Chapter 1 Global economy facing challenges: current status and issues

The subprime mortgage problem in the United States, whose strong consumption previously led the global economic growth, has developed into a global financial crisis through the Lehman shock of September 2008. The ensuing turmoil in the financial and capital markets is developing into a world economic crisis (global recession) as it affects the real economies around the world through a decline of the credit creation function and via international trade and investment relations.

In this chapter, which provides an overview of the current status and issues of the global economy, Section 1 will analyze the factors behind the financial crisis, the effects of the crisis on countries and regions, and the necessary conditions for resolving the crisis. Then, it will identify the factors behind the expansion of the U.S. housing market that gave rise to the crisis and the factors that led the U.S. subprime mortgage problem to develop into the global financial crisis, and it will point out that the former factors in particular could significantly affect the medium- and long-term measures that should be taken in order to deal with the crisis and prevent its recurrence.

Section 2 will identify the effects of the crisis on the real economies around the world, show that the effects may differ from country to country and region to region and point out that the current crisis has revealed the problems and weaknesses of the economic growth structures of various countries and regions. Moreover, it will provide an overview of economic stimulus measures taken by countries and regions and the effects thereof.

Section 1 Global economy going through financial crisis toward economic crisis

In response to a sudden drop in U.S. housing prices in 2006, the U.S. housing loan market, which had been steadily expanding until then, immediately entered a correction phase. Because of the housing price drop, the delinquency rate and the number of foreclosures on subprime mortgage loans for individuals with low creditworthiness rose sharply and prices of securitized products incorporating subprime mortgage loans dropped steeply. Thus, the subprime mortgage problem occurred.

The subprime mortgage problem immediately grew into a serious liquidity crisis involving European countries that had purchased vast amounts of securitized products.[1]

Since the failure of U.S. investment bank Lehman Brothers in September 2008, a credit crunch has spread worldwide, causing the global economy to face what is said to be the greatest financial crisis since the Great Depression of 1929, with stock prices posting record-breaking falls in major stock markets around the world.

Since the third quarter of 2008 in particular, when U.S. consumption, which heavily depended on borrowings, started to shrink rapidly, global trade has declined quickly in response to a plunge in exports to the Untied States from countries around the world, producing a serious impact on the real economies around the world. A financial crisis that started in the United States is turning into a world

[1] For details concerning the turmoil in the United States and Europe that was caused by the subprime mortgage problem, see Section 2 of this chapter and Section 2, Chapter 1 of the White Paper on International Economy and Trade 2008.

economic crisis, as it has been accompanied by a sharp drop in U.S. consumption, which acted as the driving force behind global economic growth.

This section analyzes the factors behind the financial crisis and the effects of the crisis on global trade and investment as well as the various conditions that must be met in order to resolve the crisis.

1. Factors behind the financial crisis

There is no doubt that the expansion of the U.S. housing market in recent years lies behind the current financial crisis. The expansion of the U.S. housing market was a background factor for the arrival of financial products like subprime mortgage loans in the United States, investors' increased preference for risk assets, credit rating agencies' assignment of high ratings to securities backed by subprime mortgage loans and other re-securitized products and financial institutions' increased inclination toward the securitization business.

The drop in U.S. housing prices triggered the collapse of the trust among the various parties involved in the market, including home buyers, investors, rating agencies and banks, leading to the global financial crisis.

Below, we will identify the factors behind the expansion of the U.S. housing market and the factors that led the U.S. subprime mortgage problem to develop into a global financial crisis, and we will point out that the former factors in particular could significantly affect the medium- and long-term measures that should be taken in order to deal with the crisis and prevent its recurrence.

(1) Factors behind the expansion of the U.S. housing loan market

In terms of the amount of outstanding housing loans, the U.S. housing market is worth around $10 trillion (equivalent to ¥1,200 trillion based on the yen-dollar exchange rate as of the end of 2006), or about seven times the size of the Japanese housing market (worth ¥180 trillion as of the end of 2005). In terms of the amount of new loans, it is worth around $2.8 trillion (equivalent to ¥336 trillion based on the yen-dollar exchange rate as of the end of 2006), or about 15 times the size of the Japanese market (worth ¥23 trillion as of the end of 2005). The annual loan amount (refinancing plus new loans) has increased sharply in the United States in recent years, rising to $2.5 trillion in 2006, or more than triple the amount of 10 years before. In line with the expansion of the housing market, U.S. housing prices, which posted an annual average year-on-year rise of 3.5% in the 1990s, climbed by an annual average of 7.2% since 2000, with the pace of the annual rise peaking at 9.4% in 2005.[2]

What supported this expansion of the housing market financially was the huge amount of funds raised in the United States and other countries through the U.S. mortgage securitization market.

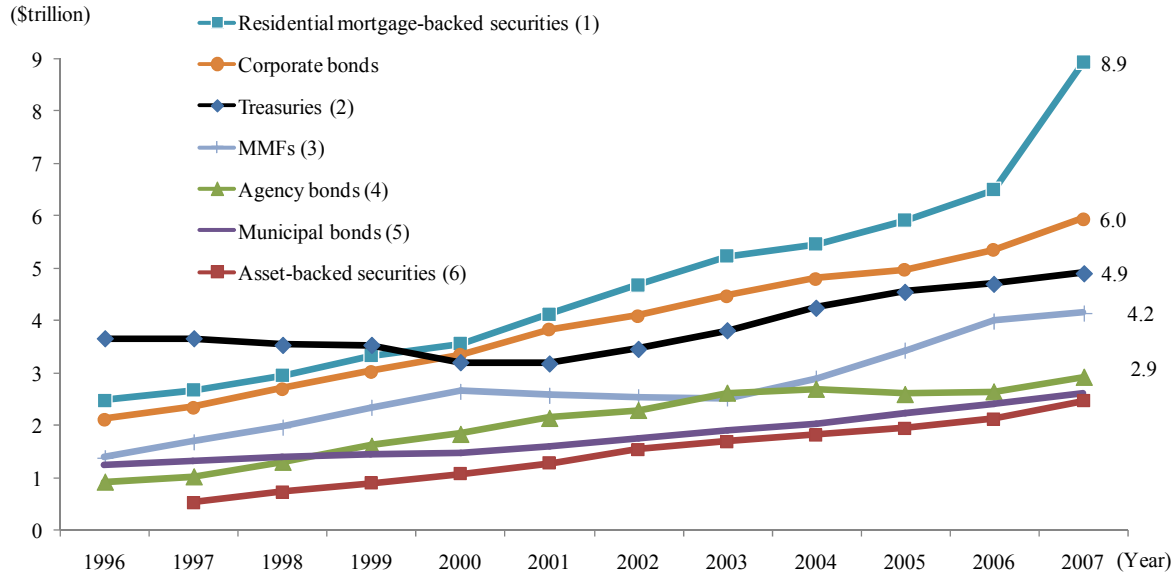
(A) Expanding U.S. mortgage securitization market

The size of the U.S. market for RMBS[3] is around 60 times the size of the Japanese market. The annual amount of RMBS issued in the United States is equivalent to some 80% of the annual amount

[2] Statistics compiled by the Federal Housing Finance Agency (FHFA) (January 1992 to June 2007)
[3] RMBS stands for residential mortgage-backed security.

of new housing loans (the ratio is some 20% in Japan), with 63% of the outstanding housing loans securitized (as of January 2006). Data on changes in the amount of outstanding securities by securities type in the U.S. capital market (see Figure 1-1-1-1) show that the amount of outstanding treasuries (Marketable Treasuries) was the largest until the 1990s because of their higher liquidity and their reputation as sound assets (characteristic of government securities and investment-grade securities[4]).

Figure 1-1-1-1 Changes in the amount of outstanding securities by securities type in the U.S.



Notes:
(1) Residential mortgage-backed securities (RMBS) collateralized by claims on mortgages issued by a government agency (Ginnie Mae), public enterprises (Fannie Mae and Freddie Mac) or private financial institutions.
(2) Marketable treasuries.
(3) Commercial paper, bank acceptances and large time deposits, etc.
(4) Securities issued by governmental agencies or public enterprises established to facilitate loans to homebuyers, students, or farmers (excluding (1)).
(5) Securities issued by states, cities or counties for their fundraising.
(6) Securities collateralized by claims on auto loans or credit cards.
Source: SIFMA (http://www.sifma.org/research/pdf/Overall_Outstanding.pdf).

However, whereas the amount of outstanding government securities grew slowly, the amount of outstanding RMBS issued by government and public housing loan enterprises and private-sector housing loan companies continued to increase rapidly,[5] exceeding the amount of outstanding government securities in 2000 to become the largest category of securities in terms of the outstanding amount. In 2007, when the subprime mortgage problem surfaced, the amount of outstanding RMBS grew to around $9 trillion from $6.5 trillion in the previous year.

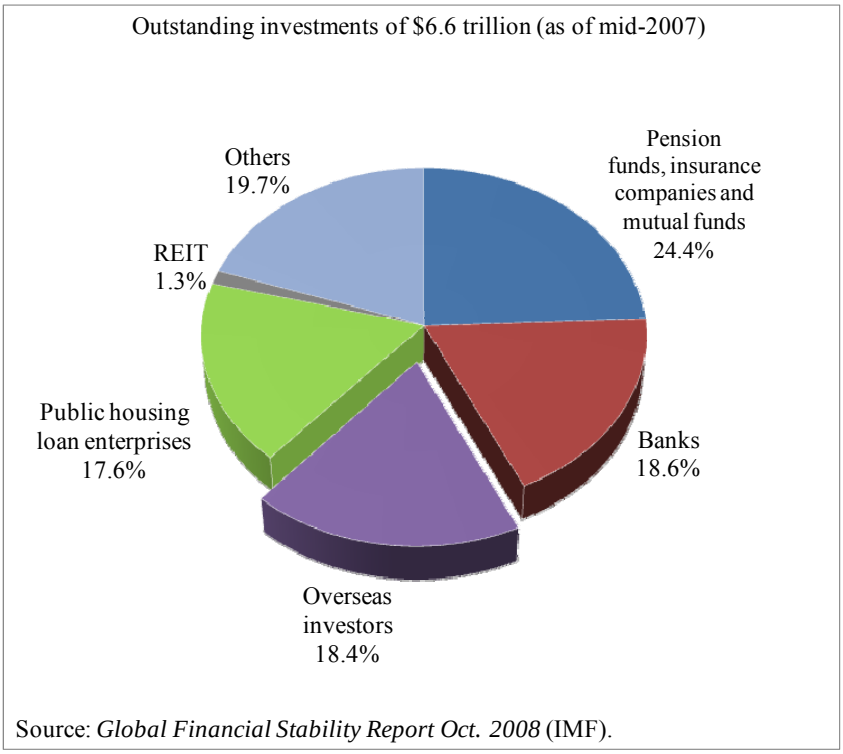
As securitized mortgage loans were sold to a broad range of investors in the United States and

[4] "Investment-grade securities" usually refers to securities rated "BBB" or higher.
[5] In the United States, private-sector housing loan companies issue RMBS, in addition to Ginnie Mae (Government National Mortgage Association), which is a government agency, and Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation), which are public enterprises. However, the amount of RMBS issued annually by Ginnie Mae, Fannie Mae and Freddie Mac far exceeds the amount of RMBS issued by private-sector housing loan companies. In 2007, the amount of RMBS issued by private-sector housing loan companies stood at $678 billion, about half of the $1.3717 trillion issued by Ginnie Mae, Fannie Mae and Freddie Mac.

other countries, it can be said that the U.S. housing loan market was supported by financial investment money flowing from both within and outside the United States (see Figure 1-1-1-2). The largest investors were U.S. pension funds, insurance companies and mutual funds, together accounting for around 24.4% of the overall funds invested.[6] U.S. banks, government and public housing loan enterprises and overseas investors accounted for around 18% each, with the remainder coming from REITs (real estate mutual funds) and others.

It should be noted that Figure 1-1-1-2 concerns investments made by primary investors in mortgage-backed securities and does not include investments in re-securitized products by government and public housing loan enterprises and banks. Therefore, if investments in re-securitized products are included, the amounts of financial investments by pension funds, insurance companies and mutual funds as well as overseas investors in particular are likely to increase.

Figure 1-1-1-2 Amount of outstanding investments in U.S. RMBS by primary investor



Source: *Global Financial Stability Report Oct. 2008* (IMF).

(B) Inflows of financial investments from pension funds, insurance companies and mutual funds

Institutional investors like pension funds, insurance companies and mutual funds in the United States and other developed countries have played a major role in expanding the U.S. housing loan market. The global fund management policies of such institutional investors, who manage vast amounts of financial investment money, have a significant influence on the trends of prices of global stocks, bonds and other financial assets.

Figure 1-1-1-3 shows changes in the amounts of funds managed by pension funds, insurance

[6] A further breakdown shows that pension funds and insurance companies accounted for 14.5% and mutual funds 9.9% respectively.

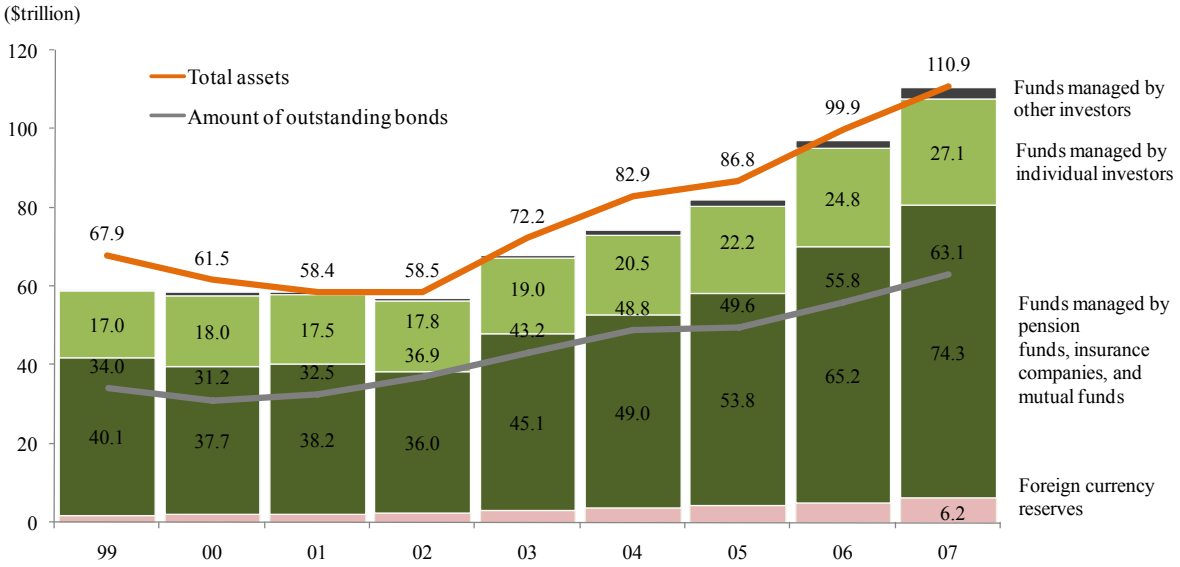
companies, mutual funds and individual investors in the United States and other developed countries as well as the amount of global foreign currency reserves. It also shows changes in the amount of outstanding bonds and the total stock market capitalization in developed countries and some emerging economies where those funds are invested.[7]

What is notable about the breakdown of financial investment money is that the amount of funds managed by pension funds, insurance companies and mutual funds, which place priority on long-term, stable fund management, is by far the largest. These funds are comprised mainly of funds from developed countries, where social security systems and financial markets are well developed, so their amount has expanded rapidly since 2003 due to the aging of society and the spread of defined-contributions pension plans in developed countries, totaling $74.3 trillion as of the end of 2007, more than doubling from $36.0 trillion in 2002.[8] In the meantime, there has not been such a significant change in the amounts of funds managed by individual investors, hedge fund managers and other investors in developed countries, who generally pursue high-risk, high-return fund management. Consequently, the amount of funds managed by pension funds, insurance companies and mutual funds as of the end of 2007 was 2.7 times as large as the amount of funds managed by individual investors, 11.9 times as large as the amount of global foreign currency reserves and 27.1 times as large as the amount of funds managed by hedge funds and other investors.

[7] In emerging economies, too, the amount of funds held by pension funds and mutual funds has increased significantly in recent years. The amount of funds held by pension funds in emerging economies, which stood at $300 billion in 1996, grew rapidly to exceed $1 trillion in 2006. The amount of funds held by mutual funds in emerging economies, which stood at $600 billion in 2000, surged to $2.7 trillion in 2007 (IMF, "Global Financial Stability Report, October 2008"). However, those funds were excluded from this analysis because their amounts are very small compared with the amounts of funds held by pension funds and mutual funds in the United States and other developed countries.

[8] For example, the IMF points out that the spread of the 401(k) plan of the United States and other defined-contribution pensions plans in developed countries led to a rapid increase in funds held by mutual funds in particular (Global Financial Stability Report September.2005, p.81).

Figure 1-1-1-3 Global financial investment money and financial assets



Notes:
1. Total assets is the sum of the amount of outstanding bonds and the total stock market capitalization
2. Foreign currency reserves do not include gold. The amount of funds managed by other investors consists of the sum of funds managed by private equity funds and hedge funds.
3. Assets (bonds and stocks) are the sum of U.S., Canada, UK, France, Germany, Italy, the Netherlands, Switzerland, Japan, Australia, Singapore and Hong Kong.
4. Funds managed by pension funds, insurance companies, mutual funds, private investors and other investors mainly consist of funds from developed countries and do not include ones from emerging economies.
Source: *CBS Fund Management 2003–2008* (International Financial Services, London).

The amount of financial assets has also grown rapidly since 2003. A breakdown by asset type shows that the growth in the amount of bonds was slower than the growth in the amount of funds managed by pension funds and other institutional investors, whereas the stock market capitalization (represented in the graph as the difference between the total asset amount and the amount of outstanding bonds) has grown steeply since 2003. Although it shrank until 2002 after the collapse of the IT stock bubble in 2000, the stock market capitalization accounted for around 40% of the overall assets as of the end of 2007.

This indicates that the growth in the amount of funds managed by institutional investors in developed countries led to an increase in global demand for financial assets, thereby promoting the expansion of global stock and bond markets, which were the main financial investment targets for those funds. This view is corroborated by a drop in the yields on inflation-linked treasuries in recent years (see Figure 1-1-1-21).[9]

The factors behind the huge amount of funds invested by pension funds, insurance companies and mutual funds in RBMS include: (i) that the amount of funds managed by pension funds, insurance companies and mutual funds around the world has grown rapidly in recent years, (ii) that it was necessary for these institutional investors to invest in sound assets from which a stable investment return was expected in the long term given the very long periods of pension and insurance obligations, (iii) that the requirements of pension funds and insurance companies were precisely met by principal

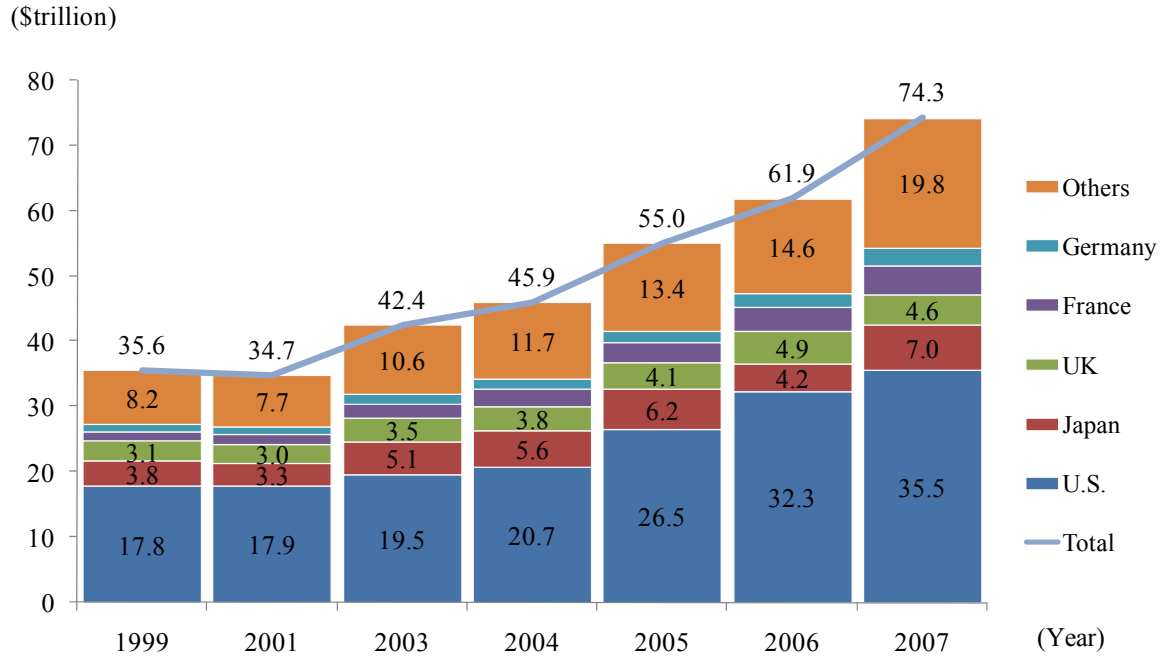
[9] For example, the IMF points out that a decrease in the return on investments in securities in recent years reflects the fact that an increase in demand for assets due to an expansion of funds managed by institutional investors exceeds growth in the supply of assets (Global Financial Stability Report April.2007, p.76)

and interest revenue generated over long periods such as 30 years in the U.S. housing loan market, which maintained stable growth as a result of a population increase due to inflows of immigrants and (iv) that the development of the U.S. mortgage securitization market enhanced access to U.S. mortgage loans by institutional investors, including pension funds.

The amount of funds managed by pension funds, insurance companies and mutual funds around the world, which stood at less than $36 trillion in 1999, has expanded strongly since 2003, exceeding $74 trillion as of the end of 2007 (see Figure 1-1-1-4). The amount of funds managed by pension funds, insurance companies and mutual funds in the United States as of the end of 2007 almost matched the amount of funds managed by their counterparts in all other developed countries combined, or $38.6 trillion (see Figure 1-1-1-5).

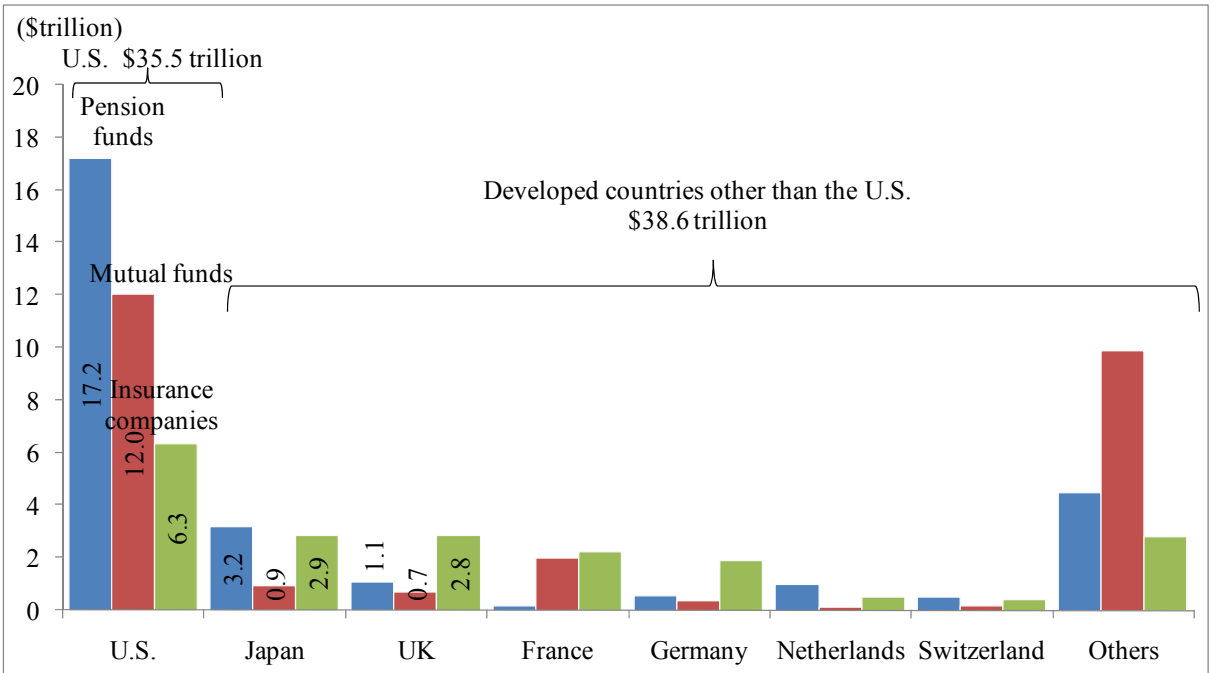
In light of the above, we may conclude that the inflow of a portion of the huge pool of funds, totaling more than $70 trillion, into the U.S. housing loan market, whose size was less than a tenth of that amount, was a major factor behind the overheating of the U.S. housing market.

Figure 1-1-1-4 Increasing amounts of funds managed by U.S. pension funds, insurance companies and mutual funds



Source: *CBS Fund Management 2003–2008* (International Financial Services, London).

Figure 1-1-1-5 Amount of funds managed by pension funds, insurance companies and mutual funds in developed countries (as of the end of 2007)



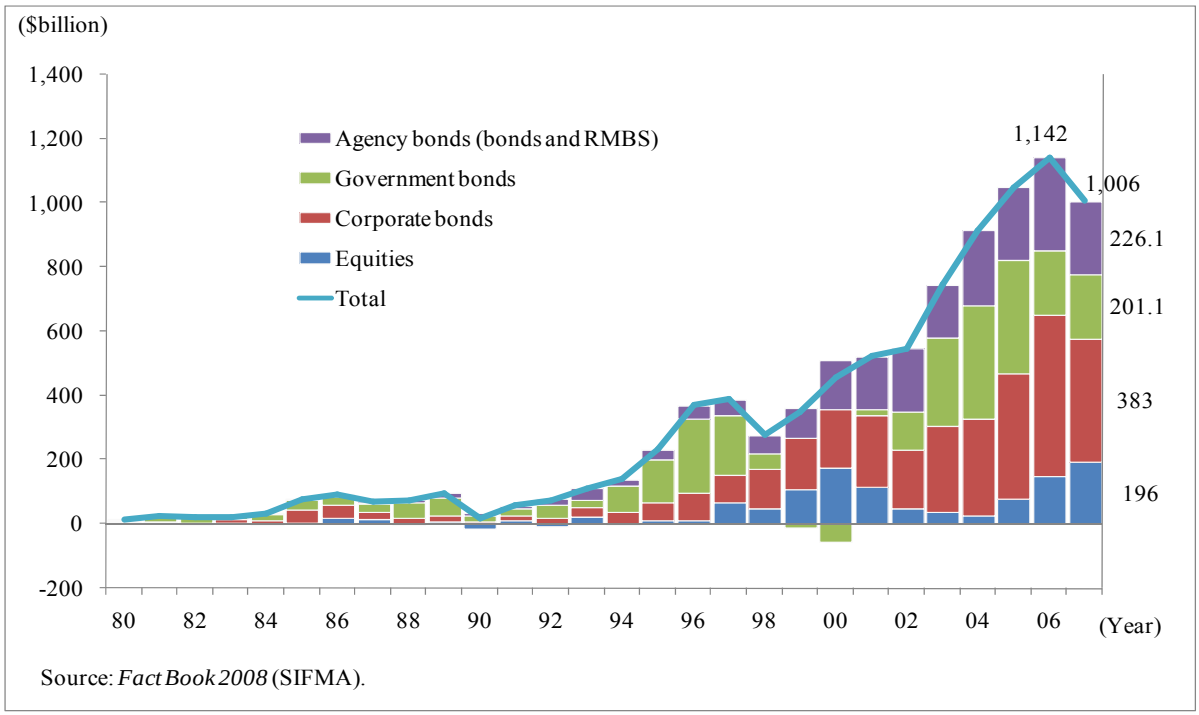
Source: *CBS Fund Management 2003–2008* (International Financial Services, London).

(C) Inflow of overseas funds

Now, we will look at the trend in overseas funds flowing into the U.S. bond market.

The amount of overseas funds flowing into the U.S. bond market has grown every year since 1998, with net purchases reaching $1 trillion in the peak year of 2006 (see Figure 1-1-1-6). The net purchase amount was about a sixth of the total amount of U.S. bonds issued in that year, or $6.2 trillion. A breakdown by bond type shows that since 1998, net purchases of agency bonds issued by the Government National Mortgage Association (Ginnie Mae), the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), grew rapidly, although such bonds had drawn little interest from abroad until then. This indicates that agency bonds have become another important element of overseas investors' U.S. portfolio investment in recent years in addition to U.S. treasuries and corporate bonds.

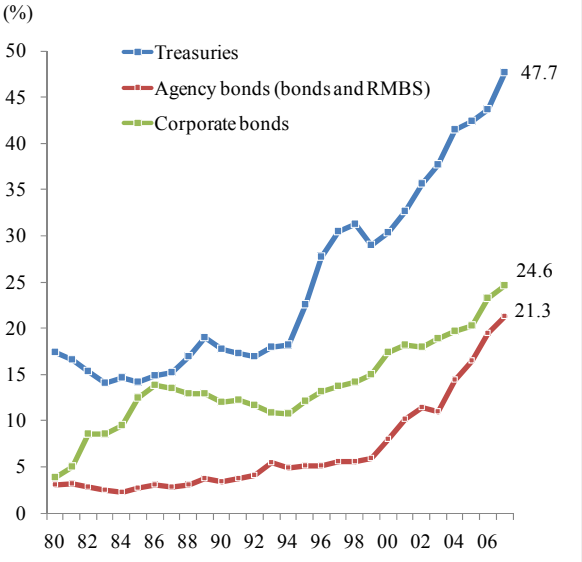
Figure 1-1-1-6 Changes in net purchases of U.S. debt and equity securities by foreign countries



Source: *Fact Book 2008* (SIFMA).

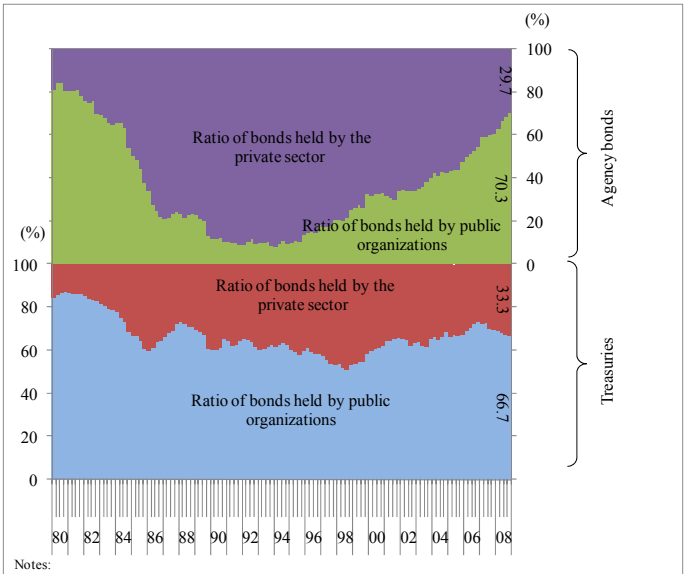
As a result, the ratio of U.S. bonds held by foreign countries to the total amount of outstanding U.S. bonds continued to rise year after year. In the peak year of 2007, foreign countries held 48% of all outstanding U.S. treasuries, 25% of all U.S. corporate bonds and 21% of agency bonds (see Figure 1-1-1-7 (i)).

Figure 1-1-1-7(i) Ratio of U.S. debt securities held by foreign countries to the total amount of outstanding U.S. debt securities



Source: *Flows of Funds* (FRB).

Figure 1-1-1-7(ii) Breakdown of U.S. treasuries and Agency bonds held by foreign countries by type of owner



Notes:
1. Agency bonds is the sum of bonds and RMBS issued by the government agency or public enterprises
2. Corporate bonds include mutual funds.
Source: *Flow of Funds* (FRB).

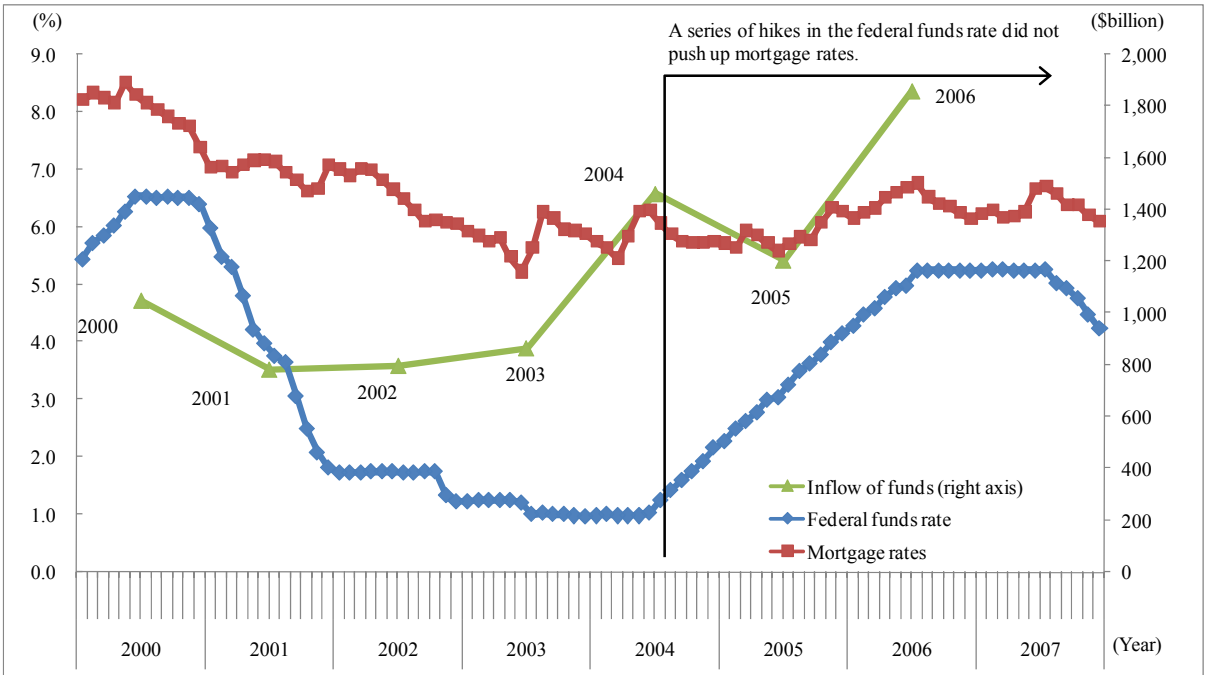
In addition, a breakdown of bonds held by foreign countries by type of owner (see Figure 1-1-1-7 (ii)), shows that the ratio of agency bonds held by foreign public organizations has risen since the latter half of the 1990s. That ratio, which stood at around 10% in the mid-1990s, reached 70% in the fourth quarter of 2008. On the other hand, the ratio of U.S. treasuries held by foreign public organizations has mostly stayed in the range of 60% to 70%. This indicates that as foreign currency reserves grew rapidly in Asian countries and other emerging economies whose economic development continued and as pension funds increased sharply in developed countries where the aging of society advanced, vast amounts of foreign currency reserves and pension funds flowed into U.S. treasuries and agency bonds[10] as safe investment vehicles with high liquidity.

(D) Long-term interest rates stabilizing at lower levels

The huge inflow of funds into the U.S. bond market from both within and outside the United States stabilized U.S. long-term interest rates at lower levels, thereby supporting the expansion of the U.S. housing market. The Federal Reserve Board (FRB), concerned about the overheating of the U.S. housing market, gradually raised short-term interest rates after 2004 in an attempt to curb housing loans through an ensuing rise in long-term interest rates. Usually, a rise in short-term interest rates would have led to a rise in long-term interest rates, including the interest rates on housing loans with maturities of up to 30 years, thereby shrinking the housing market. However, the FRB's attempt ended in failure because the huge inflow of funds from both within and outside the United States continued and also because investors did not curb their financial investments amid expectations of a continued inflow of abundant funds from within and outside the United States. Consequently, the U.S. housing market remained in a state of overheating until 2006, when housing prices suddenly plunged (see Figure 1-1-1-8).

[10]Of the three government and public housing-related organizations that issue Agency bonds, Ginnie Mae is a government agency and Fannie Mae and Freddie Mac are privately-owned organizations. Therefore, securities issued by Fannie Mae and Freddie Mac do not receive U.S. federal government guarantee. Regarding this fact, Goldman Sachs Asset Management pointed out in a note to investors that as these two organizations are regulated and supervised by the Office of Federal Housing Enterprise Oversight (currently known as the U.S. Federal Housing Finance Agency) as private enterprises established under a special federal act, they are regarded as government-affiliated financial institutions that virtually have creditworthiness next to that of U.S. treasuries.

Figure 1-1-1-8 Trends in the federal funds rate, U.S. mortgage rates and inflow of funds from outside the U.S. (from 2000s to 2007s)



Notes: Mortgage rates are the rates on 30-year fixed-rate mortgages.
Source: FRB, *Global Financial Stability Report Oct.2007* (IMF).

(E) The United States as a supplier of sound assets for the world

What are the factors behind the continued inflow of massive funds from within and outside the United States into the U.S. housing loan market?

In many developed countries, including the United States, financial assets held by individuals and funds managed by pension funds are increasing significantly, reflecting such factors as the aging of society. Financial assets held by individuals and foreign currency reserves held by emerging economies like China and oil-producing countries in the Middle East are also growing significantly, reflecting the strong economic growth of such countries and a rise in natural resource prices in recent years.

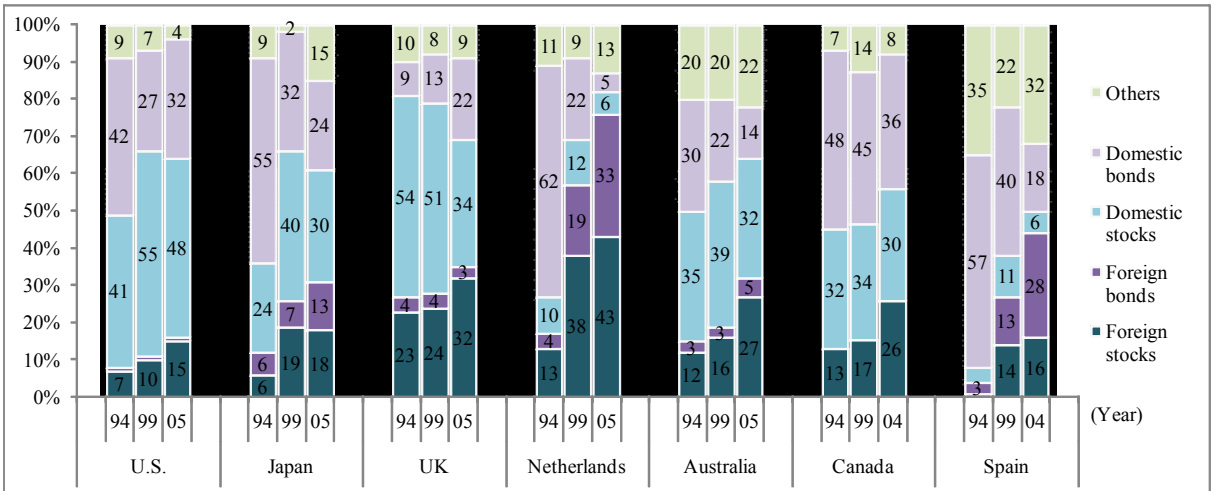
The holders of these funds are making financial investments around the world in pursuit of financial assets suited to their respective fund management strategies. For example, pension funds and insurance companies, which are required to make stable fund management in the long term in order to steadily fulfill their pension and insurance obligations, need assets that generate stable returns in the long term.

On the other hand, hedge funds and other fund managers who are required to earn higher returns in the short term need assets that generate higher returns in the short term. Managers of foreign currency reserves, which must be invested in safe assets with high liquidity, need safe assets denominated in foreign currencies as a temporary storage of their value.

The advance of financial engineering and the progress in international financial liberalization made

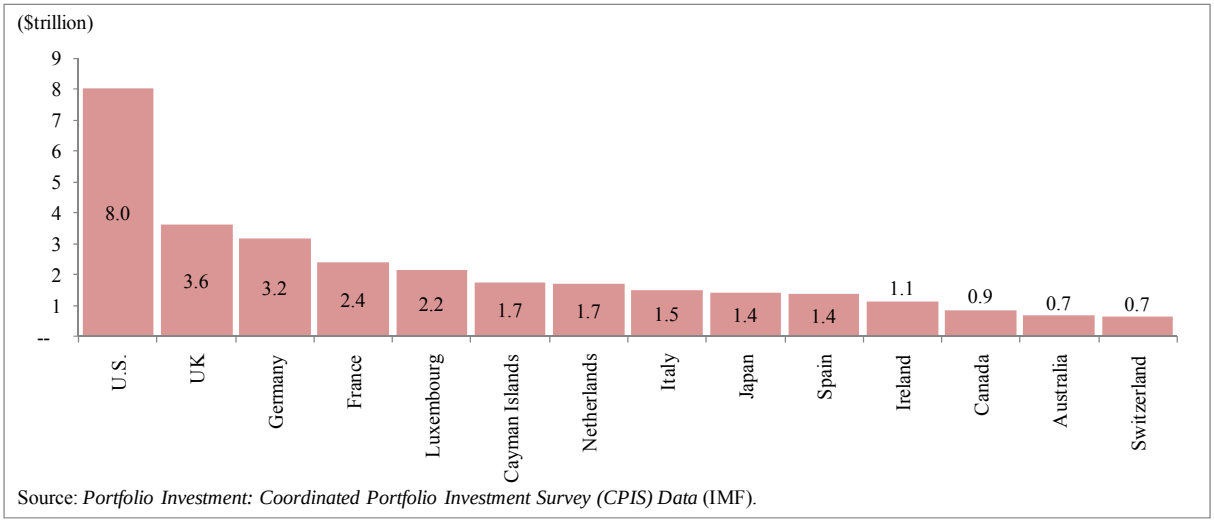
it possible for institutional investors to expand their range of investment targets beyond the domestic market into foreign markets (see Figure 1-1-1-9). The facts that U.S. pension funds invest a very small proportion of their financial investment money (money allocated to financial investment) in foreign securities compared with pension funds in other countries (see Figure 1-1-1-9) and that the amount of outstanding inward portfolio investment is far larger in the United States than in other countries (Figure 1-1-1-10) strongly suggest that the United States is the only country that can provide the sound assets needed by the managers of pension and other funds.

Figure 1-1-1-9 Changes in the asset structure of pension funds in major countries



Source: *Global Financial Stability Report Apr. 2007* (IMF).

Figure 1-1-1-10 Amount of outstanding inward portfolio investment by country and region



Source: *Portfolio Investment: Coordinated Portfolio Investment Survey (CPIS) Data* (IMF).

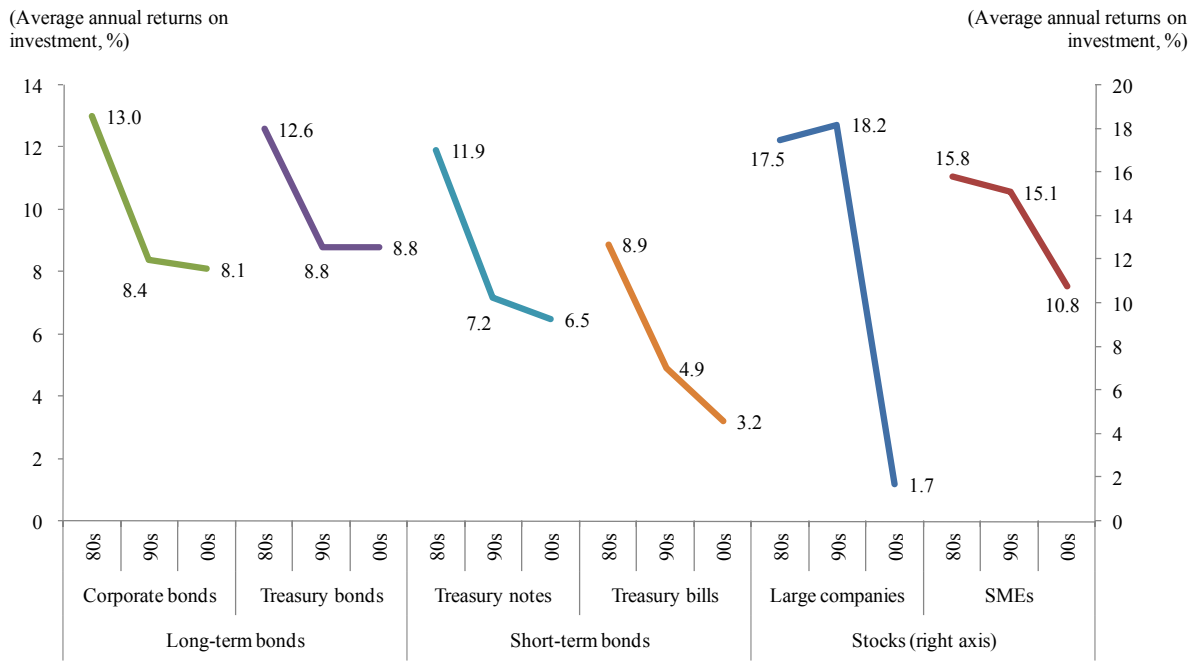
(F) Declining returns on financial investments and depleting sound assets: needs for development of new types of sound assets

(a) Declining returns on financial investments

The reaction of the stock and bond markets to an increase in demand for financial investments

usually takes the form of a decline in returns on the investments.[11] The returns on investments in both U.S. bonds and stocks over the past 30 years (see Figure 1-1-1-11) have either declined or remained flat. A downward trend in returns on financial investments leads to declines in the investment profits earned by investors, which increases pressure on investment banks and fund managers to improve their investment profits. This gives investment banks and fund managers, who are engaging in fierce competition for customers, a strong incentive to develop new financial products that can serve as sound assets with higher returns.

Figure 1-1-1-11 Trends in returns on investments in both U.S. bonds and stocks (from 1980s to 2000s)



Notes: The 2000s decade covers the period from 2000 to 2007.
Source: *Fact Book 2008* (SIFMA).

(b) Depleting sound assets

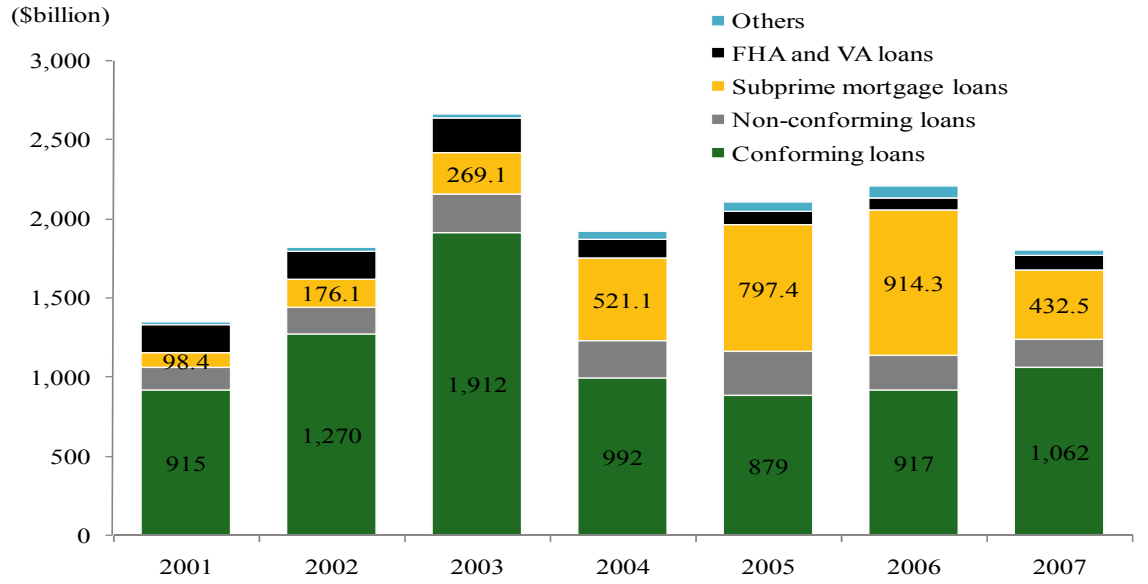
In addition to the declining returns on financial investments, the depletion of existing sound assets, including securitized products backed by prime mortgage loans as the underlying assets, provided a strong incentive for the development of new types of sound assets. Figure 1-1-1-12 shows the trend in the mortgage securitization market. The securitization of conforming loans,[12] for which it is easy to obtain a high credit rating because they are guaranteed by public enterprises, continued to increase sharply until 2003 but has decreased steeply since 2004. The securitization of FHA and VA loans,

[11] For example, the IMF points this out in "Global Financial Stability Report April 2007," Chap. II, p.76-78.
[12] "Conforming loans" refers mainly to loans to borrowers in the prime category that are purchased by public enterprises (Fannie Mae and Freddie Mac) and securitized by them into RMBSs with their guarantees. As they are secured by government guarantees, they are regarded as the safest asset with a rating of "AAA."

which are guaranteed by federal government agencies,[13] has also decreased since 2004. In contrast, the securitization of subprime mortgage loans,[14] for which it is difficult to obtain a high credit rating because they are not guaranteed by public enterprises, has increased sharply since 2004. (The securitization of non-conforming loans,[15] which are also not guaranteed by public enterprises, has remained flat.)

The securitization of conforming loans has decreased since 2004, presumably because the purchase of houses increased rapidly during the prolonged housing market boom, particularly among the prime borrowers, who were able to borrow housing loans relatively easily. Indeed, the home ownership ratio in the United States reached a record high of nearly 70% in the fourth quarter of 2004 (see Figure 1-1-1-13). Presumably, loans to consumers in the subprime category, to which financial institutions had previously been not eager to offer loans, were increased sharply following a surge in housing prices in order to offset a decline in the number of first-time home buyers among borrowers in the prime category.

Figure 1-1-1-12 Changes in the amount of RMBS issued; decreasing prime loans and increasing subprime loans



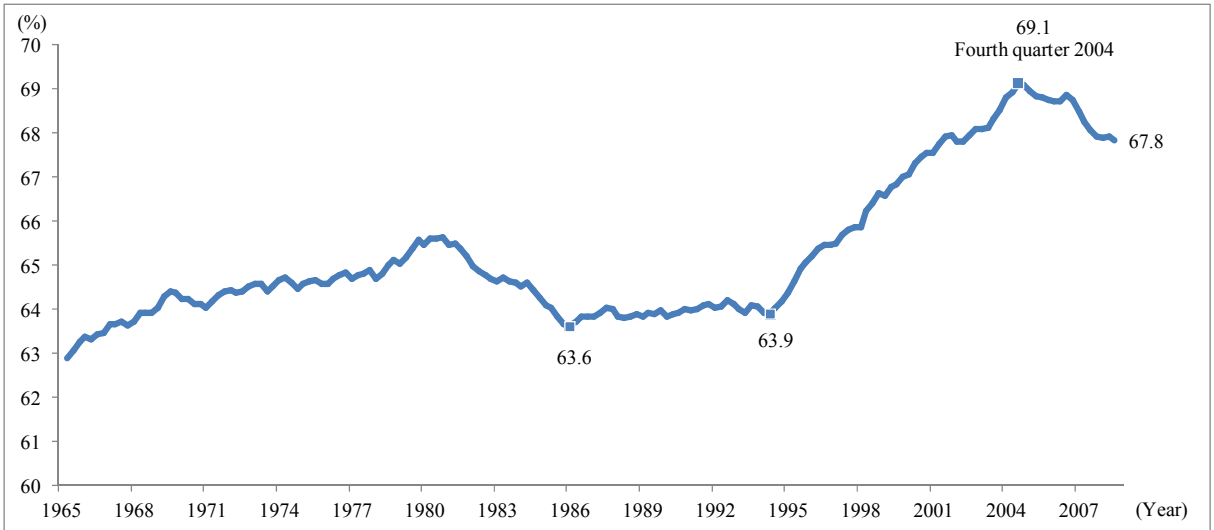
Notes: See footnotes for the details of each type of loans.
Source: *Global Financial Stability Report Oct. 2008* (IMF).

[13] These loans, which are mortgage loans provided by Federal Housing Loan Administration (FHA) and Veterans Administration, are securitized into RMBS and guaranteed by Ginnie Mae, which is a federal government agency.

[14] Including "alt-A loans," which refers to mortgage loans provided to borrowers with medium-level creditworthiness. Loans to borrowers in the prime category are classified as alt-A loans if they lack full documentation or their LTV (loan-to-value) ratio is high.

[15] "Non-conforming loans" refers to loans to be securitized by private-sector housing loan companies and not covered by public guarantee. A typical non-conforming loan is a prime jumbo loan, which is provided to a borrower with high creditworthiness (prime category) but whose amount exceeds the limit for a conforming loan.

Figure 1-1-1-13 Changes in the home ownership ratio in the U.S.



Notes: Three-quarter moving average.
Source: *Housing Vacancies and Homeownership* (US Census Bureau).

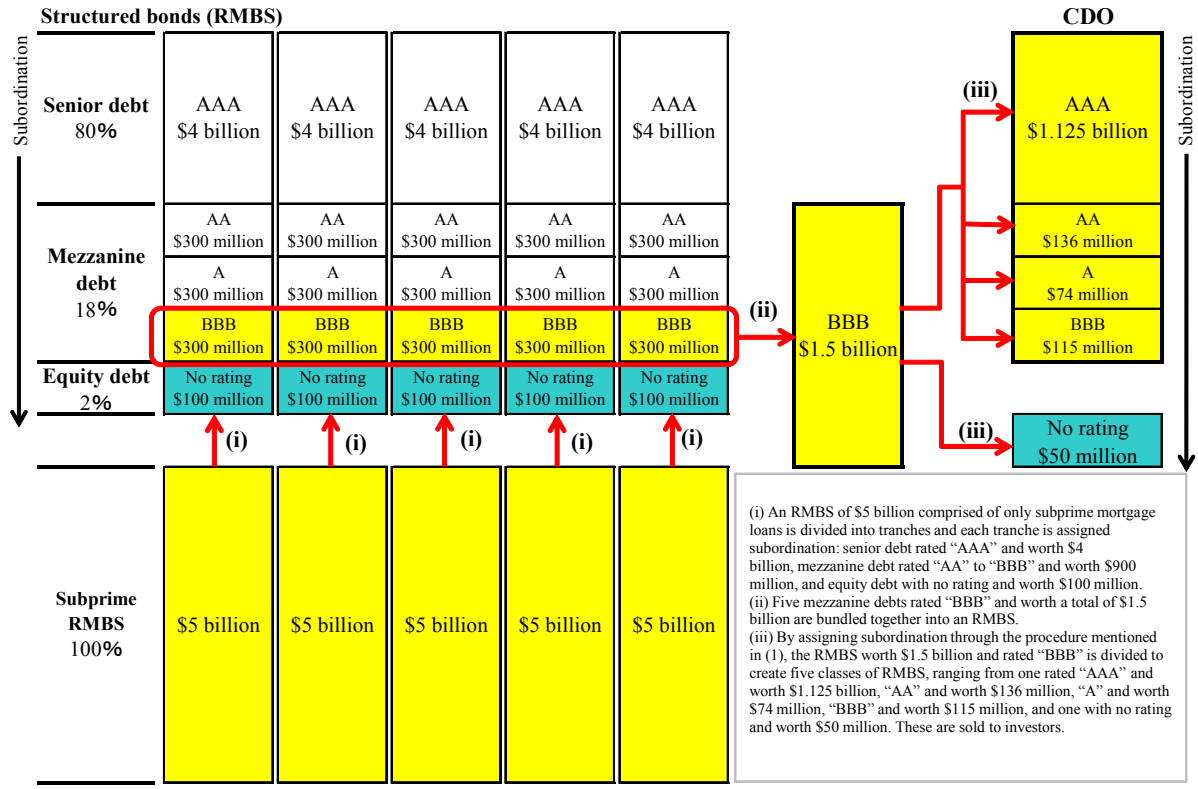
(c) Creation of new types of sound assets (structured bonds)

However, as the creditworthiness of subprime mortgage borrowers is low, it was difficult to obtain a high credit rating for securitized products (RMBS) backed by such loans.

To resolve this problem, structured bonds were invented. Structured bonds are created by dividing an RMBS comprised of several subprime mortgage loans into tranches and assigning subordination to each tranche. As a result, three classes of debts (RMBS), namely senior debt, mezzanine debt and equity debt, are created. When a borrower has repaid the principal, buyers of senior debt have the first claim on the repaid funds, and buyers of mezzanine debt have claim on the remaining funds if any.[16] Rating agencies assigned a rating of "AAA" to senior debt, as it was given the highest priority in repayment and had an extremely small probability of causing losses. Mezzanine debt, which was assigned a variety of ratings ranging from "A" to "C," was used to create collateralized debt obligations (CDOs), which will be mentioned later. Equity debt was not assigned any rating. Through this procedure, about 75% of subprime mortgage loans were securitized, of which about 80% were assigned a rating of "AAA" as senior debt and 18% were treated as mezzanine debt and 2% as equity debt.[17] This meant that unless mortgage borrowers defaulted on more than 20% of the overall underlying debts, buyers of senior debt would not incur any losses (see Figure 1-1-1-14 (i)).

[16] Interest is paid for every tranche.
[17] IMF, "Global Financial Stability Report April 2008"

Figure 1-1-1-14 Example of creation of collateralized debt obligations (CDOs)

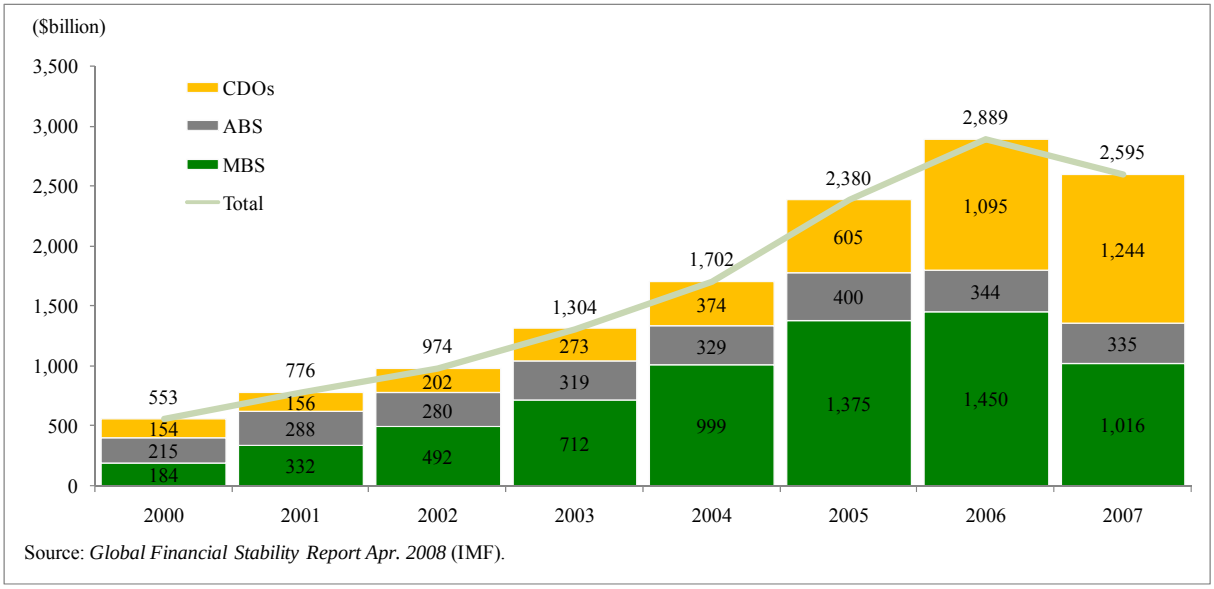


In the example case shown in Figure 1-1-1-14 (ii) and (iii), tranches with a rating of "BBB" selected from among the mezzanine debt created through the process in (i) are bundled together and then divided into several tranches, each of which is assigned subordination through the above-mentioned procedure. As a result, several RMBS, ranging from one rated "BBB" and worth $1.5 billion to one rated "AAA" and worth $1.125 billion[18] are created. These are called CDOs. Structured bonds also include ABS (asset-backed securities) backed by assets including accounts receivables or auto loans and CMBS (commercial mortgage-backed securities) backed by commercial mortgages. Structured bonds created through the above-mentioned procedure were purchased by a wide range of institutional investors around the world, from hedge funds to pension funds, because they offered higher yields than corporate bonds and treasuries with similarly high ratings and also because they gave investors a wide range of options to choose from, including investment-grade debt (senior debt and mezzanine debt) and equity debt with no rating, according to their own risk preference.

Consequently, the amounts of outstanding MBS and CDOs issued in the United States and Europe have grown rapidly in recent years, reaching $1.0 trillion and $1.2 trillion, respectively, in 2007 (see Figure 1-1-1-15).

[18] Other RMBS created in this example case are one rated "AA" and worth $136 million, one rated "A" and worth $74 million, one rated "BB" and worth $115 million and one with no rating and worth $50 million.

Figure 1-1-1-15 Changes in the amount of outstanding structured bonds in the U.S. and Europe



Source: *Global Financial Stability Report Apr. 2008* (IMF).

(G) Financial institutions' increasing inclination toward the securitization business

In addition to government-sponsored housing loan enterprises and institutional investors like pension funds and insurance companies, financial institutions, including major U.S. and European commercial banks and investment banks (securities companies), played a major role in funneling funds into the U.S. housing market (see Figure 1-1-1-2).

Those financial institutions accelerated the flow of funds into the U.S. housing market not only by making their own investments in RMBS and other securitized products but also by playing the central role in the securitization business, including the origination and distribution of re-securitized products (structured bonds) backed by mortgage loans as the underlying assets.

They established shell companies called SPVs (special purchase vehicles) for the purpose of originating and distributing structured bonds and actively engaged in the securitization business, in which they resold to investors around the world re-securitized products (structured bonds) originated from vast amounts of mortgage loans they purchased.

Moreover, many major U.S. and European financial institutions established shell companies for the purpose of making financial investments[19] and expanded assets by (i) raising funds through the issuance of CP (commercial paper) in the short-term money market with CDOs they purchased as collateral, (ii) using those funds to purchase additional CDOs from other financial institutions and (iii) issuing new CP with those CDOs as collateral in order to raise funds for the purchase of yet more CDOs.

(2) Factors that led the collapse of the U.S. housing bubble to trigger the global financial crisis

(A) Destabilization of bank balance sheet structure

As one important factor that led the turmoil in the short-term money market (a liquidity crisis)

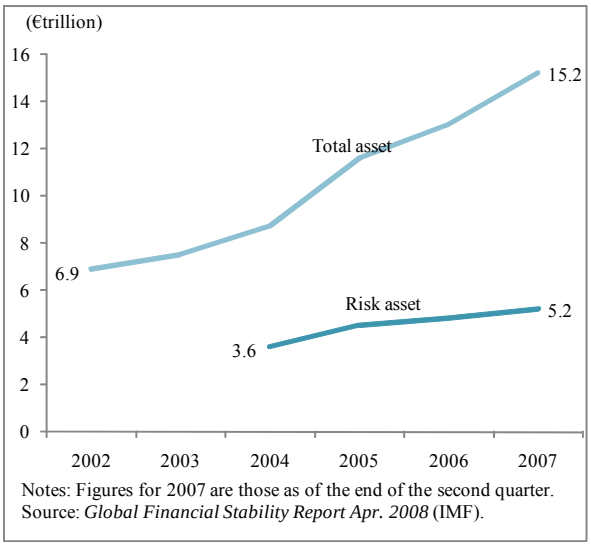
[19] These companies were called conduits or SIVs (structured investment vehicles).

caused by the U.S. subprime mortgage problem to trigger the unprecedented global financial crisis, we can point to the destabilization of the balance sheet structure of U.S. and European financial institutions that was caused by their increased inclination toward the securitization business.

Data on 10 major U.S. and European financial institutions' balance sheets show that although their total assets have increased sharply in recent years, their risk assets have grown only slightly (see Figure 1-1-1-16 (i)). This is because (i) the ratio of financial investments (e.g. portfolio investments and acceptance of bills) to these financial institutions' total assets has increased sharply while the ratio of loans has declined rapidly (see Figure 1-1-1-16 (ii)) and (ii) the risk weight of CDOs and other structured bonds could be set at a low level because rating agencies assigned a rating of "AAA" to them, as was mentioned earlier, while the risk weight of loans was usually set at a higher level than that of securities.

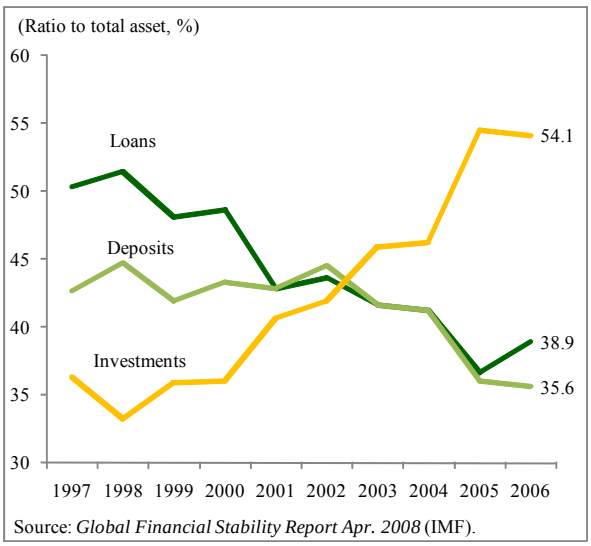
Figure 1-1-1-16 Ten major U.S. and European financial institutions' balance sheets

(i) Changes in the amounts of total assets and risk assets



Notes: Figures for 2007 are those as of the end of the second quarter.
Source: *Global Financial Stability Report Apr. 2008* (IMF).

(ii) Changes in the amount of loans, investments and deposits



Source: *Global Financial Stability Report Apr. 2008* (IMF).

As major financial institutions inclined further toward the securitization business, their traditional business model of providing loans using funds raised mainly through deposits underwent a significant change. In other words, as the securitization business grew more important as the source of profits for major financial institutions than the loan business, the ratio of deposits, which previously served as a stable source of funds, to their total assets dropped sharply (see Figure 1-1-1-16 (ii)).

It was the issuance of CP in the short-term money market that replaced deposits and become a major source of funding, the issuance of short- and long-term corporate bonds, and the origination and distribution of securitized products. However, fund-raising through these instruments was problematic in that the fund-raising costs were more susceptible to the market environment and more volatile than deposit interest rates.

In addition, a rise in the ratio of short-term debts, including outstanding CP debts, on the debt side of their balance sheets and a rise in the ratio of securitized products on the asset side meant that they

were purchasing securitized products, including CDOs, whose maturity was long and whose liquidity was low, with funds raised through the issuance of CP, whose maturity was short. This made their balance sheets' structure very unstable. As a result, a decline in the function of the short-term money market and downgrades of credit ratings assigned to securitized products immediately led to a deterioration of the fund-raising conditions and an increase in risk assets, causing many financial institutions to face a crisis situation.

(B) Sharp downgrades of securitized products by rating agencies

It was the abrupt, sharp downgrades of securitized products being traded around the world due to their investment-grade status that acted as the direct trigger causing the collapse of the U.S. housing bubble to become a global credit crunch and they eventually caused the Lehman shock of September 2008.

After the delinquency rate for subprime mortgage loans began to rise following a drop in housing prices, U.S. rating agencies started to downgrade their credit ratings assigned to RMBS and re-securitized products such as CDOs on a massive scale. The downgrades for securitized products were much sharper than those made in the past for corporate bonds and other securities. Figure 1-1-1-17 provides a comparison of the changes from the initial ratings made by S&P (Standard & Poor's) in 2007 for securities backed by subprime residential mortgage loans (originated since 2005) (see Figure 1-1-1-17 (i)) and the changes made by the same rating agency for corporate bonds in 2001 in the wake of the collapse of the IT stock bubble (see Figure 1-1-1-17 (ii)). This shows that the ratio of securities backed by subprime residential mortgage loans whose rating was downgraded in 2007 is much higher than the ratio of corporate bonds whose rating was downgraded in 2001, when corporate earnings deteriorated significantly as a result of the collapse of the IT bubble. Of the overall securities backed by subprime residential mortgage loans with a rating of "A" or lower, more than 50% were downgraded. In addition, most of the securities rated "BBB" or higher that suffered a rating downgrade were downgraded by three notches or more, indicating that the higher the initial rating was, the sharper the downgrade was.

The sharp rating downgrades abruptly made by rating agencies generated criticism that the agencies had assessed securities backed by subprime residential mortgage loans too generously.[20]

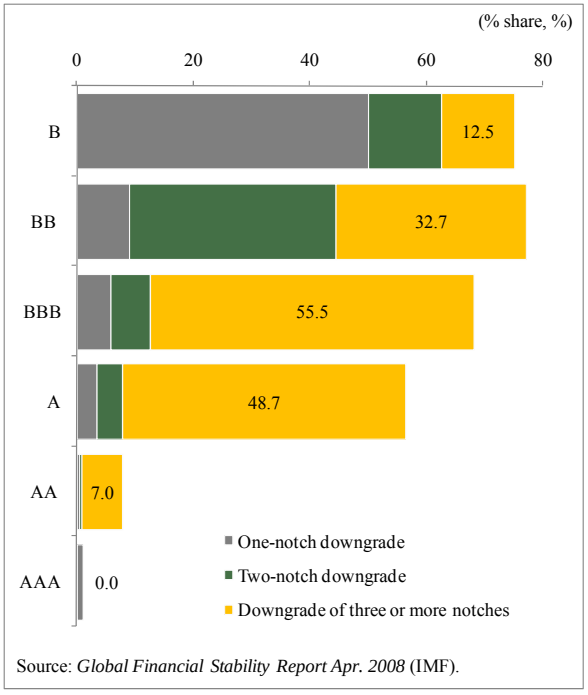
The questionable nature of credit rating agencies' assessment of securities backed by subprime residential mortgage loans becomes more pronounced when we compare the credit spreads for RMBS and corporate bonds. Figure 1-1-1-18 provides a comparison of the credit spreads for RMBS rated "AAA," corporate bonds rated "AAA" and those rated "BBB." It indicates that a large gap remained between credit rating agencies' assessment of the credit risk involved in RMBS and markets'

[20] In this respect, Keiko Sawada, Managing Director and Chief Credit Officer of Moody's Japan K.K., for example, pointed out in a public symposium held in December 2008 by Fair Rating, a non-profit organization, that, "When we rate a securitized product in the future, we will assign a 'V score,' which indicates the changeability of the assumptions for the rating, in addition to an ordinary rating score. This may mean that with regard to ratings assigned to subprime RMBS in 2005 and 2006, the assumption concerning a drop in housing prices was not appropriate. The fact that we are reviewing the past ratings means that there was a change in our assumption."

assessment of it, even after July 2007, when the ratings of numerous RMBS started to be downgraded. The spread for RMBS rated "AAA," which should be similar in size to the spread for corporate bonds rated "AAA," widened significantly after July 2008, becoming as large as the spread for corporate bonds rated "BBB." This strongly suggests that rating agencies have lost the trust of the market since the summer of 2007, when they started to make sharp downgrades on a massive scale and that their subsequent ratings reviews have been insufficient.

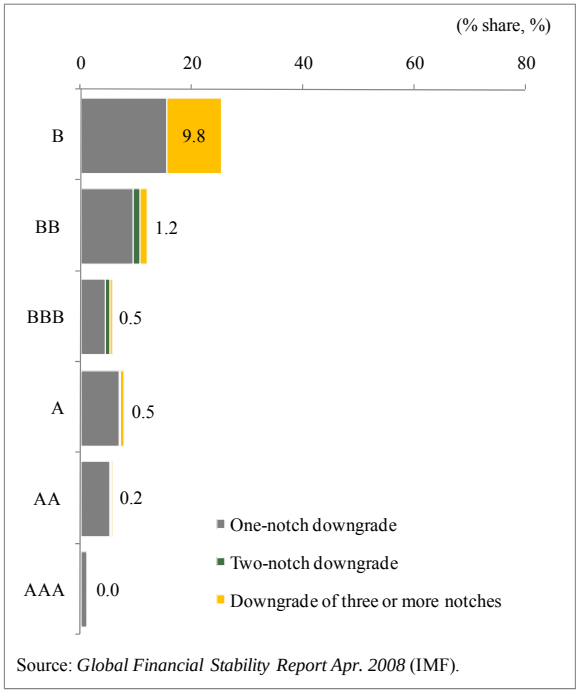
Figure 1-1-1-17 RMBS downgraded more sharply than corporate bonds

(i) Subprime residential mortgage-backed securities (2007–2008)



Source: *Global Financial Stability Report Apr. 2008* (IMF).

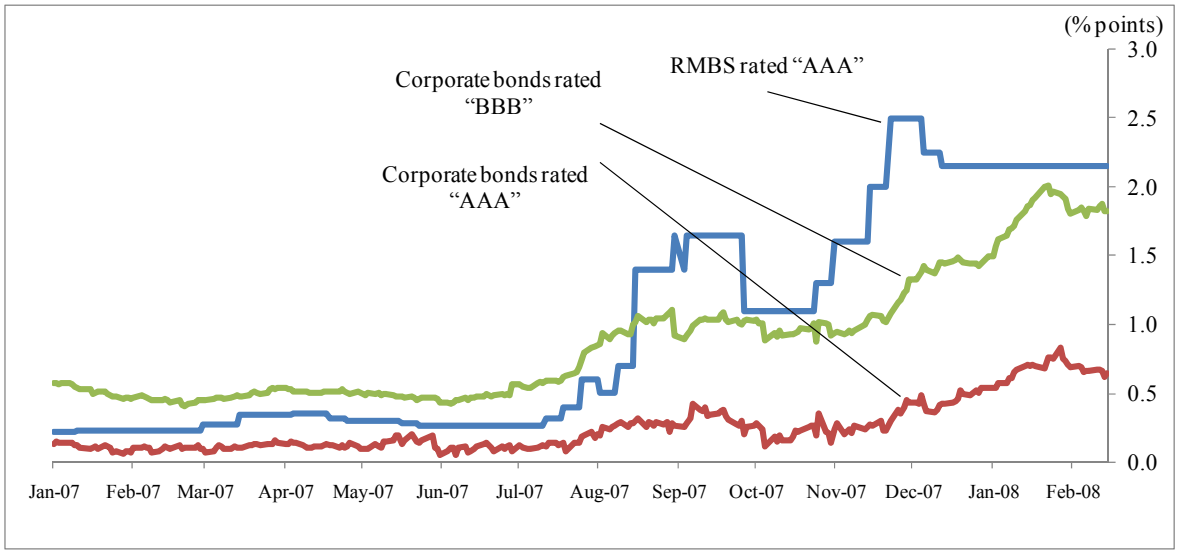
(ii) Corporate bonds (2001)



Source: *Global Financial Stability Report Apr. 2008* (IMF).

Figure 1-1-1-18 Increasing deviation of RMBS ratings from markets' assessments

Credit spreads for RMBS (rated "AAA") and corporate bonds (rated "AAA" and "BBB")



(C) CDS fueling mutual distrust

Another factor seen as having led the collapse of the U.S. housing bubble to trigger a financial crisis is a financial derivative called CDS (credit default swap). The CDS is a kind of insurance contract which compensates for losses incurred by creditors when corporate bonds, loans and other debts become irrecoverable. A seller of the CDS corresponds to an insurance company and a buyer corresponds to the person who receives insurance protection. The CDS buyer pays a premium in exchange for purchasing protection from the CDS seller. If the corporate bond or loan covered by the protection goes into default for reasons such as bankruptcy of the debtor, the seller makes a payment commensurate with the losses to the buyer (see Figure 1-1-1-19). CDS transactions have increased sharply in recent years, with the total notional principal amount (sum of the protection contract values) at $54.6 trillion as of the end of June 2008, reaching almost the same size as global GDP in 2007 (see Figure 1-1-1-20).

Figure 1-1-1-19 Structure of CDS

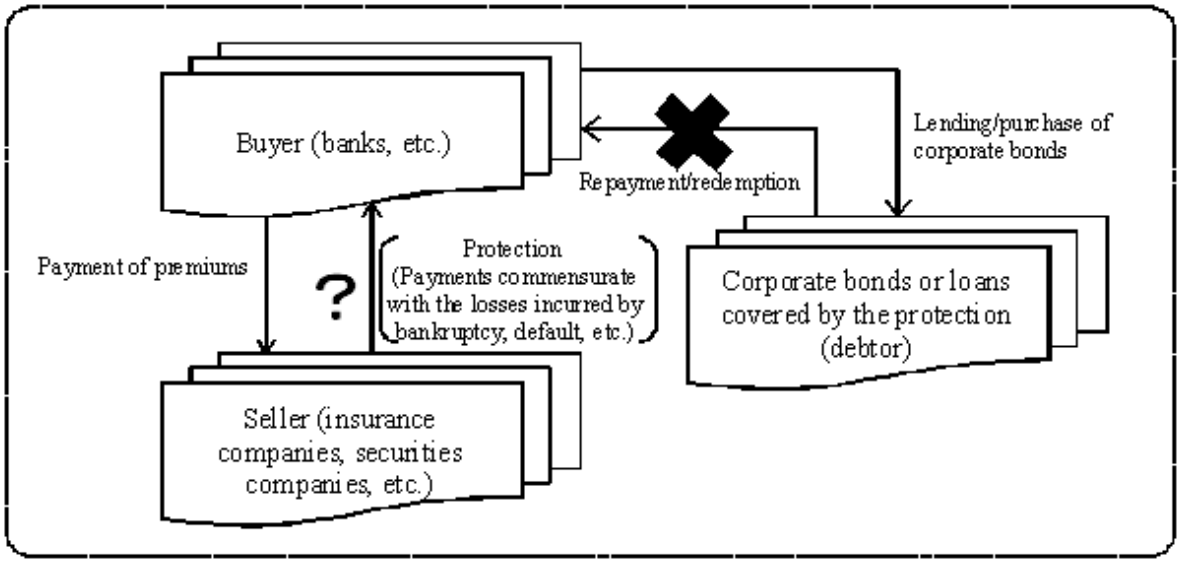
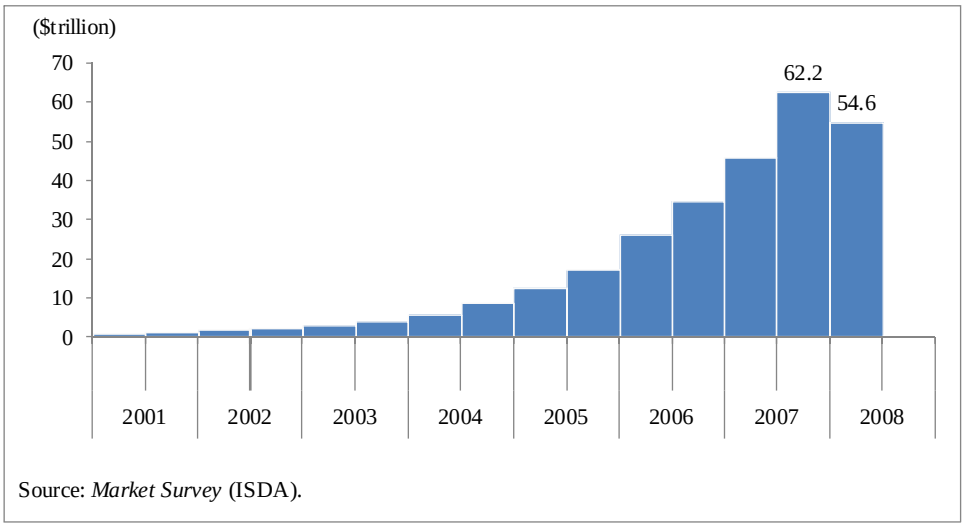


Figure 1-1-1-20 Changes in the total notional principal amount



Source: *Market Survey* (ISDA).

It was the abrupt deterioration of the business condition of AIG (American International Group), the largest U.S. insurance company, that highlighted the problems involved in the CDS. AIG concluded numerous CDS contracts with financial institutions and investors around the world, gaining a huge presence in the global CDS market. However, as its credit rating was sharply downgraded from "AA" because of a steep increase in the discharges of obligations related to subprime mortgage-related securities, AIG was required to provide a vast amount of additional collateral to CDS buyers, facing a rapid deterioration of its fund-raising condition. As a result, AIG received emergency loans from the FRB in September 2008 and effectively failed.

The risk of losses arising as a result of the failure of the counterparty to a transaction, including losses due to the default by a CDS seller, is called counterparty risk. Since CDS contracts are concluded through over-the-counter transactions between two parties without an exchange, it is difficult to gather information as to who have concluded CDS contracts in what amount.[21] As the failure of a CDS seller could trigger numerous chain-reaction failures via CDS contracts, cautiousness about counterparty risk grew suddenly among financial institutions and companies after the deterioration of AIG's business condition in July 2008 and the failure of Lehman Brothers in September of the same year, causing the financial markets to malfunction.

(3) Conclusion

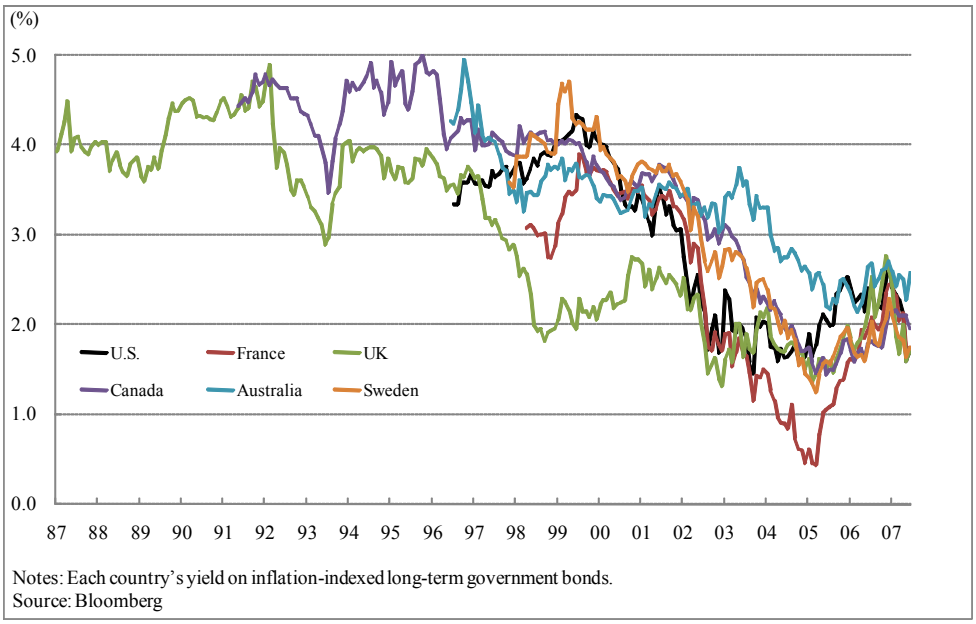
As shown above, behind the expansion of the U.S. housing market that acted as the direct trigger of the current global financial crisis are structural problems, such as a rapid increase in financial investment money, including money managed by pension funds, insurance companies, mutual funds, individual investors and foreign currency reserves. That rapid increase in financial investment money is associated with the aging of society in the United States and other developed countries and the growth of emerging economies, and a global shortage of the supply of sound assets, which are indispensable as financial investment targets for those vast amounts of financial investment money. The tight global supply-demand balance for sound assets has led to a decline in interest rates or their stabilization at low levels around the world since the late 1990s (see Figure 1-1-1-21). In addition, it combined with the allure of the U.S. dollar as a settlement currency to increase the concentration of financial investments in the United States, the only country that could provide vast amounts of sound assets (see Figure 1-1-1-22). Consequently, excess demand[22] for U.S. assets arose, triggering a surge in asset prices, as represented by the IT stock bubble and the housing bubble (see Figure 1-1-1-23).

---

[21] In this respect, AIG announced on March 15, 2009, for what purposes it used the public funds it had received, revealing the entities to which it provided additional collateral under CDS contracts and the amount of additional collateral. According to the announcement, those entities included major global financial institutions, such as Societe Generale, Deutsche Bank, Merrill Lynch, Calyon, Barclays and UBS, with additional collateral totaling $22.4 billion (Financial Times, March 17, 2009).

[22] "Excess demand" refers to a state in which the actual demand (L_2) exceeds the demand (L_1) at the equilibrium point (the point where (L_1) and (P_1) intersect with each other) because of an increase in demand for assets arising for some reason or other and the limited supply of such assets as land or government bonds. In this case, excess demand disappears if the equilibrium price (P_1) rises to a new equilibrium price (P_2).

Figure 1-1-1-21 Changes in global real interest rates



Notes: Each country's yield on inflation-indexed long-term government bonds.
Source: Bloomberg

Given that behind the current crisis is the continued concentration of financial investments in U.S. assets amid a global shortage of the supply of sound assets, it is essential not only to take short-term measures such as strengthening regulations on financial institutions and securitized products and enhancing the transparency of financial derivatives, but also to expand the supply of sound assets on a global scale as a medium- to long-term measure to deal with the crisis and prevent its recurrence.

It should be noted that the returns on investments in stocks and bonds declined sharply as a result of a global flight to safe assets prompted by the crisis, leading to an across-the-board deterioration of the investment performance of institutional investors in countries around the world.[23] In particular, a pension system squeeze will be caused by a prolonged decline in returns on financial investments and will become a serious social problem in developed countries, where the aging of society is advancing. From this viewpoint, too, it is desirable that the crisis be resolved at an early date. Each country should remind itself of the risk posed by dependence on a particular country for the supply of sound assets.

[23]Financial Times reported on April 27, 2009, that the return on investments (median rate) by public pension funds in the United States declined to minus 25% in 2008 and that at 59 of the 125 pension funds owned by U.S. states, the ratio of reserves to pension liabilities fell to 77% as of June 2008.

Figure 1-1-1-22 Outline of factors which led to the U.S. housing bubble

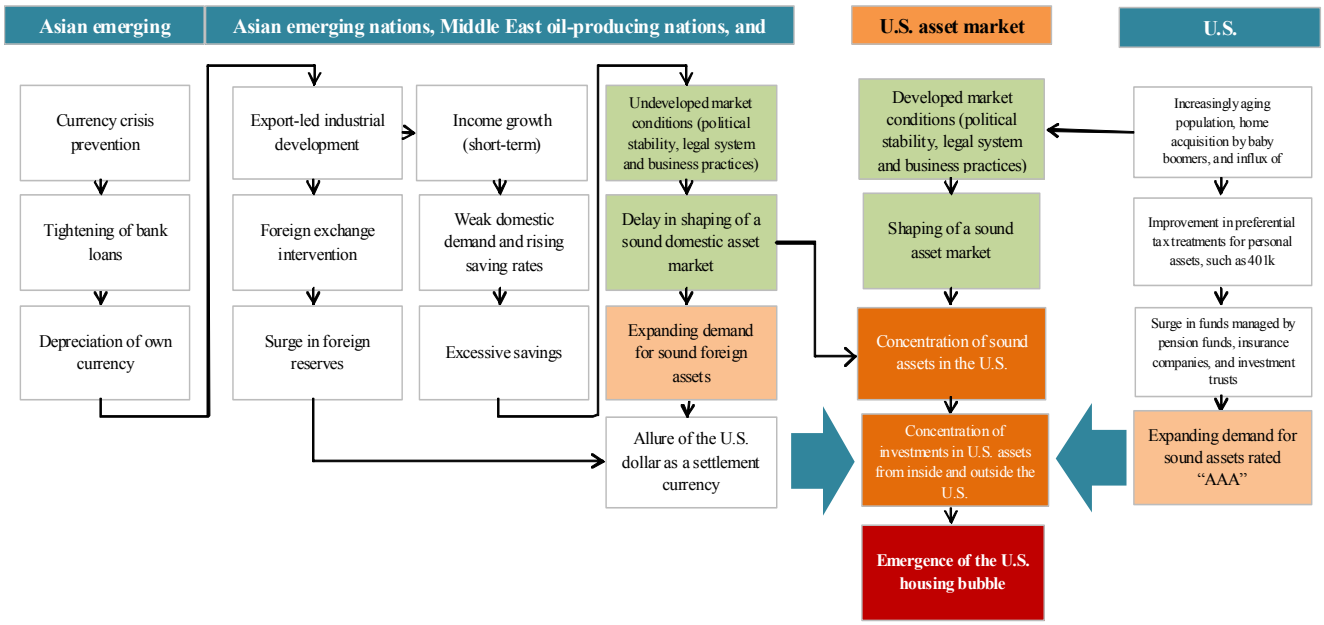
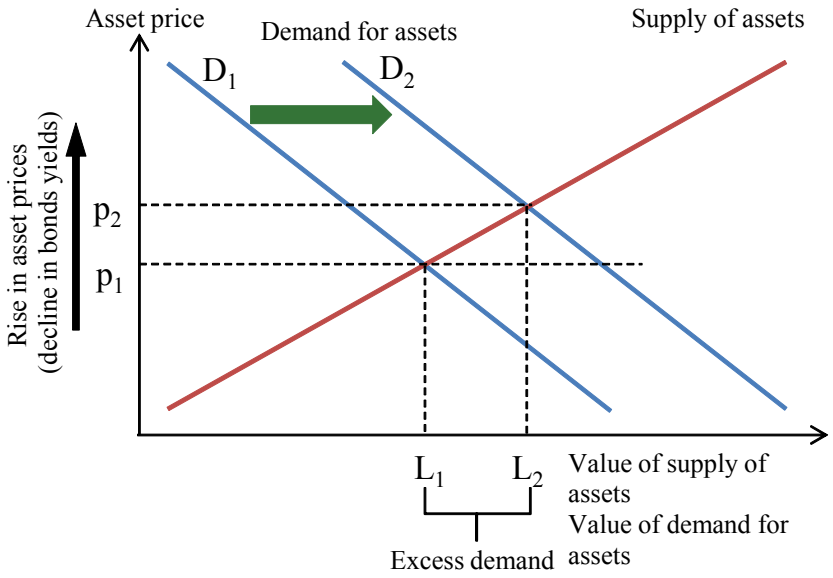


Figure 1-1-1-23 Asset demand/supply curve



2. Spread of the financial crisis to various countries

The financial crisis that started in the United States quickly spread to the financial markets and the real economies around the world, producing a serious economic impact in various countries and regions. In this process, the weaknesses of Japan and other Asian countries and of European countries, which until then continued to enjoy economic growth through investments in U.S. securities and exports to the United States as an expanding consumer market, have been exposed.

Below, we will explain the channels through which the current financial crisis spread to the real economies around the world and the mechanism of the spread, with a focus on the financial channel and the trade channel.

(1) Spread of the crisis through the financial channel

When a crisis spreads through the financial channel, it especially strikes hard the financial sectors and real economies of countries that depend heavily on overseas funds by causing the withdrawals of foreign loans and portfolio investments.

In the current crisis, many East European countries in particular faced a rapid currency depreciation or a shortage of foreign currency reserves, as shown by the provision of financial assistance by the IMF and the EU to Hungary, Romania and Latvia. This is attributable to the heavy dependence on overseas funds of emerging economies in East Europe, which continued to post strong economic growth. Many of these countries depended on loans extended by foreign banks and financial investments from abroad because of a shortage of domestic funds due to their strong funding needs (see Figure 1-1-2-1). Therefore, their real economies suffered serious effects, such as a rapid depreciation of their currencies and a slump in financial investments when foreign banks and investors began to withdraw funds after the financial crisis broke out.

Meanwhile, it is notable that in Asian countries, there are very few economic indicators that require caution compared with in other emerging economies, as many Asian countries have taken such measures as shifting to a floating exchange rate system, reducing short-term debts and expanding foreign currency reserves, thereby cutting external debts and improving the current account balance based on the lessons of the Asian currency crisis of 1998.[24]

(A) Stock prices and exchange rates

The effects of a financial crisis that spreads to the economies of various countries through the financial channel first appear in stock prices and exchange rates.

As for stock prices (see Figure 1-1-2-2), stock prices in major stock markets around the world started declining across the board after the U.S. subprime mortgage problem surfaced in the summer of 2007. Although stock prices showed signs of stabilizing temporarily at the beginning of 2008, they continued dropping steeply after the Lehman shock of September of the same year, with stock indexes around the world registering record-breaking drops.[25] In late 2008 through early 2009, stock prices stopped falling and started to rebound in stock markets around the world. However, the rebound was slow, with stock prices remaining far below the levels seen before the global stock plunge started.

[24] However, in South Korea, whose net debts to foreign banks is higher than 10% of GDP and whose loan-to-deposit ratio is higher than 100% in the current crisis, a rapid stock price drop and a depreciation of the won have occurred as a result of massive withdrawals of foreign financial investment money from the stock and other markets.

[25] Stock prices in China dropped particularly sharply (The SSEC (Shanghai Stock Exchange Composite Index) dropped about 70% between November 2007 and October 2008), and the factors cited as the reasons for this included (i) that there was already a stock price bubble in the Chinese market, (ii) that the supply-demand balance in the stock market deteriorated because a huge number of non-circulating shares have been floated under the Chinese non-circulating share reform plan, and (iii) that the authorities strengthened their credit-tightening stance because of accelerating inflation.

Table 1-1-2-1 Economic and financial indicators for emerging nations

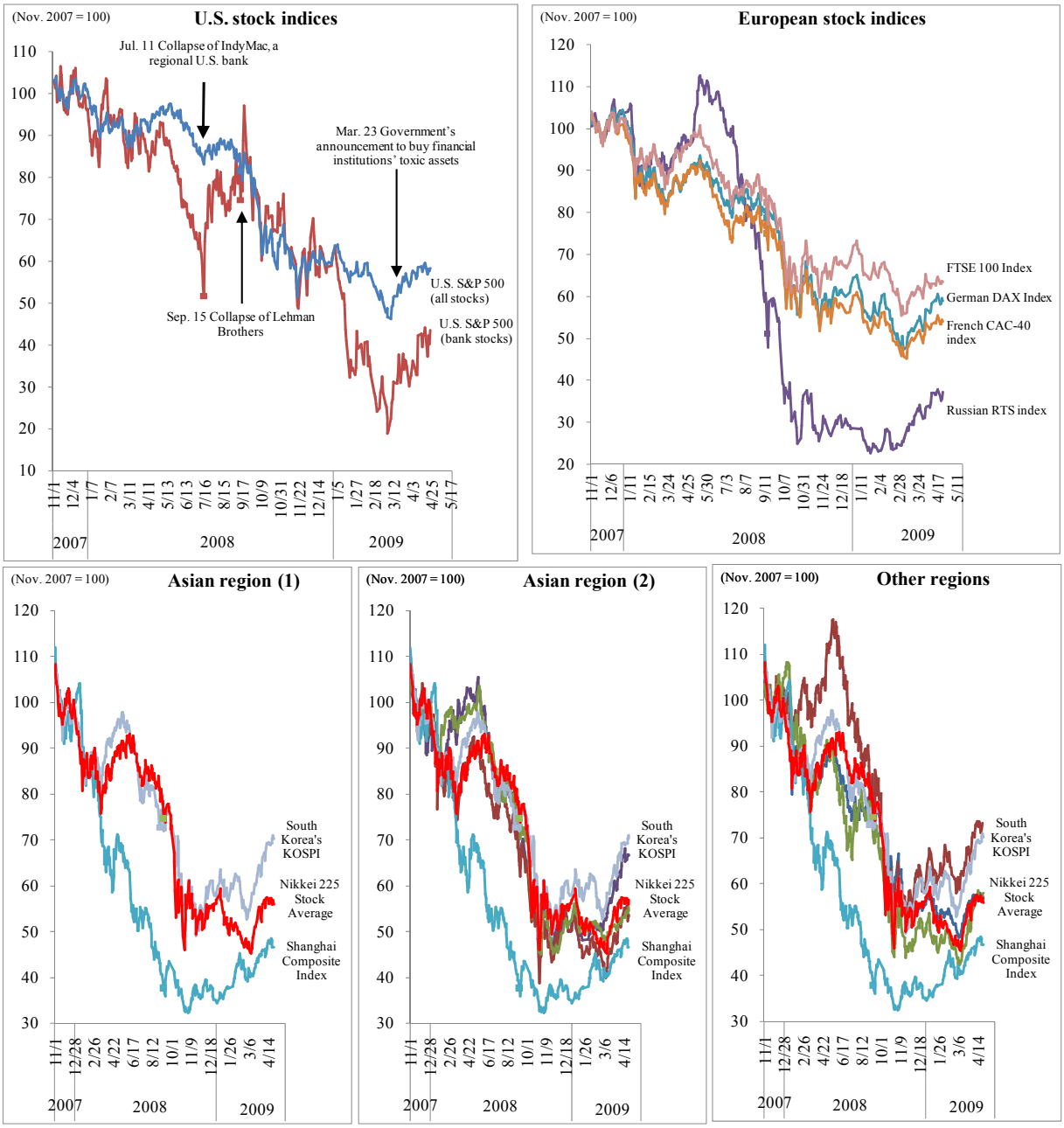
(The shaded boxes point to areas of potential concern.)

	Projections of the Current Account Balance for 2009 in Dollar Terms (Percent of GDP)	External Debt Refinancing Needs in 2009 (Percent of reserves)	Net External Position vis-à-vis BIS Reporting Banks as of Sep.2009 (Percent of GDP)	Average Real Growth of Credit to the Private Sector over the Last Five Years (Percent, Year-on-year)	Loan/Deposit (Ratio)	Forex Share of Total Loans (Percent of total loans)
European countries						
Bulgaria	-12.3	188.0	-34.9	35.9	1.3	66.9
Croatia	-6.5	136.0	-44.5	13.1	1.1	62.0
Czech Republic	-2.8	236.0	-13.1	16.0	0.8	13.6
Estonia	-6.3	210.0	-68.8	27.3	2.1	85.3
Hungary	-3.9	171.0	-50.2	14.3	1.4	65.7
Kazakhstan	-6.4	82.0	-5.1	50.1	1.7	43.6
Latvia	-6.7	331.0	-57.6	38.4	2.8	89.3
Lithuania	-4.0	425.0	-41.5	43.2	2.0	64.0
Poland	-4.9	169.0	-15.4	14.7	1.1	32.6
Romania	-7.5	127.0	-32.5	47.1	1.3	55.5
Russia	0.2	34.0	3.1	34.5	1.3	15.3
Serbia	-12.2	...	-12.2	26.2	1.2	68.0
Turkey	-1.1	110.0	-11.9	29.8	0.7	28.9
Ukraine	0.6	208.0	-17.6	47.5	2.0	59.5
Gulf countries						
Kuwait	25.8	109.0	3.8	19.8	1.1	...
Saudi Arabia	-1.8		22.3	22.2	0.9	8.2
UAE	-5.6		-12.2	32.5	1.2	18.9
African countries						
Egypt	-3.0	14.0	8.5	0.9	0.6	28.0
Ghana	-10.9	13.0	-5.0	26.4	0.8	...
Nigeria	-9.0	...	10.3	34.2	1.1	...
South Africa	-5.8	49.0	4.4	12.8	1.2	...
Uganda	-6.2	...		17.7	0.8	...
Asian countries						
China	10.3	14.0	0.7	11.3	0.8	...
India	-2.5	33.0	-8.9	18.2	0.8	...
Indonesia	-0.4	73.0	-7.5	15.1	0.8	19.8
South Korea	2.9	93.0	-18.9	6.3	1.2	8.5
Malaysia	12.9	23.0	-8.3	5.2	0.9	...
Pakistan	-5.9	28.0	2.4	13.5	0.7	...
The Philippines	2.3	39.0	-2.2	...	...	
Thailand	0.0	34.0	1.3	2.6	1.0	...
Vietnam	-4.8	8.0	-7.4	26.4	1.1	21.2
Latin American countries						
Argentina	2.3	85.0	2.5	14.6	0.7	15.8
Brazil	-1.8	40.0	-7.1	15.9	0.8	...
Chile	-4.8	84.0	-7.2	11.6	1.4	...
Colombia	-3.9	52.0	0.5	16.0	2.0	6.3
Mexico	-2.5	64.0	-2.1	11.7	0.8	11.6
Peru	-3.3	27.0	-2.2	8.2	0.9	57.5
Venezuela	-0.4	59.0	19.7	45.8	0.8	<0.5

Notes: The shaded boxes of the table point to areas of potential concern. Cut-off values are as follows: current account balance below -5% of GDP; refinancing needs in excess of 100% of reserves; net debts to foreign banks above 10% of GDP; average growth of credit to the private sector greater than 30% year-on-year; loan-to-deposit ratio exceeding 1; and foreign-currency denominated loans exceeding 50% of total loans.

Source: Global Financial Stability Report April 2009 (IMF).

Figure 1-1-2-2 Changes in stock indices in countries and regions

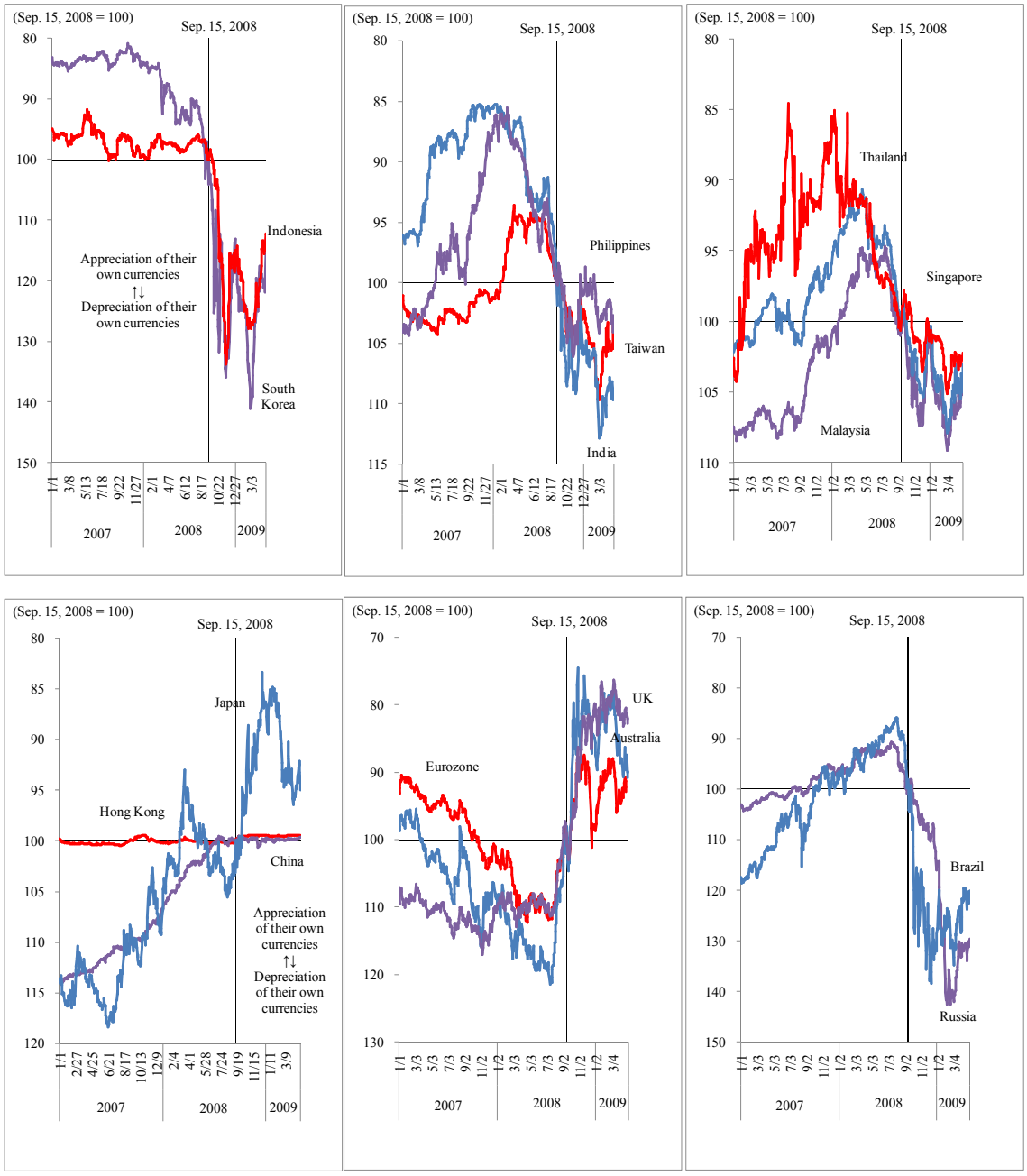


Source: Bloomberg

As for the movements of various currencies against the U.S. dollar (see Figure 1-1-2-3), volatile exchange rate movements presumably related to the financial crisis were observed in many Asian countries. The currencies of most Asian countries, including South Korea, Indonesia, India, Taiwan, Malaysia and Singapore, declined steeply against the dollar after the Lehman shock of September 2008. In South Korea in particular, the won depreciated nearly 70%. The currencies of Russia and Brazil also declined sharply against the dollar. Britain, the euro area and Australia experienced a steep currency appreciation against the dollar after the crisis broke out. As the monetary authorities in countries like South Korea intervened in the currency market, one-sided exchange rate movements

were arrested. However, exchange rates have not yet returned to the pre-crisis levels.

Figure 1-1-2-3 Changes in exchange rates of various currencies against the U.S. dollar

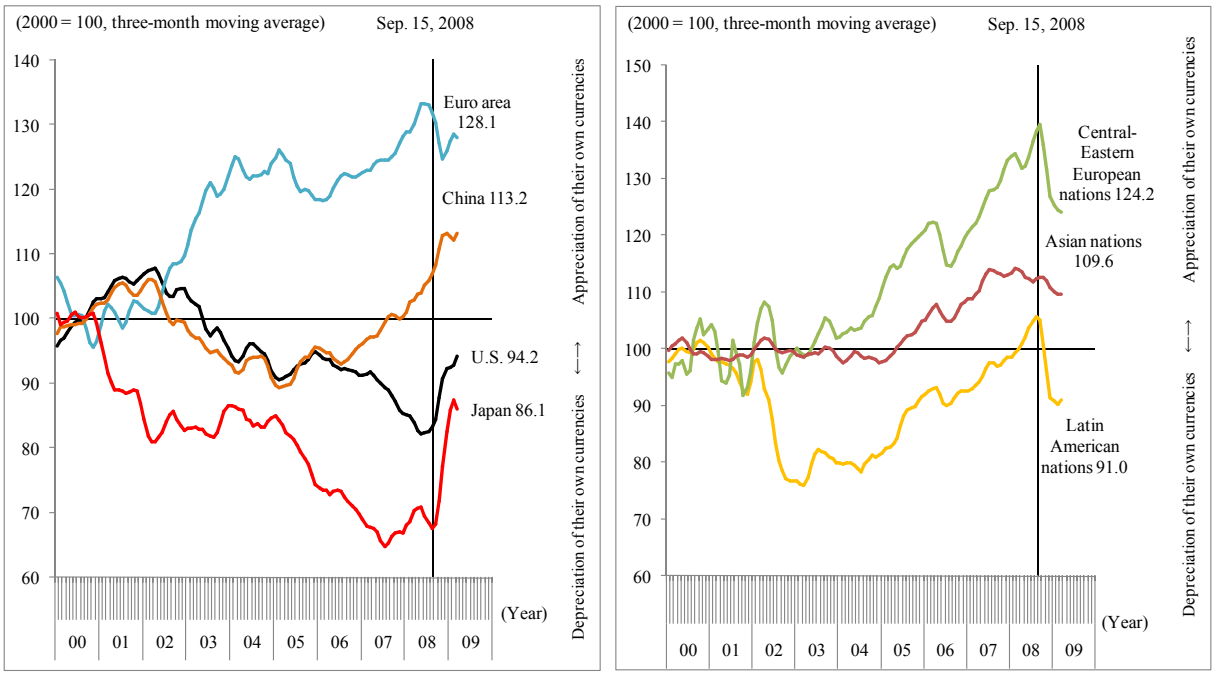


Source: Bloomberg

Regarding the trend in real effective exchange rates, which take into consideration exchange rates against a basket of currencies, rather than just a particular currency (Figure 1-1-2-4), Japan and the United States experienced an appreciation of their own currencies after the Lehman shock of September 2008, a turnaround from the preceding downtrend, while the euro area, Central and Eastern European countries, Asian countries and Latin American countries saw their currencies depreciate, in a reversal of the preceding uptrend. Thus, in developed countries and regions, the downtrend of the yen and the U.S. dollar and the uptrend of the euro that were seen in recent years were arrested. In

emerging economies, the uptrend of the local currencies due to an emerging market boom was curbed significantly.

Figure 1-1-2-4 Trends in countries and regions' real effective exchange rates



Notes:
1. Asia does not include China.
2. Central-Eastern European nations include nine countries: Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Turkey.
3. Latin American nations include seven countries: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.
Source: *World Economic Outlook, April 2009* (IMF)

(B) A major change in the cross-border flow of funds after the crisis

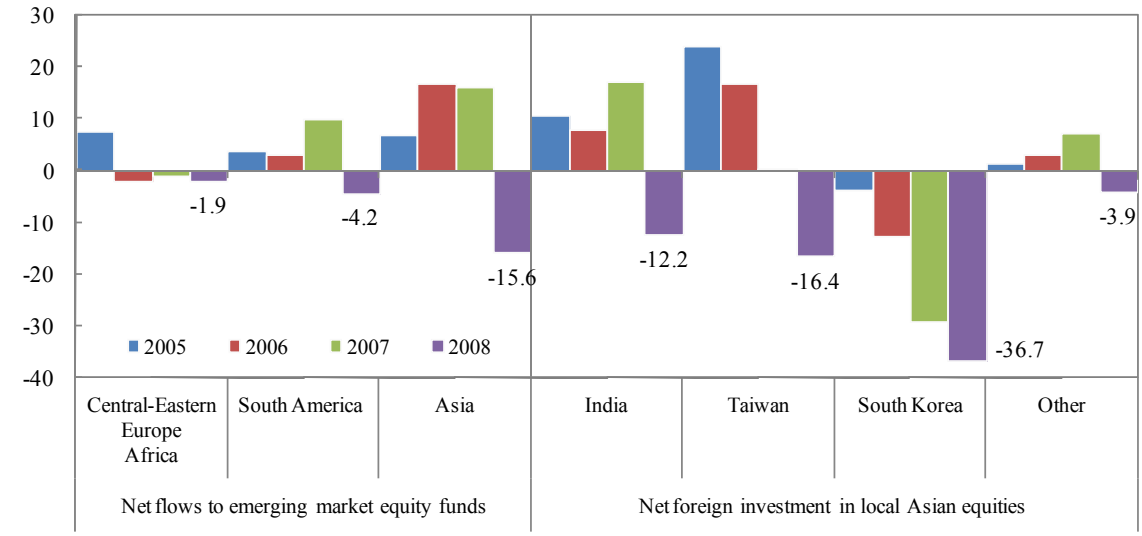
Behind the volatile movements of exchange rates and stock prices in various countries and regions is a change in the cross-border flow of funds that was caused by the financial crisis.

The cross-border flow of funds excluding direct investments, which are of a highly fixed nature, depends mainly on the flow of funds into corporate bonds, stocks, bank loans and deposits. A major change occurred in the flow of these funds after the financial crisis broke out.

For example, data on changes in the amount of funds flowing into emerging economies show that the amount of portfolio investment flowing into emerging markets, many of which were enjoying strong economic growth, continued to expand at a fast pace until 2007 (Figure 1-1-2-5).

Figure 1-1-2-5

Emerging economies experienced large portfolio outflows



Notes: Other is the sum of Indonesia, the Philippines, Thailand and Vietnam.
Source: *Global Financial Stability Report Apr. 2009* (IMF).

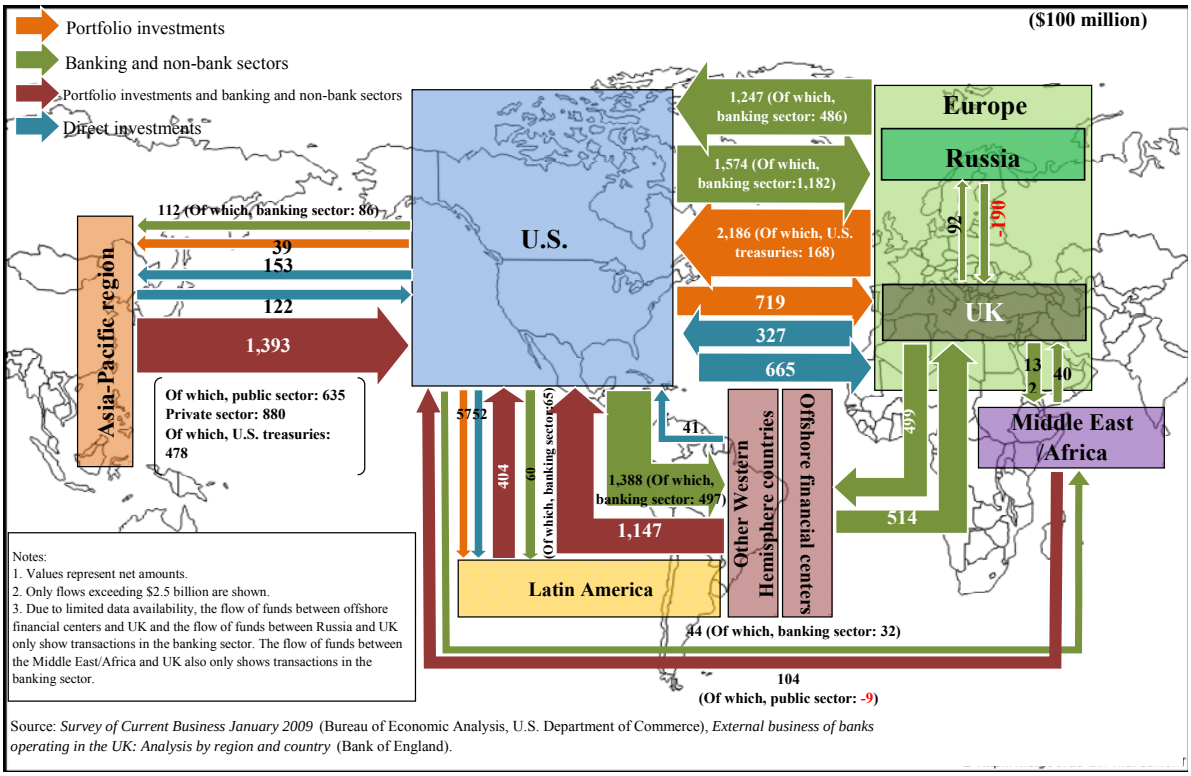
However, the data shows that an outflow of funds from the securities markets of emerging economies increased in 2008. The amount of funds flowing out of the markets of Asian emerging economies in particular was far larger than the amount of funds flowing out of other emerging economies, with South Korea suffering the largest outflow.

Among factors behind the outflow of funds from emerging economies are the start of efforts by financial institutions and investors in the United States, Europe and other countries around the world to secure dollars following a global credit crunch (competition to secure dollars) and the flight to quality by financial institutions and investors facing a financial crisis, which led to the withdrawals of their money from currency, bond and stock markets in countries and regions around the world.

Now, we will look at the competition to secure dollars and the flight to quality from the viewpoint of the flow of funds between the United States and Asia and between the United States and other regions based on statistics compiled by the U.S. Department of Commerce and the Bank of England.

Figures 1-1-2-6 and 1-1-2-7 provide a comparison of the flow of long-term funds in the second quarter of 2007 (Figure 1-1-2-6), immediately before the emergence of the subprime mortgage problem, and that in the third quarter of 2008 (Figure 1-1-2-7), after the emergence of this problem.

Figure 1-1-2-6 Global flow of funds originating from the United States (2nd. quarter, 2007)[26] [27]



Source: *Survey of Current Business January 2009* (Bureau of Economic Analysis, U.S. Department of Commerce), *External business of banks operating in the UK: Analysis by region and country* (Bank of England).

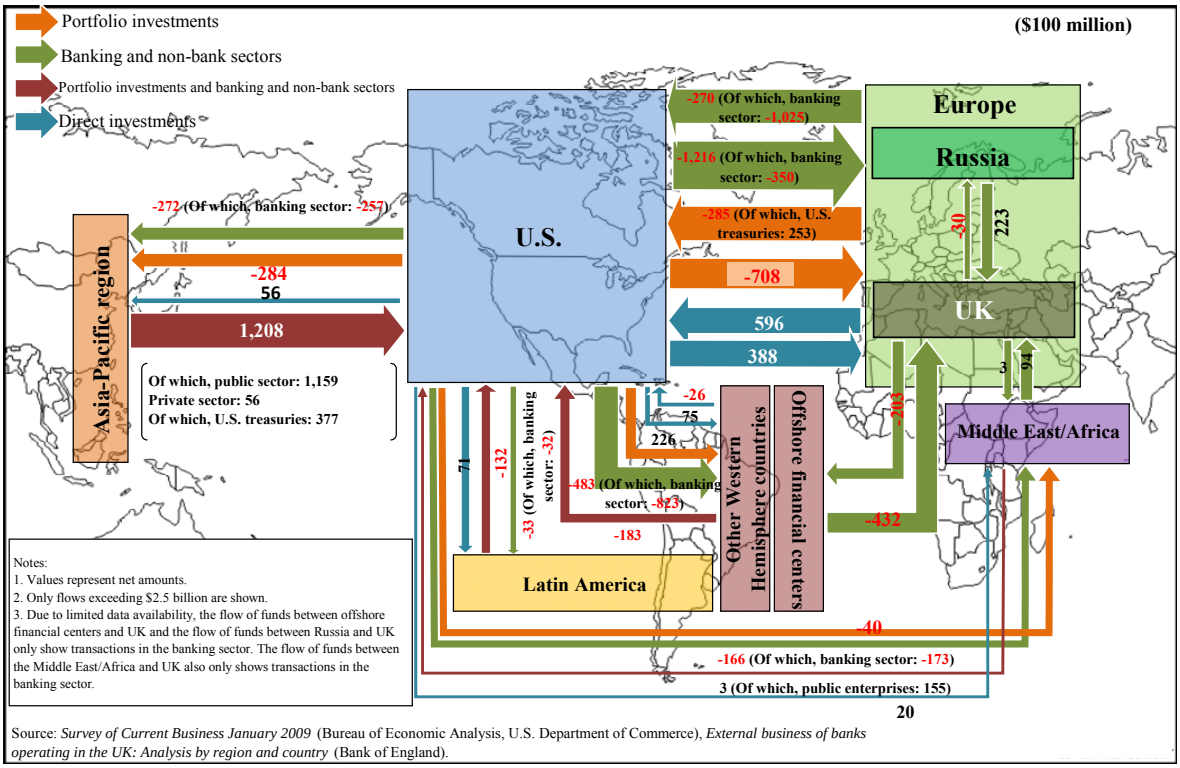
[26] It should be kept in mind that this figure, which covers transactions involving long-term funds, does not include transactions made with short-term funds raised in the call money market, such as the so-called yen-carry trade.

[27] In this figure, the tails of the arrows point to creditors or purchasers of securities and the tips of the arrows point to the debtors or securities issuers. The wider the arrow, the larger the amount of transactions is. The amount of transactions is on a net basis, with the amounts of sales and purchase offset with each other. The negative values of funds indicate that the creditor (the holder of securities) withdrew loans (sold securities).

Data concerning some countries and regions indicate only the aggregate amount of individual sectors' transactions due to statistical constraints. Regarding the transactions between the offshore financial centers and the United Kingdom, between Russia and the United Kingdom and between the Middle East/Africa and the United Kingdom, only the amount of transactions in the banking sector are indicated. The flow of oil money is presumably mostly included in transactions represented by the arrows originating in Europe, rather than the Middle East, because a large portion of the money goes through accounts opened in the City, the financial district of London.

It should be noted that we regarded "other Western hemisphere countries," a statistical category used by the U.S. Department of Commerce, and "offshore financial centers," a statistical category used by the Bank of England, as virtually representing the same region from the viewpoint of the flow of funds, since both include so-called tax havens such as Caribbean countries.

Figure 1-1-2-7 Global flow of funds originating from the United States (3rd. quarter 2008)[26] [27]



Source: *Survey of Current Business January 2009* (Bureau of Economic Analysis, U.S. Department of Commerce), *External business of banks operating in the UK: Analysis by region and country* (Bank of England).

This comparison shows that there were active transactions involving long-term funds between the United States and other countries and regions in the second quarter of 2007, before the crisis broke out. On a gross basis, Europe made the largest amount of transactions with the United States, followed by the offshore financial centers, including the Caribbean island countries, and the Asia-Pacific region, including Japan and China. The amount of direct investments was relatively small, with portfolio investments and transactions in the banking and non-bank sectors accounting for a substantial portion of the overall transactions. As for the flow of funds between Europe and the United States before the crisis, the amount of funds flowing from Europe into the United States and the amount of funds flowing in the opposite direction were almost the same in the banking and non-banking sectors. Meanwhile, the amount of portfolio investments made by Europe in the United States far exceeded the amount of U.S. portfolio investments in Europe. Investments in U.S. treasuries accounted for only a small portion of the overall portfolio investments by Europe, with investments in corporate bonds and stocks accounting for most of the total. As for the flow of funds between the Asia-Pacific region and the United States, the data shows that the amount of funds flowing from the Asia-Pacific region into the United States far exceeded the amount of funds flowing in the opposite direction. What is notable is that the public sector accounted for nearly half of the funds flowing from the Asia-Pacific region into the United States.

However, the data shows that in the third quarter of 2008, all countries and regions, except for the Asia-Pacific region, withdrew funds other than direct investments from the United States. While the flow of funds from the Asia-Pacific region into the United States continued on a net basis, portfolio

investments other than U.S. treasuries decreased. In other words, investments in corporate bonds and stocks and loans were withdrawn from the United States. At the same time, the data also shows that the United States withdrew funds other than direct investments from abroad.

In light of the above, it is evident that the repatriation of financial investment money occurred on a global scale.

In the meantime, investments by the Asia-Pacific region and Europe in U.S. treasuries continued. This is presumably because investors in countries and regions around the world reinvested repatriated funds in U.S. treasuries, which are regarded as safe assets, as their inclination toward the flight to quality grew. Also notable is that the public sector came to account for most of the funds flowing from the Asia-Pacific region to the United States after the outbreak of the crisis because the private sector in the region proceeded with the withdrawals of funds while the public sector increased financial investments in the United States.

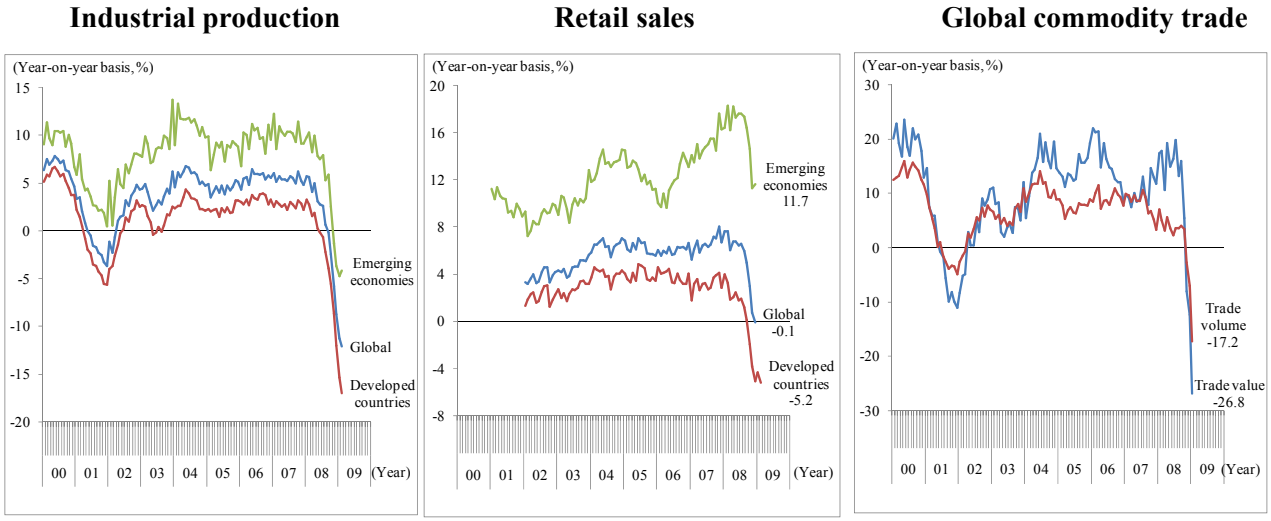
(2) Spread of the crisis through the trade channel

A financial crisis not only aggravates the domestic real economy of the country where it occurs but also produces a significant impact on the real economies of other countries through international trade.

(A) Plunging global industrial production, retail sales and global commodity trade

Figure 1-1-2-8 shows the trend of global industrial production, retail sales and global commodity trade since 2000. After falling sharply in 2001 through 2002 in the wake of the collapse of the IT stock bubble, global industrial production resumed growing. However, its growth started to slow down again after August 2007, when the BNP Paribas shock occurred, and an unprecedented decline continued after the Lehman shock of September 2008. Industrial production in developed countries (including NIEs) posted a particularly steep drop. Growth in industrial production there started to slow down at the beginning of 2008, and a decline began and accelerated after June 2008. On the other hand, industrial production in emerging economies continued to expand until July 2008. Although its growth started to slow down in August and a decline began in November, the pace of the decline was more moderate than in developed countries.

Figure 1-1-2-8 Plunging global industrial production, retail sales and global commodity trade



Notes:
1. Developed countries include 17 nations and regions: the U.S., Canada, the UK, the euro area, Japan, South Korea, Taiwan, Hong Kong, Singapore, Australia, New Zealand, Czech Republic, Denmark, Israel, Norway, Sweden and Switzerland.
2. Emerging economies include 26 nations: China, India, Pakistan, Indonesia, Malaysia, Thailand, Argentina, Brazil, Bulgaria, Chile, Colombia, Estonia, Hungary, Latvia, Lithuania, Mexico, Peru, the Philippines, Poland, Romania, Russia, Slovakia, South Africa, Turkey, Ukraine and Venezuela.
3. Trade value is denominated in SDR.
Source: *Global Economic Outlook, April 2009* (IMF)

As for the trend in retail sales, growth in retail sales first started to slow down in developed countries at the beginning of 2008 and in emerging economies in the autumn of the same year. Then, retail sales in developed countries turned down in October and the pace of decline accelerated thereafter. In the meantime, it is notable that although retail sales in emerging economies slowed down significantly, such sales still maintain double-digit growth of 11.7% compared with the previous year.

Lastly, we will look at the trend in commodity trade. In terms of value, global commodity trade started to slow down in October 2008, after maintaining double-digit growth until September of the same year, and declined sharply in November and onward. On the other hand, in terms of volume, global commodity trade already started to slow down in the summer of 2007. The time gap is presumably due to a worldwide surge in prices of natural resources and foods, which inflated the value of traded commodities despite a decline in the trade volume.

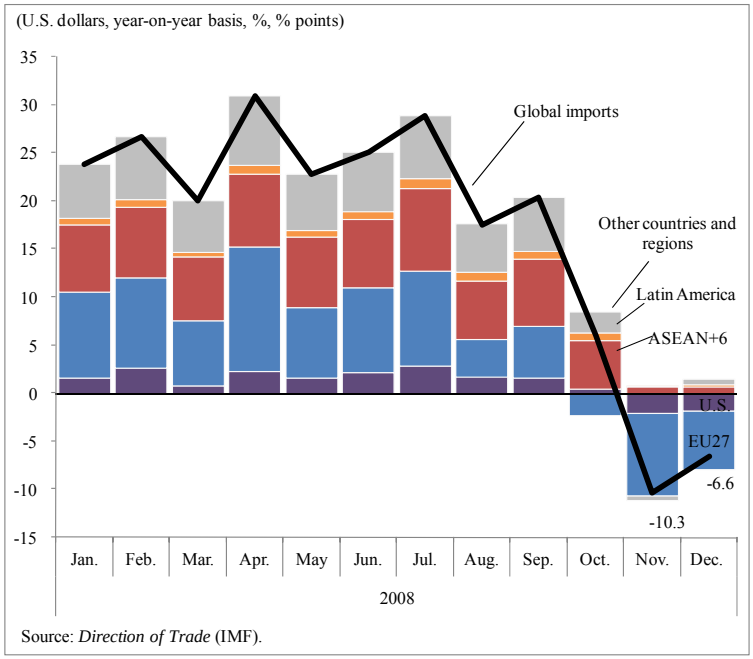
(B) Decline in imports of goods by the United States and Europe and exports by countries and regions

The above-mentioned trends in global industrial production, retail sales and global commodity trade may be said to reflect the fact that production is declining simultaneously in Japan, NIEs and emerging economies, which supply vast amounts of consumer and intermediate goods to the United States and Europe, because of a decrease in U.S. and European domestic production and imports of consumer goods amid the rapid shrinkage of consumption there.

A sharp decline in imports of goods by the United States and Europe due to decreases in personal consumption and capital expenditures caused by the financial crisis is the main cause of the recent

rapid drop in global trade (see Figure 1-1-2-9). The decline in imports of goods by the United States and Europe affected all items of goods, particularly consumer durables and capital goods, such as transportation equipment, including automobiles, electrical machinery and general machinery (see Figure 1-1-2-10). In the meantime, countries and regions that manufacture consumer durables and capital goods are suffering from a significant decline in exports, mainly to the United States and Europe (see Figure 1-1-2-11).

Figure 1-1-2-9 Contributions to global imports of goods (year-on-year basis) by country and region



Source: *Direction of Trade* (IMF).

First, it is notable that EU countries themselves suffered a sharp decline in exports because in addition to the decline in their exports to the United States, their exports in parts and intermediate goods to East European countries dropped. Meanwhile, a decline in exports by East European countries and Russia is mostly attributable to a drop in exports to EU countries.

Asian countries, which have established a close-knit intra-regional production network, mainly in consumer goods for the United States and Europe, also experienced a steep decline in exports, mainly to the United States and EU countries. Japan, too, posted a sharp decline in exports to all regions.

China, whose exports remained firm throughout 2008, also suffered a sharp downturn in exports to all regions in the first quarter of 2009 because U.S. and European consumption started to decline steeply.

Figure 1-1-2-10 Contributions to U.S. and EU-27 commodities imports (year-on-year basis) by type of commodities (excluding imports of natural resources such as crude oil)

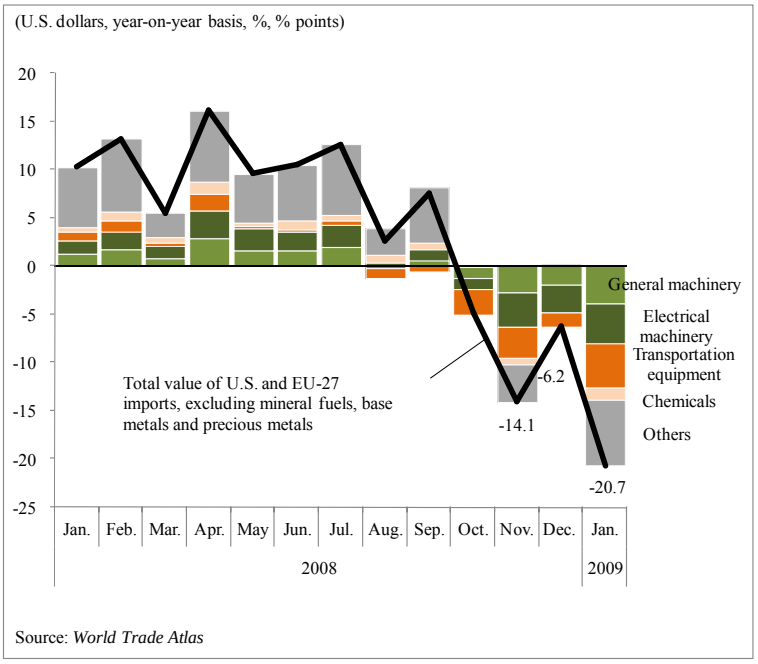
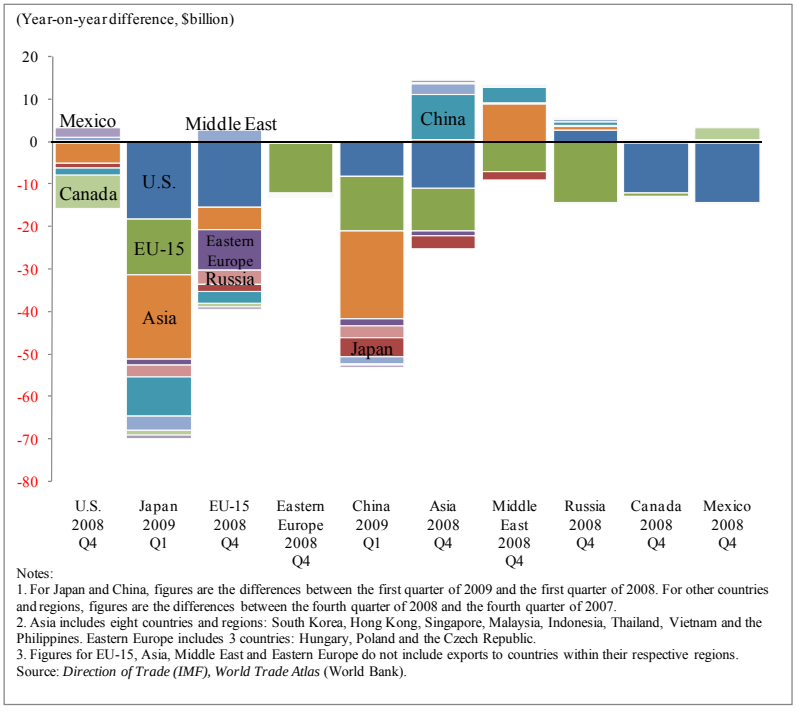


Figure 1-1-2-11 Changes in commodities exports by destination



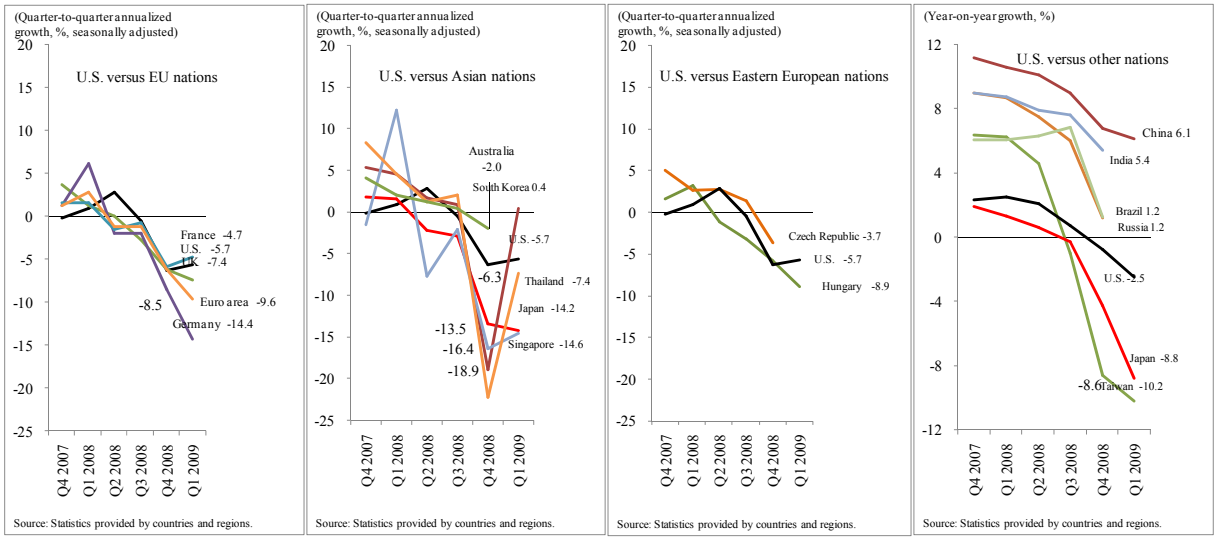
(C) Economic growth in various countries

While the above-mentioned decline in imports by the United States and Europe caused real GDP growth in various countries and regions to slow down or turn negative, the degree of the impact is not necessarily equivalent across them.

Figure 1-1-2-12 shows quarterly real GDP growth (quarter-to-quarter annualized growth or year-on-year growth) in Japan, the United States, the euro area, and emerging economies in Asian and other regions.

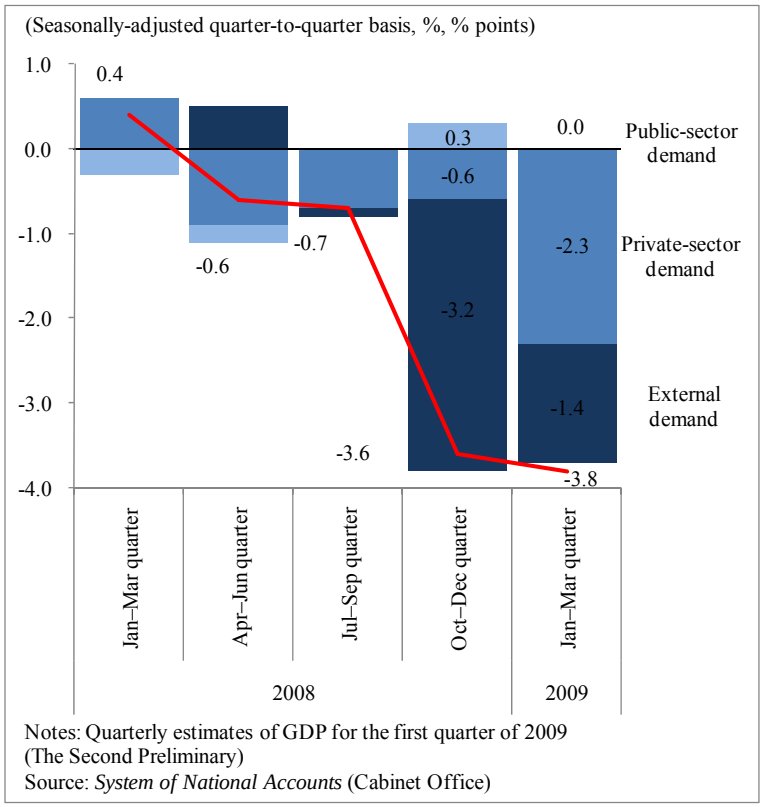
According to this figure, in the fourth quarter of 2008, immediately after the financial crisis broke out, the growth rates in Japan (quarter-to-quarter annualized negative growth of 13.5%), Thailand (negative growth of 22.3%), South Korea (negative growth of 18.9%), Singapore (negative growth of 16.4%) and Taiwan (negative growth of 8.6%) were far worse than the growth rate in the United States (quarter-to-quarter annualized negative growth of 6.3% and year-on-year negative growth of 0.8%), which is the epicenter of the crisis. Of Japan's real GDP contraction of 3.6% (on a seasonally-adjusted, year-on-year basis), a decline in external demand accounted for as much as 3.2 points (see Figure 1-1-2-13).[28]

Figure 1-1-2-12 Countries and regions' real GDP growth in comparison with the U.S., the epicenter of the crisis (quarter-to-quarter annualized growth or year-on-year growth)



[28] According to GDP data for the first quarter of 2009 (revised data), the negative contribution of imports shrank to 1.4% due to a fall in imports, while the margin of the contraction of real GDP widened due to sharp drops in personal consumption and private investments in equipment.

Figure 1-1-2-13 Contributions to Japan's real GDP growth by type of demand



Notes: Quarterly estimates of GDP for the first quarter of 2009 (The Second Preliminary)
Source: *System of National Accounts* (Cabinet Office)

In the first quarter of 2009, real GDP contracted more moderately or resumed positive growth in some countries, including the United Sates, the epicenter of the crisis, Japan and South Korea, supported by the effects of economic stimulus measures taken by governments.[29]

It is notable that in the meantime, real GDP growth in China (year-on-year growth of 6.1%), India (growth of 5.4%), Brazil (growth of 1.2%) and Russia (growth of 1.2%) all slowed down but remained positive in the most recent quarter for which GDP data are available, namely in the fourth quarter of 2008 or the first quarter of 2009.[30]

3. Conditions for resolving the financial and economic crises

(1) Lessons learned from Japan's experiences

Described below are the lessons learned from Japan's experiences, including the disposal of bad loans, during its financial crisis that lasted from 1997 to 2003.

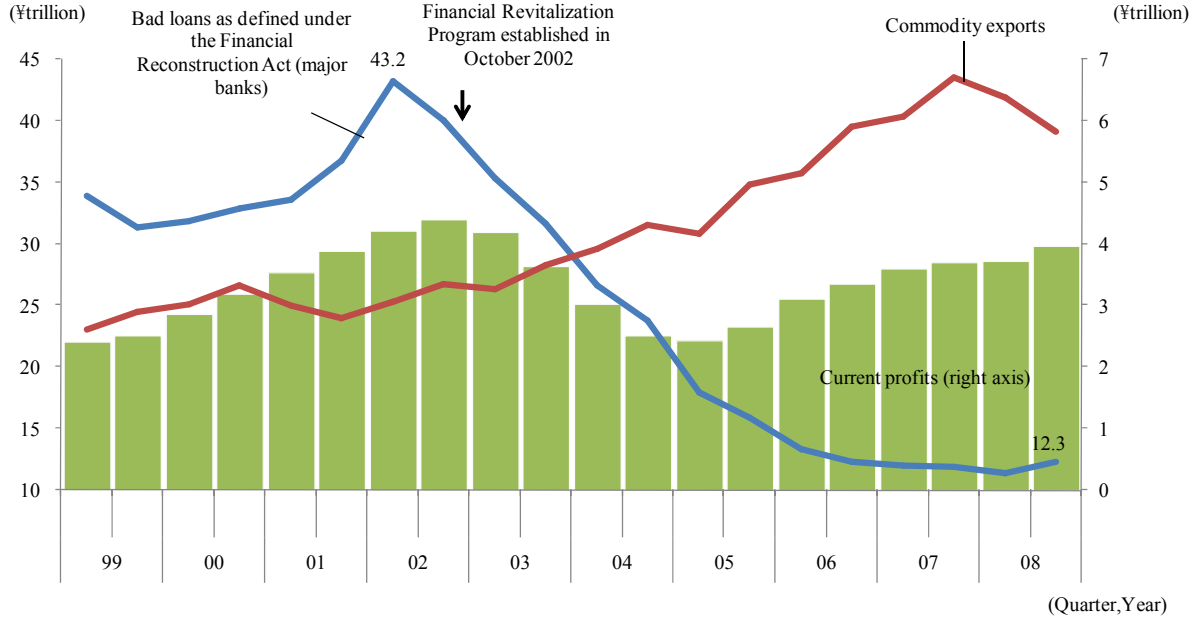
(A) Importance of the macroeconomic environment

Changes in the amount of bad loans depend significantly on the macroeconomic environment, including the economic cycle.[31]

[29] For the effects of economic stimulus measures taken by countries, see Section 2.7 of this chapter.
[30] For the factors behind the differences in the impact on economic growth between countries and regions, see Section 2 of this chapter and Section 1 of Chapter 2.
[31] Bad loans as referred to herein are loans to debtors that have legally or virtually failed, debtors that are highly likely to fail, debtors that are in arrears for three months or longer and debtors for whom lending

The effects of the disposal of bad loans in a time of recession are limited because additional bad loans arise as a result of an economic downturn. In fact, after 2001, when the IT stock bubble collapsed, Japan experienced a sharp economic downturn and the amount of bad loans on the balance sheets of financial institutions grew rapidly in line with a deterioration of corporate earnings. As a result, the amount of bad loans reached a peak of ¥43.2 trillion in the first half of 2002 (Figure 1-1-3-1).

Figure 1-1-3-1 Changes in macroeconomic environment and changes in outstanding bad loans at Japanese banks



Notes: The figure shows the amount of bad loans as defined under the Financial Reconstruction Act at major banks. Current profits are those of the whole manufacturing sector as of the end of each quarter.
Source: *Changes in non-performing loans (NPLs) based on the Financial Reconstruction Act* (Financial Service Agency), *Trade Statistics* (Ministry of Finance) and *Financial Statements Statistics of Corporations, Quarterly* (Ministry of Finance)

However, the amount of bad loans declined significantly in the second half of 2002 and onward as the disposal of such loans accelerated in line with an improvement of the macroeconomic environment, including a rapid improvement in corporate earnings.

(B) Money supply and bank credit to the private sector

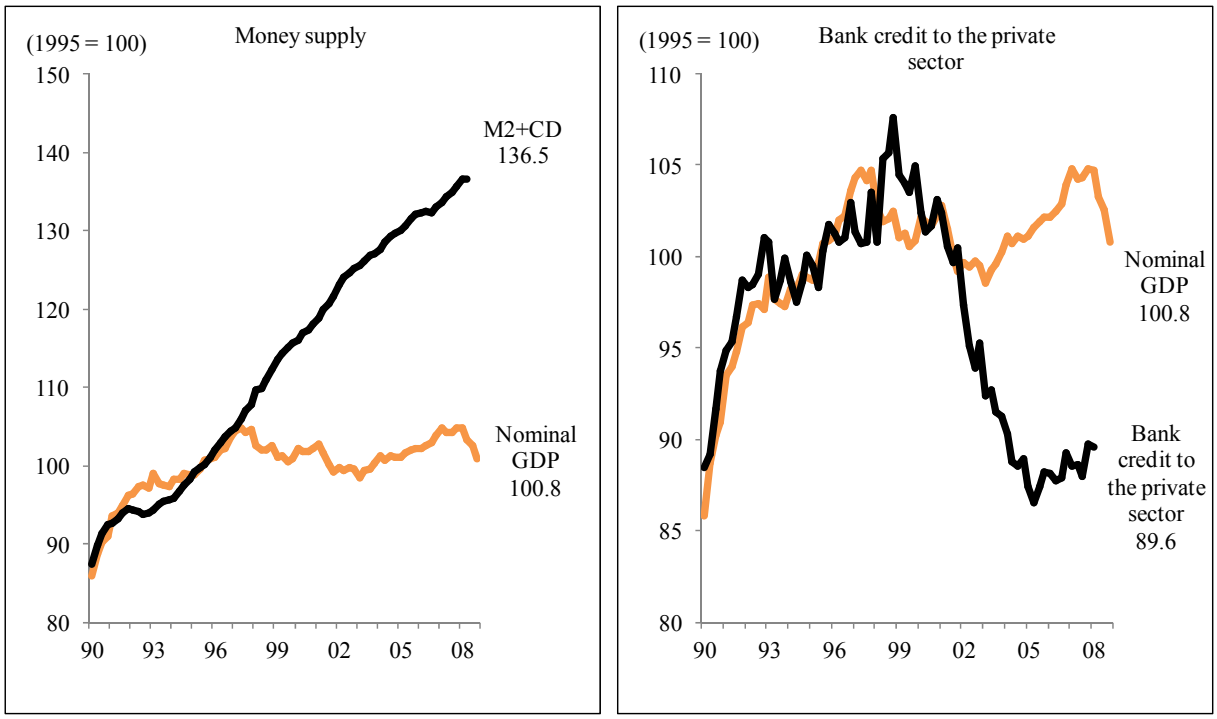
When corporate demand for loans was weak, the provision of credit to the private sector did not increase despite growth in the money supply.

In Japan during the financial crisis, companies reduced debts (deleveraging) and banks' financial intermediary function declined due to excessive corporate debts and the bad loan problem. Although loans to small and medium-size enterprises later resumed growing gradually as the bad loan problem moved closer to a solution, the balance of bank credit provided to the private sector continued to decline, partly as a result of a decrease in loans to large companies.

terms have been relaxed (bad loans as defined under the Financial Reconstruction Act).

Consequently, the downtrend of the balance of bank credit provided to the private sector continued until the end of 2004, despite growth in the money supply (M2 plus CD) (see Figure 1-1-3-2). In fact, data on the trend in the DI (diffusion index) for corporate demand for loans (see Figure 1-1-3-3) indicates that corporate demand for loans remained weak until the end of 2004, with the number of companies curbing borrowings or reducing debts exceeding the number of companies increasing borrowings.

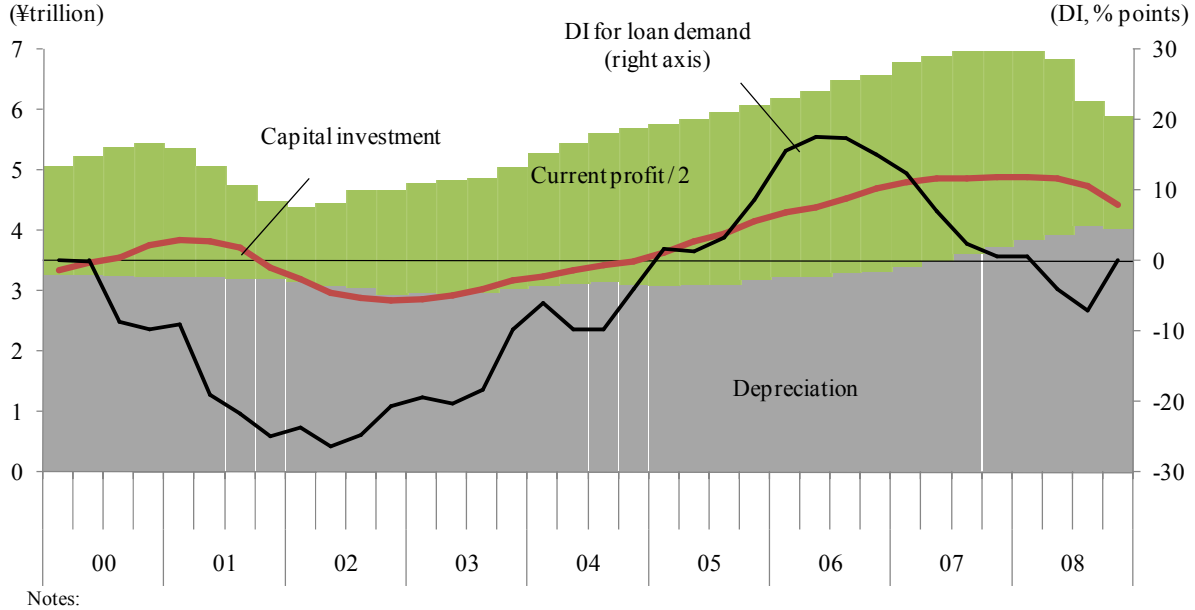
Figure 1-1-3-2 Changes in Japan's money supply (M2 + CD) and bank credit to the private sector



Source: *Monetary Survey* (Bank of Japan), *System of National Accounts* (Cabinet Office)

In addition, Figure 1-1-3-3 indicates that when the overall macroeconomic environment improved in 2002 and onward because of an increase in exports, many companies avoided new borrowings and made capital expenditures within the limits of their own cash flow following an improvement in their balance sheets due to progress made in debt reduction.

Figure 1-1-3-3 Changes in Japanese manufacturing sector's fixed investment in equipment, cash flow and the DI for loan demand



Notes:
1. Cash flow = current profit / 2 + depreciation
2. Capital investment does not include investment in software.
3. The DI for loan demand indicates corporate demand for bank loans. Three-term moving average.
Source: *Financial Statements Statistics of Corporations, Quarterly* (Ministry of Finance), *Senior Loan Officer Opinion Survey on Bank Lending Practices at Large Japanese Banks* (Bank of Japan)

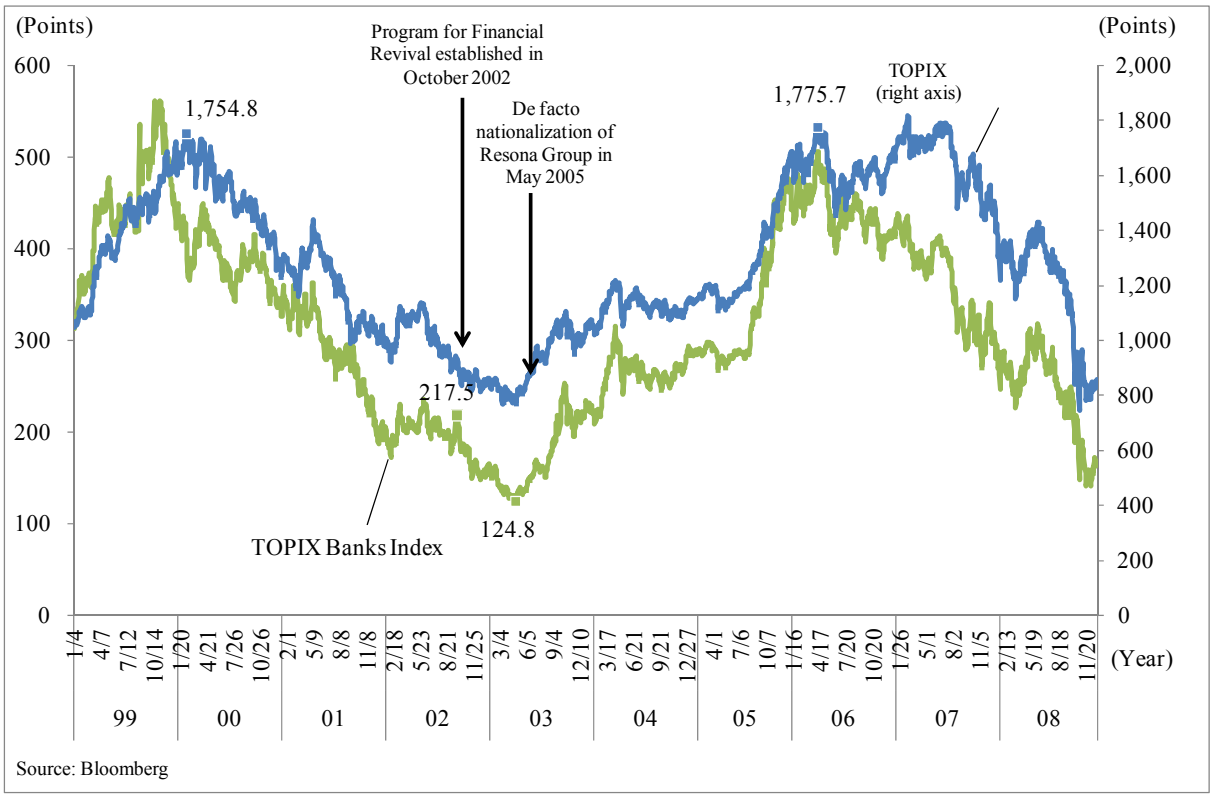
(C) Importance of stabilizing market (investor) sentiment

The most important thing to do in order to resolve a financial crisis is to stabilize market (investor) sentiment by eliminating uncertainty.

In Japan during the financial crisis, the country steadily implemented a variety of measures to ensure more rigorous assessment of assets, higher capital requirements and reinforce corporate governance, with a view to establishing a more robust financial system that would underpin structural reforms by halving the ratio of bad loans to overall loans at major banks at the end of March 2002 (8.4%) by the end of March 2005 under the Program for Financial Revival, which was adopted in October 2002. For a while after this program started, stock prices, including bank shares, continued to decline (Figure 1-1-3-4).

Eventually, after Resona Bank, which was found to be undercapitalized, received public funds to boost its capital (June 2003), the view spread in the market that the risk of Japanese banks failing had almost completely been eliminated and prices of bank shares recovered rapidly from their slump, triggering a rebound in overall stock prices to the level seen before the financial crisis (February 2000).

Figure 1-1-3-4 Changes in Japanese stock prices
(bank shares and listed shares on the TSE First Section)



In the current financial crisis, the failure of major investment bank Lehman Brothers in September 2008 dealt a significant blow to the market, which had temporarily regained stability following the bailout of major securities company Bear Stearns in March of the same year, fueling market concern that other financial institutions might fail. As a result, a flight to safe assets occurred on a global scale, triggering a global financial crisis.

This turn of events suggests that when governments make specific policy decisions, they need to carefully consider a possible impact on market (investor) sentiment and that stabilizing market sentiment, namely creating an environment in which investors can make financial investments with a sense of security, is the most effective means to resolve a crisis.

(2) Medium- and long-term measures to deal with the crisis and prevent its recurrence

As we pointed out in 1. (3) of this section, the key to dealing with the crisis and preventing its recurrence is to expand the supply of sound assets in individual countries, apart from short-term measures aimed at resolving the ongoing crisis.

However, a substantial portion of domestic funds in developed countries flowed into the U.S. asset market in pursuit of high returns and safety, as the United States achieved high economic growth compared with other developed countries due to strong growth in domestic demand. In addition, domestic funds in emerging economies in Asia and other regions, which achieved high economic

growth compared with developed countries, including the United States, continued to flow into the U.S. asset market because of the high level of safety of U.S. assets and the allure of the U.S. dollar as a settlement currency (Figure 1-1-2-6).

These flows are clearly reflected in the changes of the money supply in major developed countries and regions.

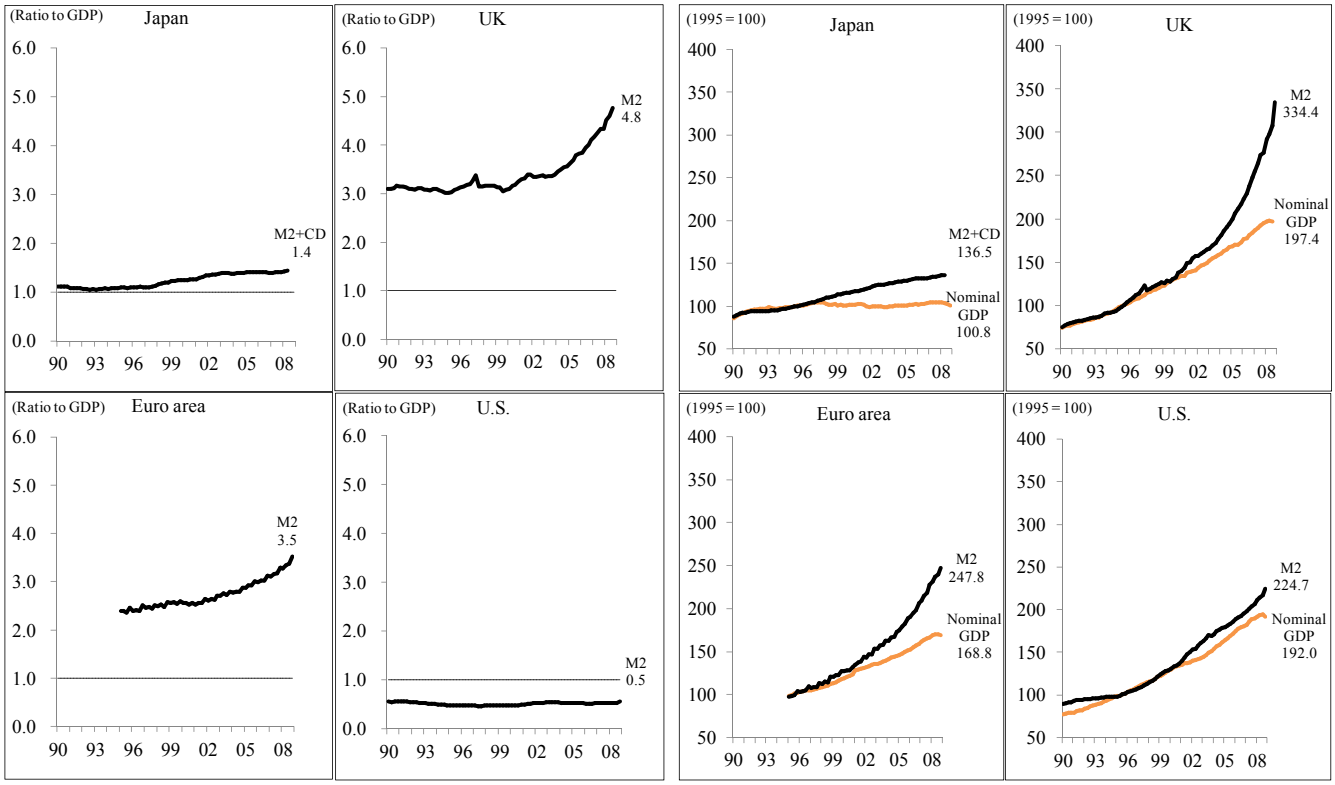
If we examine the changes of the money supply in Japan, the United Kingdom, the euro area and the United States in relation to nominal GDP (Figure 1-1-3-5) since 1990, we recognize that M2 has grown rapidly in the United Kingdom since 2000, in the wake of the collapse of the IT bubble, with its amount nearly five times as large as the country's nominal GDP in the fourth quarter of 2008. In the euro area, too, M2 has continued to grow since 1999, when the euro was introduced, with its amount was 3.5 times as large as the region's nominal GDP in the same quarter. In Japan, the amount of the money supply was 1.4 times as large as the country's nominal GDP in the same quarter, as M2 plus CD has continued to grow moderately since 2000 while economic growth remained low. On the other hand, M2 has consistently remained flat since the 1990s in the United States, with its amount about half the country's nominal GDP.

As described above, whereas the money supply in Japan (M2 plus CD) as well as the United Kingdom and the euro area (M2) has been larger than the size of the respective nominal GDPs in recent years, the money supply in the United States (M2) has stayed far smaller than the size of its nominal GDP, indicating that money flows very rapidly there. This means that in the United States, a large amount of transactions (GDP) are made with a relatively low level of liquidity.

On the other hand, it indicates that in Japan, the United Kingdom and the euro area countries, there is a substantial amount of idle money that is not being used for domestic production or consumption activity.

The comparison of the money supply growth and nominal GDP growth shows that the nominal GDP of the United States grew at almost the same pace as the country's M2, while the nominal GDP growth rates in Japan, the United Kingdom and the euro area were far lower than the respective money supply growth rates.

Figure 1-1-3-5 Money supply in major developed countries and regions



Source: *Monetary Survey* (Bank of Japan), *System of National Accounts* (Cabinet Office), Bank of England, *International Financial Statistics* (IMF), Federal Reserve Bank, Bureau of Economic Analysis, U.S. Department of Commerce and Eurostat.

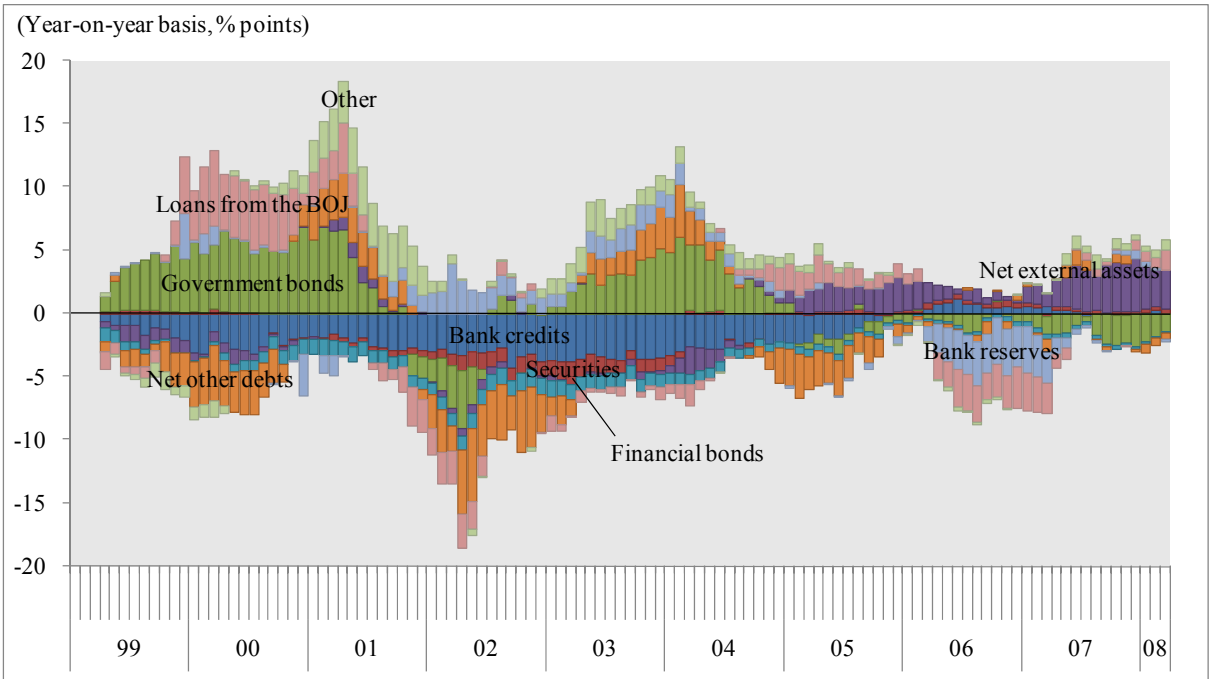
This strongly suggests that an increased amount of money was not invested in domestic production activity and has become idle money, and that some of such idle money was used for production and consumption activity in the United States through investments in U.S. treasuries and RMBS and other securities. Indeed, the decomposition of changes in Japan's money supply (M2 plus CD) (Figure 1-1-3-6) shows that net external assets replaced government bonds as the main factor behind the money supply growth around 2005 amid a continued slump in bank credit to the private sector.

Behind this situation is the fact that the returns on financial investments in domestic sound assets such as government, municipal and corporate bonds are relatively low in Japan, where weak growth has continued for a long time, and in other countries where economic growth is slower than in the United Sates, including France and Germany, (Figure 1-1-3-7).

Developed countries can resolve this problem by raising the returns on domestic sound assets through sustainable economic growth achieved by an expansion of domestic demand. For emerging economies, it is important to make efforts to ensure an adequate domestic supply of sound assets by developing domestic asset markets through the securing of political stability, improvement of domestic legal frameworks and modernization of business practices.

Pursuit of domestic demand-led growth by countries around the world, including developed countries, is expected to contribute to the diversification of the growth engine of the global economy and the reduction of the global economy's excessive dependence on U.S. consumption.

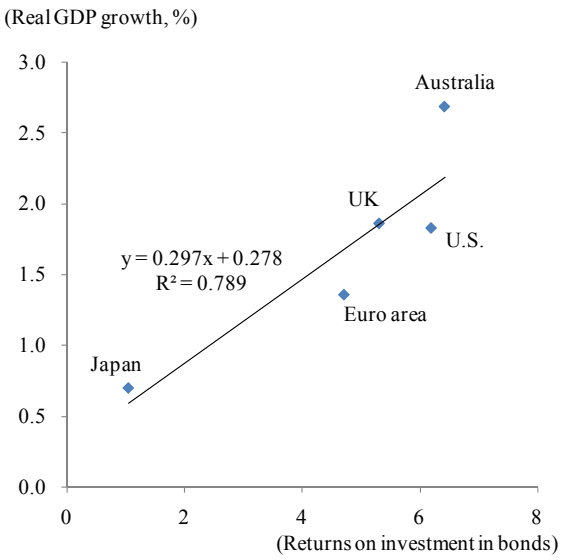
Figure 1-1-3-6 Decomposition of changes in Japan's money supply (from April 1999 to March 2008)



Source: *Monetary Survey* (Bank of Japan)

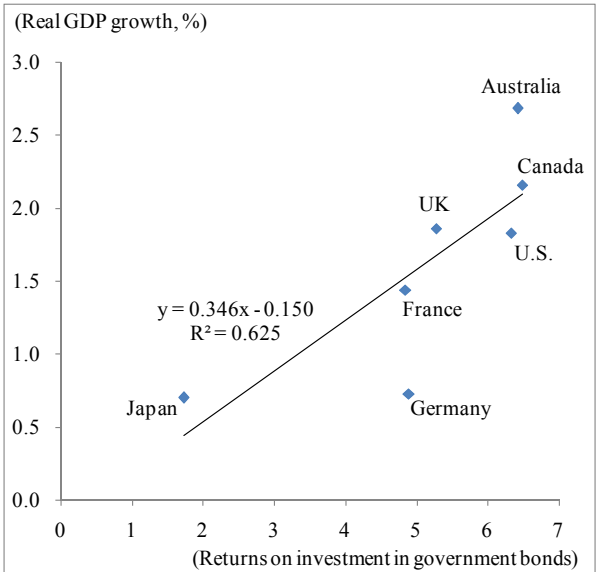
Figure 1-1-3-7 Average rates of portfolio returns in developed countries and the respective real GDP growth rates

(i) Public and corporate bonds (from January 2000 to April 2009)



Notes: They consist of municipal bonds, asset-backed securities and corporate bonds that have remaining maturity of more than one year, and ratings of at least either BBB- by S&P or Baa3 by Moody's.
Source: World Economic Outlook Database (IMF), Citigroup Global Index.

(ii) Government bonds (from January 2000 to April 2009)



Notes: They consist of fixed-rate government bonds issued in local currency that have remaining maturity of more than one year and ratings of at least either BBB- by S&P or Baa3 by Moody's.
Source: World Economic Outlook Database (IMF), Citigroup Global Index.

Column 1 Why was financial engineering unable to predict the financial crisis?

Fischer Black and Myron Scholes published "The Pricing of Options and Corporate Liabilities" in 1973, for which they were later awarded the Nobel Prize in Economics. Their paper presented the Black- Scholes formula, which derives theoretical prices of financial derivative products such as stock options. This formula became a foundation of modern financial engineering development and made a large contribution to the expansion of today's financial derivatives market. After its publication, the Black- Scholes formula was immediately utilized by U.S. investment banks,[32] which it was said brought them enormous profits.

The foundation of this theory is the assumption that stock price movements follow a stochastic process (a random walk), that is, that stock price movements follow a normal distribution. However, it is currently a well known fact that stock price movements do not follow a normal distribution: they roughly follow a bell curve, but it is more concentrated near the center with a higher peak than a normal distribution, and its base has longer tails away from the center.[33]

The UK's FTSE 100 share index is used below to examine the characteristics of such stock price movements. This shows, in an actual stock market, failure of the assumption that asset price (stock price) movements follow a normal distribution, on which capital markets analysis using the Black-Scholes formula and other financial engineering methodologies depend.

The Black- Scholes formula and other modern finance theories are based on the assumption that the expected value (mean μ) and standard deviation (variance σ) of stochastic distribution, which express predicted results of securities returns, follow a normal distribution. This signifies that "an investor can build a portfolio which maximizes utility, by maximizing expected return μ to be obtained from portfolio investment, and minimizing risk σ."[34]

However, looking at the FTSE 100 share price movements since 1984 (stock price difference from the previous trading day) (Column Figure 1-1), price movements exceeding $\pm 3\sigma$ from the mean occurred many times. These events have only a 0.2% statistical probability of occurring, but looking at price drops alone, they actually occurred on a total of 78 days over 24 years, such as Black Monday in October 1987, dates around the 2000 IT bubble collapse, the terrorist attacks on September 11, 2001, and the global financial crisis since the recent Lehman Brothers shock (Column Table 1-4).

Column Figure 1-2 compares the stochastic distribution of stock price movements against a normal distribution. This shows that the distribution of stock prices has a very different shape to a normal distribution. As mentioned above, its shape has a higher peak near the center, and its base has longer tails away from the center.

Column Figure 1-3 zooms in on this base. Near the base, the probability density of stock price

[32] Actually, it is said that in the systems implemented in investment banks, theoretical values were updated each second in order to constantly reflect market movements which change each moment.

[33] This characteristic is often expressed as "leptokurtosis", or "fatter tails and a higher peak at the mean."

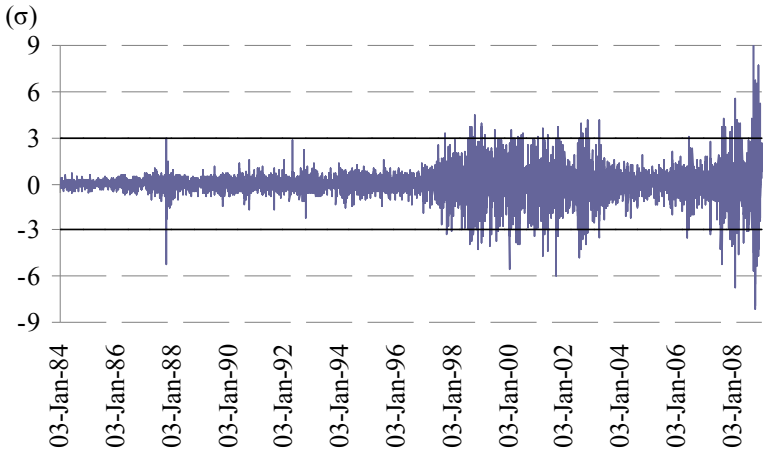
[34] From Takamoto, S., "SHOUKEN NO SHUUEKIRITSU NO HISEIKISEI TO HISSSENKEISEI NI TSUITE," *Hyogo University Journal* Vol.3 (19980331).

movements starts to move outside the normal distribution from around ±2σ.

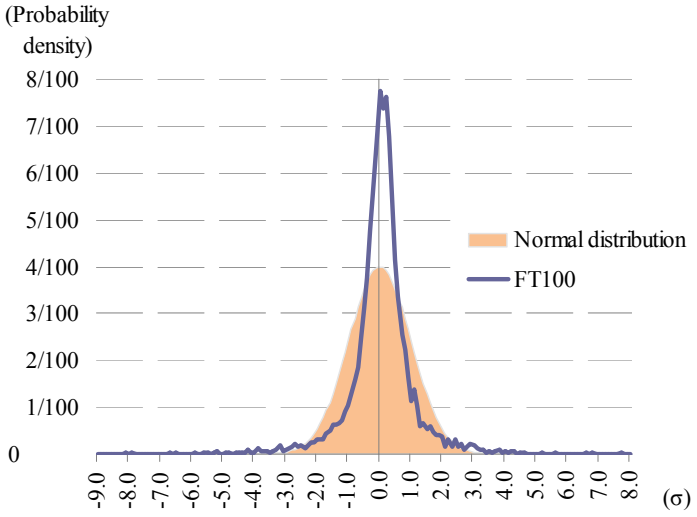
Actually counting the number of days that the stock price movement exceeded the normal distribution in the base area of the distribution (≥ 2σ or ≤ -2σ) during this period (25 years), there were 130 declining days, and 138 rising days. Looking at the number of days with ±3σ from the center, there were 78 declining days as already seen, and 66 rising days.

All of these have a probability of occurring between once every few years and once every 25 years. Incidentally, in a normal distribution, the Lehman Shock on September 15, 2008, saw the stock price index fall 212.5 points from 5,416.7 to 5,204.2 (equivalent to -4.45σ), which has a probability of only 2.5×10^{-6} (once in 1,585 years).

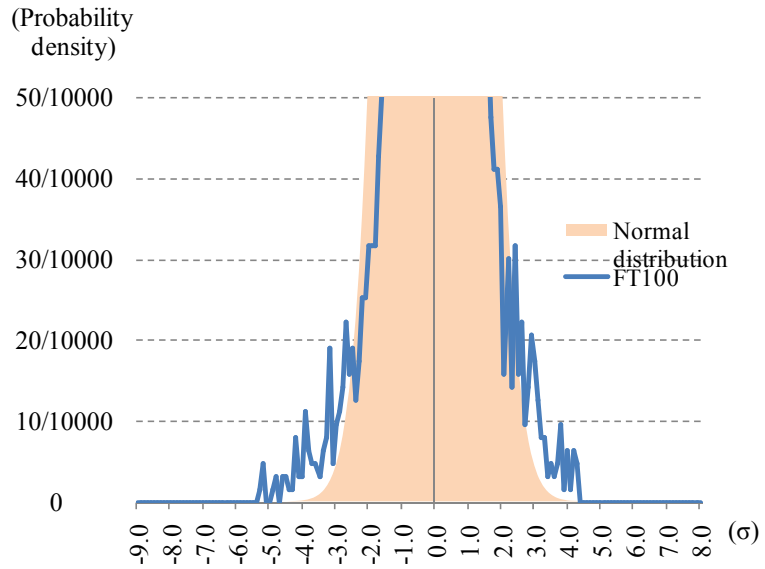
Column Figure 1-1 / FTSE 100 share price movements



Column Figure 1-2 / Probability distribution of FTSE 100 share price movements



Column Figure 1-3 / Probability distribution of FTSE 100 share price movements (expanded)



The above signifies that in financial engineering typified by the Black- Scholes formula, large movements which occur once every few years are excluded from the theory. That is, the actual occurrence of such events is totally unpredicted. U.S. Princeton University Professor P. Krugman, another Nobel Laureate in economics, stated: "We thought we could use financial engineering to manage risks even without diligently examining each loan. We believed there was a self-cleansing function in the market. However, in the end that belief was wrong."[35]

[35] Yomiuri Shimbun article on January 3, 2009.

Column Table 1-4 / Dates recording large share price declines of -3σ or more
(Jan. 3, 1984, to Jan. 5, 2009)

		Date	⊿FT100	×σ		Date	⊿FT100	×σ
	1	06-Oct-08	-392.79	-8.16	40	13-Jan-99	-184.08	-3.82
	2	10-Oct-08	-382.32	-7.94	41	29-Jul-99	-180.28	-3.74
	3	21-Jan-08	-325.23	-6.75	42	14-Apr-00	-179.48	-3.72
	4	15-Oct-08	-315.20	-6.54	43	16-Sep-08	-179.18	-3.72
Sept. 11 terrorist attack	5	**11-Sep-01**	**-288.28**	**-5.98**	44	27-Aug-98	-177.48	-3.68
	6	29-Sep-08	-271.43	-5.63	45	28-Aug-02	-176.28	-3.66
	7	04-Jan-00	-267.19	-5.55	46	10-Sep-98	-175.28	-3.64
	8	06-Nov-08	-258.90	-5.37	47	19-Nov-07	-172.13	-3.57
Black Monday	9	**19-Oct-87**	**-251.33**	**-5.22**	48	17-May-06	-171.28	-3.55
	10	20-Oct-87	-251.28	-5.22	49	16-Mar-01	-166.98	-3.46
	11	16-Aug-07	-250.98	-5.21	50	12-Mar-03	-166.28	-3.45
	12	08-Oct-08	-239.11	-4.96	51	18-Jan-00	-165.48	-3.43
	13	10-Aug-07	-233.48	-4.85	52	20-Sep-01	-165.38	-3.43
	14	15-Jul-02	-231.33	-4.80	53	22-Jan-99	-161.68	-3.35
	15	22-Mar-01	-226.48	-4.70	54	22-Nov-00	-161.28	-3.35
	16	01-Dec-08	-224.25	-4.65	55	14-Mar-07	-161.08	-3.34
	17	17-Mar-08	-219.03	-4.55	56	18-Sep-02	-160.28	-3.32
	18	16-Oct-08	-218.78	-4.54	57	17-Sep-98	-159.38	-3.31
Lehman Crisis	19	**15-Sep-08**	**-214.23**	**-4.45**	58	05-Feb-08	-158.78	-3.29
	20	14-May-01	-208.03	-4.32	59	02-Oct-98	-158.38	-3.29
	21	01-Dec-98	-206.98	-4.29	60	23-Oct-97	-157.88	-3.27
	22	24-Oct-08	-205.05	-4.25	61	11-Nov-08	-157.81	-3.27
	23	22-Jul-02	-204.53	-4.24	62	14-May-99	-156.78	-3.25
	24	26-Jul-07	-203.68	-4.23	63	01-Oct-98	-156.78	-3.25
	25	19-Nov-08	-203.45	-4.22	64	21-Nov-07	-156.18	-3.24
	26	01-Aug-02	-202.28	-4.20	65	03-Apr-01	-155.98	-3.24
	27	19-Jul-02	-199.58	-4.14	66	11-Aug-98	-155.38	-3.22
	28	13-Dec-07	-196.18	-4.07	67	29-Oct-02	-155.18	-3.22
	29	20-Apr-99	-196.08	-4.07	68	11-Apr-00	-154.78	-3.21
	30	21-Aug-98	-190.98	-3.96	69	03-Jul-02	-154.78	-3.21
	31	11-Jul-02	-190.68	-3.96	70	30-Mar-00	-154.18	-3.20
	32	15-Jan-08	-190.68	-3.96	71	03-Sep-02	-152.88	-3.17
	33	22-Oct-08	-189.42	-3.93	72	07-Feb-08	-151.88	-3.15
	34	03-May-00	-189.18	-3.92	73	27-Feb-07	-149.18	-3.09
	35	14-Sep-01	-188.48	-3.91	74	19-Dec-97	-148.68	-3.08
	36	19-May-00	-188.08	-3.90	75	10-Aug-99	-148.58	-3.08
	37	30-Sep-02	-187.13	-3.88	76	26-Jun-08	-148.48	-3.08
	38	20-May-08	-185.48	-3.85	77	01-Jul-08	-146.58	-3.04
	39	17-Apr-00	-185.23	-3.84	78	11-Jul-08	-145.78	-3.02 **-3σ**

Notes: Shaded dates recorded declines of -3σ or more since the Lehman crisis.
Source: Bloomberg