2001	2002	2003	2004	2005	2006
Commodities	S&P Goldman Sachs Commodity Index	+ 50	▲ 32	+ 32	+ 21	+ 17	+ 26	▲ 15
	Dow Jones AIG Commodity Index	+ 32	▲ 20	+ 26	+ 24	+ 9	+ 21	+ 2
Global equities	MSCI AC World Index	▲ 15	▲ 17	▲ 21	+ 32	+ 13	+ 9	+ 19
Global bonds	Citigroup World BIG Bond Index	+ 9	+ 7	+ 9	+ 3	+ 5	+ 3	+ 2

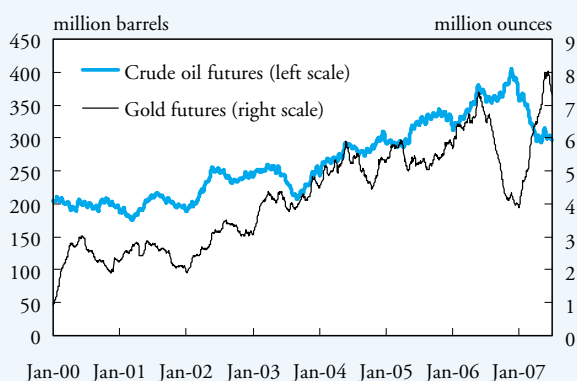
Note: Like the S&P Goldman Sachs Commodity Index, the Dow Jones AIG Commodity Index is an index comprised of several commodities. One of the things that sets it apart from the S&P Goldman Sachs Commodity Index is that oil receives a smaller weighting. The MSCI AC World Index is a weighted average index of the market capitalization of equity indexes in 48 developed and developing countries around the world. The Citigroup World BIG Bond Index is a price index comprised of bonds (government bonds, corporate bonds, mortgage bonds, municipal bonds etc.) from 20 developed countries.

Source: Bloomberg

In addition to institutional investors and other long-term investors, investment funds that attempt to capture profit opportunities by analyzing short-term price fluctuations across markets have also expanded their range of investments to include commodity futures.⁴

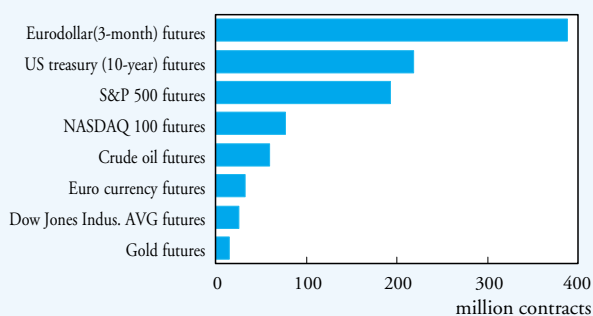
Trading volumes on commodity markets are expanding, in part because of the diversification of market participants (Chart 4). Indeed, trading volumes of crude oil, gold, and some other commodity futures have increased to the levels comparable to equity and currency futures (Chart 5).

Chart 4: Trading Volumes



Notes: 1. Trading volumes for the 1st through the 15th contract month on NYMEX and ICE are used for oil; on NYMEX for gold.
2. 100-day backward moving average.
Source: Bloomberg

Chart 5: Exchange Volumes



Notes: 1. Totals for October 2004 to September 2005.
2. For US treasury and Dow futures, CBOT (Chicago Board of Trade); for euro, S&P 500, NASDAQ and dollar interest futures, CME (Chicago Mercantile Exchange); for oil and gold, NYMEX are used.
Source: CFTC

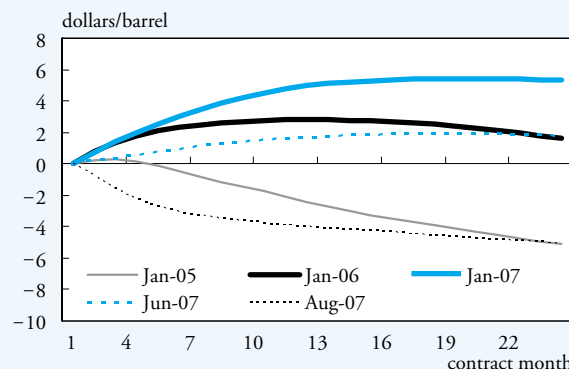
Such expansion of trading volumes may indicate that the views of a more diverse group of participants are now being reflected in commodity market prices, and also demonstrates the increased value of the information gathered through careful monitoring of these markets.

Changing price formation in response to the participation of global investors

Over the long term, prices on commodity markets are basically determined by the fundamentals (the relationship between demand and supply) of each commodity. When analyzing commodity market prices, one must also take into account several unique factors such as the impact of storage costs on spot prices and the high degree of regional segmentation compared with other markets. In this regard, market participants indicate that the entry of market participants active in global financial markets in recent years has brought changes to the ways in which prices are formed on commodity markets. When monitoring commodity markets, both fundamentals and other factors affecting price formation must be considered. As a specific example of changes in price formation, we will present tentative case studies on the crude oil and copper markets.

In the crude oil futures markets, a phenomenon called “backwardation,” in which prices tend to be lower as the contract months go farther in the future, had traditionally been observed. However, since 2006, there has been a stronger tendency towards “contango,” in which prices are higher at the farther contract months (Chart 6).

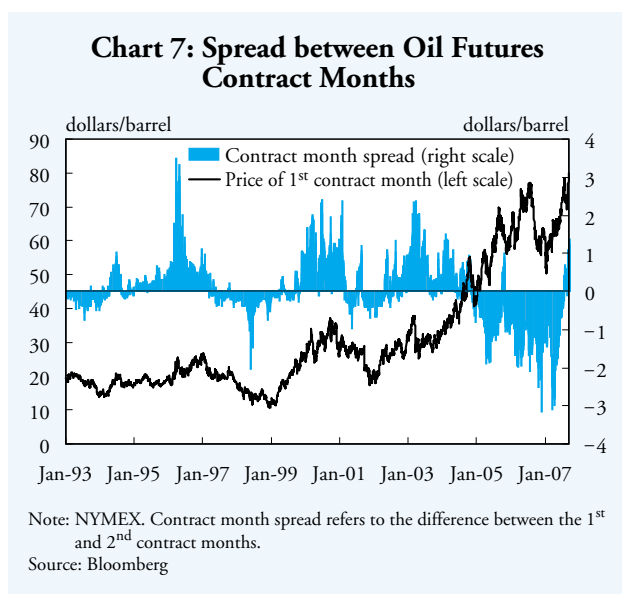
Chart 6: Crude Oil Futures Curve



Notes: 1. NYMEX. Contract month prices are shown as differences from the 1st contract month (nearest) of each point of time.
2. Data are as of the end of each month.
Source: Bloomberg

These changes are coinciding with substantial rises in oil prices and high price volatility, and hence, there is as yet no consensus view on whether they are transient or structural, nor on what the underlying factors are.

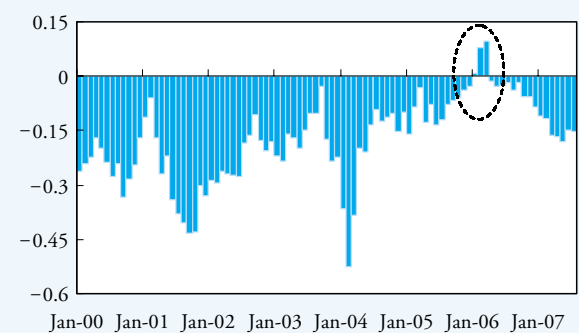
Some market participants think that the entry of non-physical holder investors into the market in the form of index investments etc. has produced structural changes in price formation. However, since the end of July, the price curve has reverted to a more traditional price curve in which prices are higher for closer contract months, with the closest contract months marking record price levels (**Chart 7**).



There are a number of different factors that influence demand and supply on the crude oil market, and monitoring requires close attention to activities of non-physical holder investors as well as physical holders.

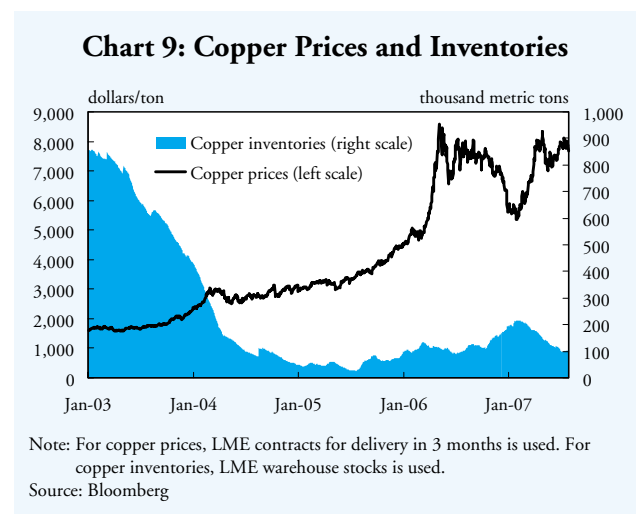
On the copper market, as with the crude oil markets, there are hints of changes in the price formation mechanism in recent years. Up to 2004, there was a moderate negative correlation between monthly changes in copper prices on the London Metals Exchange (LME) and changes in copper inventories. However, since 2005 the relationship has switched to the opposite, i.e. growing inventories have been accompanied by rising prices. Trends up to March 2006 indicate a positive correlation between the two (**Chart 8**).

Chart 8: Coefficient of Correlation between Copper Prices and Copper Inventories



Note: For copper prices, LME contracts for delivery in 3 months is used. For copper inventories, LME warehouse stocks is used. Coefficient of correlation is for the monthly rate of change (24-month backward moving average).
Source: Bloomberg

Prior to these changes, up until mid-2004, copper inventories levels declined from 900,000 tons to 200,000 tons (**Chart 9**). It may therefore be inferred that the change in the relationship between inventories and prices were caused by declining inventory levels themselves. However, it could also be inferred that the decline in inventory levels are the result of the change in this relationship and hence, both direction of causality is possible. It is, in addition, interesting that these changes on the copper market occurred at virtually the same time as the changes in the shape of the crude oil futures curve discussed above. While it is difficult to draw a definite conclusion at this point, if common factors were at work in changing the price formation mechanisms of the crude oil and copper markets, it is possible that the increase in non-physical holder investors during this period had some influence.



Looking at these changes in price formation from the perspective of non-physical holder investors, it seems that global investors' initial motive for entering commodity markets, risk diversification, has actually declined in recent years, which is a point of concern (**Chart 2**). While it is difficult to judge from only a few years of developments, if investors think that their entry into the market itself increased the price linkage with other assets and therefore prevented them from fulfilling their initial aims, it can lead to further changes in both investment behavior and the resulting price formation.

Issues to work on: Discussions in the BIS Markets Committee

The BIS Markets Committee is currently discussing the establishment of a global monitoring framework on global commodity markets in response to the increased attention toward them. In this process, the first step should be to study actual trading by market participants from the perspective of understanding the structures of commodity markets, just as are done for bond markets or equity markets.⁵

We will explain the recent developments on the Tokyo Commodity Exchange (TOCOM) as an example. It should be mentioned that TOCOM transactions are subject to maximum daily price fluctuation limits, which are not found in other major exchanges around the world (**Chart 10**).

Chart 10: Maximum Daily Price Fluctuation Limits on Major World Exchanges

	TOCOM	NYMEX	ICE
Oil	2,700 yen/kl	No limits (Note 1)	No limits
Gold	120 yen/g	No limits	× (Note 2)

Notes: 1. A "circuit breaker" system does exist (price movements in excess of a certain threshold result in a suspension of trading for a certain period of time, after which trading is resumed with higher fluctuation bands).

2. "×" indicates that the commodity is not listed on this exchange.

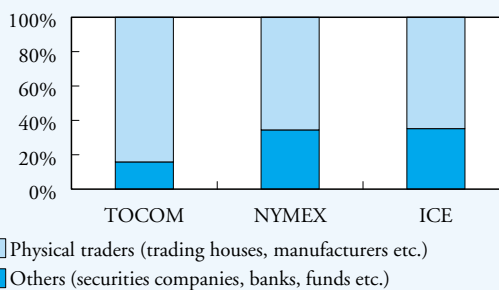
Sources: TOCOM, NYMEX, ICE

This rule was one of the reasons why Tokyo trading was stopped when there were volatile price movements for gold futures and other products in December 2005, a move that resulted in price divergence between Tokyo and foreign markets. TOCOM has subsequently relaxed its price

fluctuation limits for all futures trading, and in October 2007, raised the fluctuation limit for oil futures from 1,800 yen to 2,700 yen.⁶

There are also differences in the participants on the world's major commodity exchanges. Comparing the structure of members (settlement members) of TOCOM against other commodity exchanges, TOCOM has a relatively high percentage of physical traders (including specialist brokers) and low participation of others (**Chart 11**). If the changes in commodity market price formation mechanisms noted in this paper are the result of the entry of non-physical holders, these differences in participant structure have the potential to create discrepancies in global price formation, which is an issue that deserves careful monitoring.

Chart 11: Membership of Commodity Exchanges



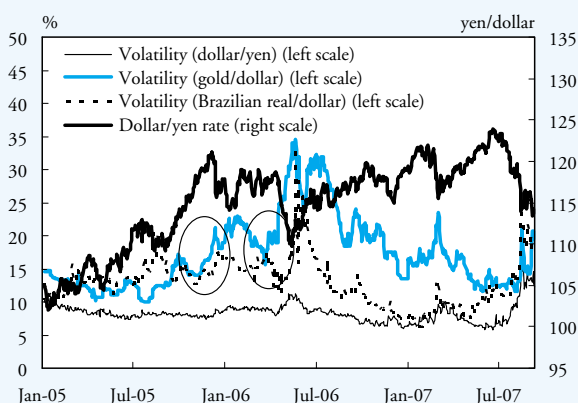
Sources: TOCOM, NYMEX, ICE

Enhancing monitoring techniques

Finally, we would like to note some of the remaining issues to be considered in daily monitoring of global financial market trends. There is a steady stream of new and different participants who have an influence on price formation in global financial markets; namely Japanese retail investors in the foreign exchange market and non-physical holders in the commodity markets. As a result, it may be possible that the leading indicators that show the investors' sentiments have diversified. For instance, one technique for capturing the sentiment of market participants regarding the outlook for the yen rate has traditionally been to use information from the options market. This is because the price of options allows one to calculate the degree of fluctuation that the market expects in the value of the yen (implied volatility). However, according to

the recent experience, there were some cases where it was not the implied volatility of the dollar/yen rate that went up prior to a sharp decline in the dollar/yen rate (i.e., an appreciation of the yen), but the Brazilian real/dollar or the gold/dollar volatility instead (the circled points on **Chart 12**).

Chart 12: Implied Volatility of the Dollar/Yen Rate, Commodities, and Emerging-Economy Currencies



Note: 1-month implied volatility
Source: Bloomberg

The mechanism behind these phenomena is not clear, but these experiences do demonstrate the possibility that the sentiment of the markets as a whole can be more effectively captured by referring to markets participants' views expressed in various option prices for commodities and the emerging-economy currencies.

We believe that, by making more detailed, and intense use of the information contained in commodity markets, it is possible to extract useful information for understanding and analyzing trends of major currencies and global markets. In this regard, utilizing the expertise and experience that we have accumulated with respect to the dollar-yen, euro-dollar, and other major currency markets to build up a similar body of knowledge regarding commodity markets and emerging-economy financial markets, should be effective. We would also like to enhance the opportunities for exchanging views with participants in domestic and foreign commodity markets so as to deepen our understanding of market developments and structures.

¹ The BIS Markets Committee (formerly known as the Committee on Gold and Foreign Exchange) was established in 1962 following the initiation of the so-called Gold Pool

(a mechanism using funds collected from the central banks of Europe and North America to stabilize the gold market with trading on London market performed by the Bank of England as an agent). Though the Gold Pool arrangement ended in 1968, members continued to meet for open and informal exchange of views. Over the years, the focus of these discussions has shifted towards coverage of recent development in foreign exchange and related financial markets, an exchange of views on possible future trends, and consideration of the short-run implications of particular current events. Since June 2006, the committee has been chaired by the Bank of Japan (Chair: Hiroshi Nakaso, Director General, Financial Markets Department). For further information see <http://www.bis.org/about/factmktc.htm>.

² An example is the Merrill Lynch Global Fund Managers Survey, which asks about allocations of cash in portfolios. According to this survey, the larger the "net balance," defined as the number of investors responding "underweight" subtracted from the number of investors responding "overweight," the more risk averse investors are (the higher their cash positions). During the correction that took place around May 2006, the net balance increased from 18 to 29; during the correction of February 2007, from 14 to 30.

³ Survey by Barclays Capital, February 2007.

⁴ For discussion of the increase in hedge fund investments in commodities, see Naoto Higashio, Tai Terada, and Tokiko Shimizu, "Changes in Hedge Fund Investment Behavior and the Impact on Financial Markets-Position Concentration, Expanded Scope, and Market Liquidity Risk" (December 2006 *Bank of Japan Review*, <http://www.boj.or.jp/en/type/ronbun/rev/rev06e06.htm>).

⁵ For a specific example of exchange market microstructure, see Larry Harris, *Trading and Exchanges: Market Microstructure for Practitioners*, Oxford University Press, USA (September 30, 2002).

⁶ For details see TOCOM "Modifications in Oil Market Contracts" (http://www.tocom.or.jp/news/2007/20070919_Modifications_in_Oil_Market_Contracts.html).

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