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Sovereign Credit Default Swaps: Market Developments and Factors behind Price Changes

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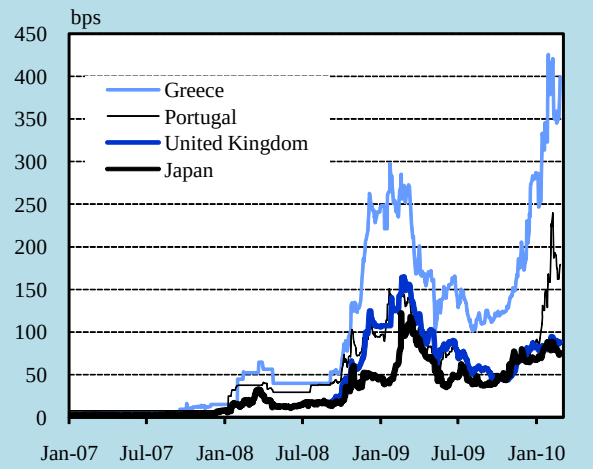
This paper examines sovereign credit default swaps (CDSs), which have attracted attention since the emergence of the fiscal deficit problem in Greece, with particular focus on the expansion of the sovereign CDS market, the relationship between CDS premiums and fiscal risk variables, and the international co-movement of CDS premiums. The analysis reveals the following: (1) CDS transaction volume has recently expanded rapidly, mainly reflecting the significant increase in fiscal expenditure in some countries and the heightened awareness of European sovereign risk; (2) however, the degree of interrelation between CDS premiums and actual fiscal risk varies by country; and (3) concerns over sovereign risk in some continental European countries may have spilled over to other countries, as seen in the increase in the international co-movement of CDS premiums among major countries.

Introduction

Since the emergence of the fiscal deficit problem in Greece[1] in the autumn of 2009, sovereign risk has attracted attention in the global financial market. As a result, sovereign CDS[2] premiums have widened, mainly for some continental European countries (Chart 1).

Chart 1: Sovereign CDS premiums



Note: As of February 25, 2010.
Source: Bloomberg.

Some market participants, however, have expressed the view that changes in the sovereign CDS premiums may not accurately reflect a country's actual fiscal situation, because they are susceptible to investors' speculative motives due to low market liquidity. It has also been pointed out that the willingness of a small number of investors to invest in sovereign risk transactions, rather than the actual fiscal situation of individual countries, significantly influences the price dynamics. Therefore, once investors become aware of a country's sovereign risk and the sovereign CDS premiums increase, the effects of the increase may spread to other countries even though there is no significant change in the fiscal situation. This paper examines (1) the expansion of the sovereign CDS market by utilizing basic information such as the amount outstanding of CDSs, (2) the relationship between CDS premiums and fiscal risk variables, and (3) the international co-movement of CDS premiums.

Recent Developments in the Sovereign CDS Market[3]

Sovereign CDS transactions have expanded rapidly, as seen in the increase of more than 30 percent in the amount outstanding of CDSs over the past year (Chart 2). This expansion can be attributed to the following factors. First, transactions with more

attention to public-sector risks than private-sector ones increased toward the spring of 2009, given the implementation of large-scale fiscal stimulus measures to stabilize the financial sector and economic stimulus packages after the failure of Lehman Brothers. And second, activity in the sovereign CDS market increased again, as concerns over sovereign risk in some European countries intensified from the autumn of 2009. Meanwhile, a rapid recovery in stock prices and a marked narrowing in corporate bond spreads have been observed in financial markets around the world, and firms' demand for hedging credit risk has not appeared to increase significantly. Therefore, the amount outstanding of CDSs to hedge the firms' credit risk has changed little.

In other words, the rapid expansion in the sovereign CDS market over the past year generally has not spread to the credit-related transactions of the corporate sector. It should be noted that even after the rapid expansion, the amount outstanding of sovereign CDSs still amounts to less than 20 percent of that of corporate CDSs.

The growth rate of the amount outstanding of sovereign CDSs by country has risen markedly in Japan, the United States, and the United Kingdom (Chart 3).

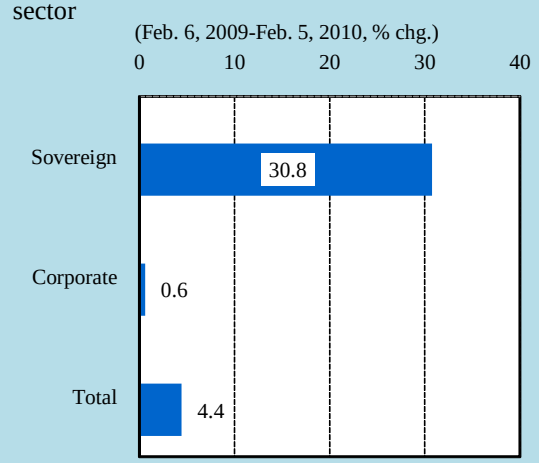
In these three countries including Japan, which face a deterioration in their fiscal balance, market participants seemed to be more concerned about the fiscal situation. By region, however, the ranking of these three countries is not high, and the percentage share of each in the amount outstanding of CDSs registers only around 1 percent (Chart 4).

In this regard, despite the rapid expansion in the amount outstanding of CDSs in Japan, the United States, and the United Kingdom, such movements have been within extremely low levels. Therefore, the expansion does not necessarily mean that market participants are relatively more concerned about the fiscal situation of these countries compared to other countries.

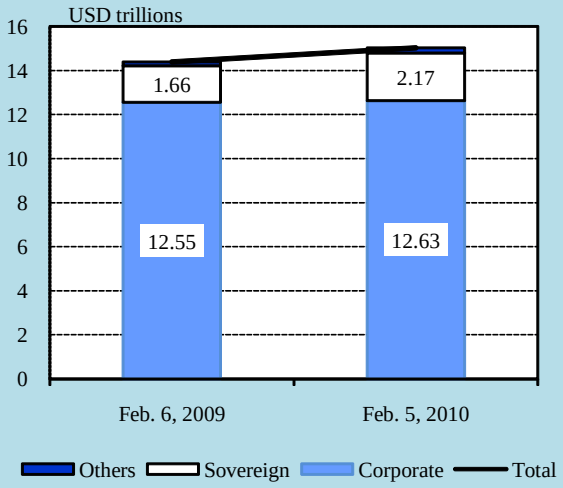
Taking into account the fact that investors' fundamental needs for CDSs are to hedge risks, there might be a correlation between one country's amount outstanding of public debt including government bonds and its amount outstanding of sovereign CDSs. In order to briefly examine this point, we compare the share of the amount outstanding of public debt held by central governments, including government bonds by region with that of the amount outstanding of sovereign CDSs by region, using the data for 26 countries of the member states of the Organisation for Economic Co-operation and Development (OECD) for which data are available (Chart 5).

Chart 2: Developments in the CDS markets

1. Growth rates of the amount outstanding of CDSs by sector



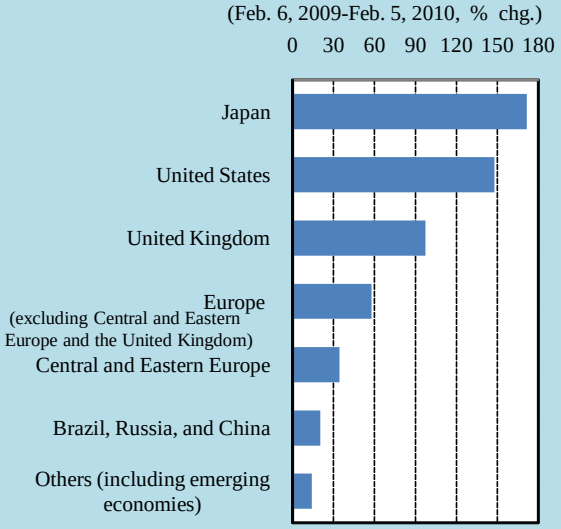
2. Amount outstanding of CDSs by sector



Notes: 1. The data for Depository Trust & Clearing Corporation (DTCC) do not necessarily cover all transactions, but could cover nearly 90 percent of transactions.
2. Amount outstanding refers to gross notional values in U.S. dollars throughout the paper. Gross values may be regarded as transaction volumes, while net values may indicate bias of the positions in the markets.
3. "Sovereign" includes central governments and municipalities (e.g., state governments in the United States). "Others" includes mortgage-backed securities (MBSs), CDSs on loans, and others.

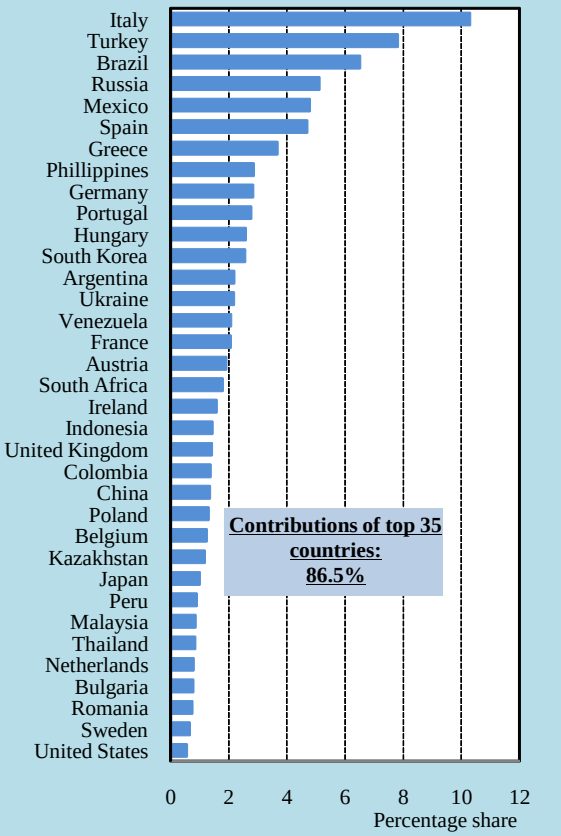
Source: Depository Trust & Clearing Corporation.

Chart 3: Growth rates of the amount outstanding of sovereign CDSs by region



Source: Depository Trust & Clearing Corporation.

Chart 4: Share of top 35 countries in the amount outstanding of sovereign CDSs

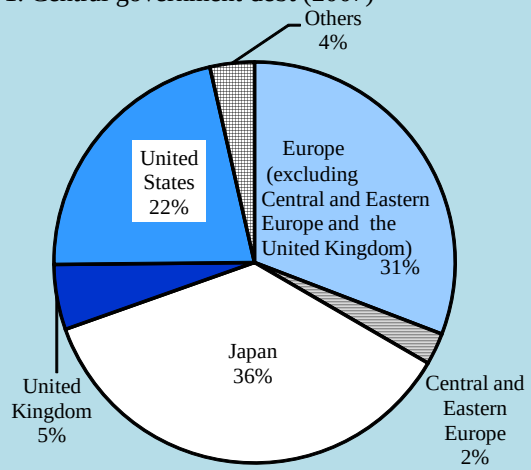


Note: As of February 5, 2010.

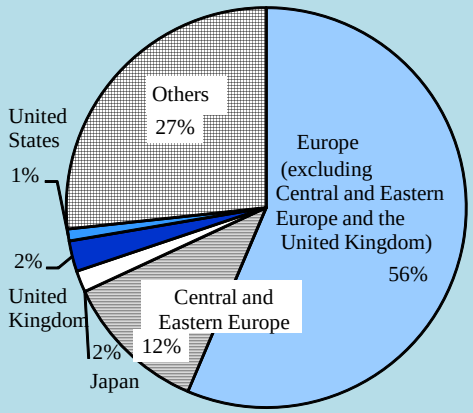
Source: Depository Trust & Clearing Corporation.

Chart 5: Share of the central government debt and the amount outstanding of CDSs by region

1. Central government debt (2007)



2. Amount outstanding of sovereign CDSs (2010)



Note: The shares of 26 countries for which both CDS outstanding data and central government debt data are available among 30 OECD member states (excluding Australia, Canada, Luxembourg, and Switzerland).
Central and Eastern Europe: Austria, the Czech Republic, Hungary, Poland, and the Slovak Republic.
Others: South Korea, Mexico, New Zealand, and Turkey.

Sources: Depository Trust & Clearing Corporation; Organisation for Economic Co-operation and Development.

The comparison shows that Japan, the United States, and the United Kingdom, which account for almost two-thirds of the total public debt, hold only around 5 percent of sovereign CDSs. From this, it can be concluded that so far investors holding Japanese, U.S., and U.K. government bonds have not increasingly purchased protection to hedge the default risk of the respective government bonds.

It has been pointed out that a significantly high percentage of Japanese government bonds (JGBs) is held by Japanese investors while Japanese

sovereign CDSs are mostly traded by foreign investors, suggesting that Japanese sovereign CDSs are rarely used by JGB holders. Given the historical background that U.S. treasury yields have served as a benchmark rate for the evaluation of government bond yields in emerging economies, it is generally considered difficult to directly connect U.S. Treasuries with sovereign risk. This seems to have served as one factor that limits the trading volumes of U.S. sovereign CDSs.

The amount outstanding of sovereign CDS contracts in continental European countries and emerging economies represents a high share in the global market. This can be attributed to the following factors. First, arbitrage transactions on sovereign risk tend to be conducted in these countries where the euro convergence trade (trading based on speculation that yield spreads would narrow which took place in the run-up to the euro's introduction) [4] and spread trading between these countries' sovereign bonds and U.S. Treasuries have been carried out. Second, liquidity in the government bond markets is relatively low in some of these countries, and CDSs are often used to hedge the risk of fluctuations in government bond prices. And third, investors are not sufficiently confident about the sound management of fiscal balances in some emerging economies.

Relationship between Sovereign CDS Premiums and Fiscal Risk Variables

As mentioned above, the amount outstanding of sovereign CDSs varies by country. An examination of this point in terms of the price formation mechanism of and liquidity in the sovereign CDS market enables the following observations: (1) in countries where the amount outstanding of sovereign CDSs is at low levels, such as Japan, the United States, and the United Kingdom, CDS premiums are more directly affected by speculative flows as they are susceptible to the behavior of a small number of investors; (2) on the other hand, sovereign CDS market liquidity is relatively high in continental European countries and emerging economies, and the CDS premiums are more likely to reflect a country's fiscal risk premiums. In what follows, we examine this point by using the CDS premiums and other fiscal risk variables.

First, we regress the CDS premiums for four continental European countries (Greece, Portugal, Italy, and Spain), which account for a large amount outstanding of sovereign CDSs and have attracted much attention since the autumn of 2009, and those for Japan, the United States, and the United Kingdom, which account for a small amount outstanding of sovereign CDSs, on their spreads between the government bond yield and the overnight index swap (OIS) rate, [5] which are considered as a fiscal risk premium indicator. [6] When concerns over a country's fiscal situation heighten, the rate of increase in the government bond yields outpaces that in the OIS rate, leading to a narrowing of negative spreads (or a widening of positive spreads). Estimation shows that (1) in the four continental European countries, R-squared is generally high and the coefficients of determination for the government bond yield-OIS spread are statistically significant; (2) while in Japan, the United States, and the United Kingdom, R-squared is extremely low and the coefficients are not statistically significant (Chart 6).

Chart 6: Relationship between CDS premiums and government bond yield-OIS spreads

$$(\textit{Weekly change in CDS premium})_t = c + \alpha\ (\textit{weekly change in gov. bond yield} - \textit{OIS spread})_t$$

	R^2	α	(t-value)
Greece	0.80	0.94	(10.12)
Portugal	0.80	1.02	(10.13)
Italy	0.25	0.71	(2.87)
Spain	0.48	1.00	(4.79)
Japan	0.03	0.31	(0.82)
United States	0.00	0.05	(0.35)
United Kingdom	0.00	0.04	(0.23)

Notes: 1. Weekly data from August 14, 2009 to February 12, 2010 (number of samples: 27).
2. Shaded areas are statistically significant with 1 percent critical value.
Sources: Bloomberg; CMA.

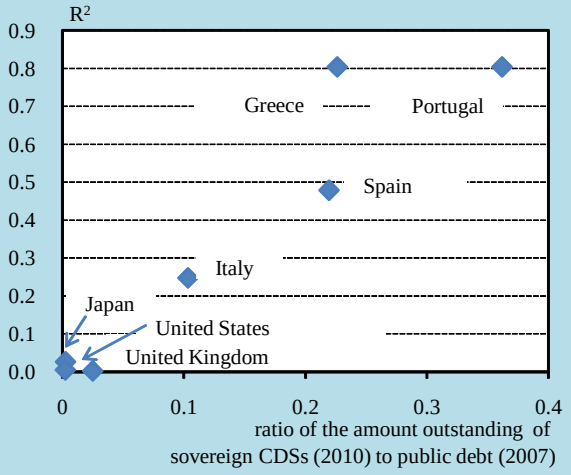
Sovereign CDS premiums in Japan, the United States, and the United Kingdom have recently risen against the background of the heightened concerns over sovereign risk, co-movements of CDS premiums and government bond yields have not been confirmed, and a strong relationship between CDS premiums and fiscal risk premiums is not found throughout the estimation period (since August 2009). This implies that, because the

amount outstanding of sovereign CDSs is at low levels, CDS premiums seem to be affected by the behavior of a small number of speculative investors.

Turning to the four continental European countries, in Greece and Portugal, where the sovereign CDS premiums are volatile, the relation between CDS premiums and the government bond yield-OIS spread is exceptionally strong. This suggests that both reflect the fiscal risk premiums.

The ratio of the amount outstanding of sovereign CDSs to public debt and R-squared in Chart 6 shows a moderate positive correlation (Chart 7). Although it is difficult to interpret this due to the limited number of samples, it also seems to imply that when the amount outstanding of sovereign CDSs decreases relative to the amount outstanding of government bonds, sovereign CDSs tend to be affected more by transactions reflecting demand other than to hedge risks (such as various arbitrage transactions focused on trading and the difference between asset prices) or transactions based on the specific trading motives of certain investors.[7]

Chart 7: Ratio of the amount outstanding of sovereign CDSs to public debt and R^2 in Chart 6



Sources: Bloomberg; CMA; Depository Trust & Clearing Corporation; Organisation for Economic Co-operation and Development.

A similar analysis is also conducted with regard to four emerging economies (Turkey, Brazil, Russia, and Mexico), which account for a large amount outstanding of sovereign CDSs, by adopting the yield spreads of these countries' government bonds over the benchmark rate (U.S. or German government bonds) as a comparable explanatory variable (this analysis is conducted again for the four continental European countries). The results suggest a certain level of correlation between the sovereign CDS premiums and yield spreads of each country's government bonds over U.S. or German government bonds (Chart 8). However, the degree of correlation varies by country, and thus it should be borne in mind that some degree of error is unavoidable in examining sovereign risks by using sovereign CDS premiums.

Chart 8: Relationship between CDS premiums and yield spreads over U.S. or German government bonds

$$(\textit{Weekly change in CDS premium})_t = c + \alpha\ (\textit{weekly change in spreads of gov. bonds over U.S. [or German] gov. bonds})_t$$

	R^2	α	(t-value)
Greece	0.81	0.90	(10.28)
Portugal	0.76	0.94	(8.92)
Italy	0.23	0.58	(2.72)
Spain	0.43	0.86	(4.38)
Turkey	0.46	0.27	(4.58)
Brazil	0.68	0.43	(7.35)
Russia	0.26	0.63	(2.86)
Mexico	0.36	0.49	(3.78)

Notes: 1. Weekly data from August 14, 2009 to February 12, 2010 (number of samples: 27).
2. Turkey: 5-year yields and German 5-year yields.
Russia: 9-year yields and German 9-year yields.
Brazil and Mexico: 10-year yields and U.S. 10-year yields.
Others: 10-year yields and German 10-year yields.
3. Shaded areas are statistically significant with 1 percent critical value.

Source: Bloomberg.

International Co-Movement of Sovereign CDS Premiums

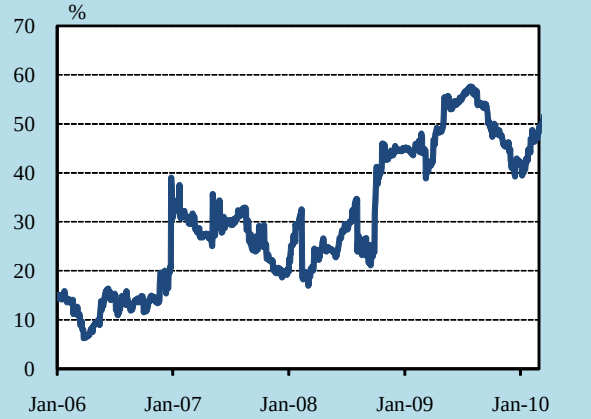
The above analyses reveal that the correlation between sovereign CDS premiums and actual fiscal risk variables varies from country to country, and a strong correlation cannot always be confirmed. This is because developments in sovereign CDS premiums reflect the behavior of a small number of investors. When investors become aware of a country's sovereign risk (when the investment attitude of a small number of investors changes) and the sovereign CDS premiums increase, the effects of this increase may spread to other countries. In what follows, we examine the international co-movement of sovereign CDS premiums via time-series analysis.

First, we review how the international

co-movement of sovereign CDS premiums has changed. Specifically, we follow the method described in Diebold and Yilmaz (2009)[8] and estimate the international dependence (the international co-movement[9] computed by aggregating the international dependence) of sovereign CDS premiums for six major countries for which long-term time-series data are available (Japan, Germany, Greece, Portugal, Spain, and Brazil).

The results of the analysis show that the international co-movement of sovereign CDS premiums has grown over the past four years, albeit with some fluctuations (Chart 9). This implies that sovereign CDS premiums might not only reflect the economic fundamentals of the countries but also be increasingly affected by the globally common factors or the effects of other countries.[10]

Chart 9: International co-movement of sovereign CDS premiums



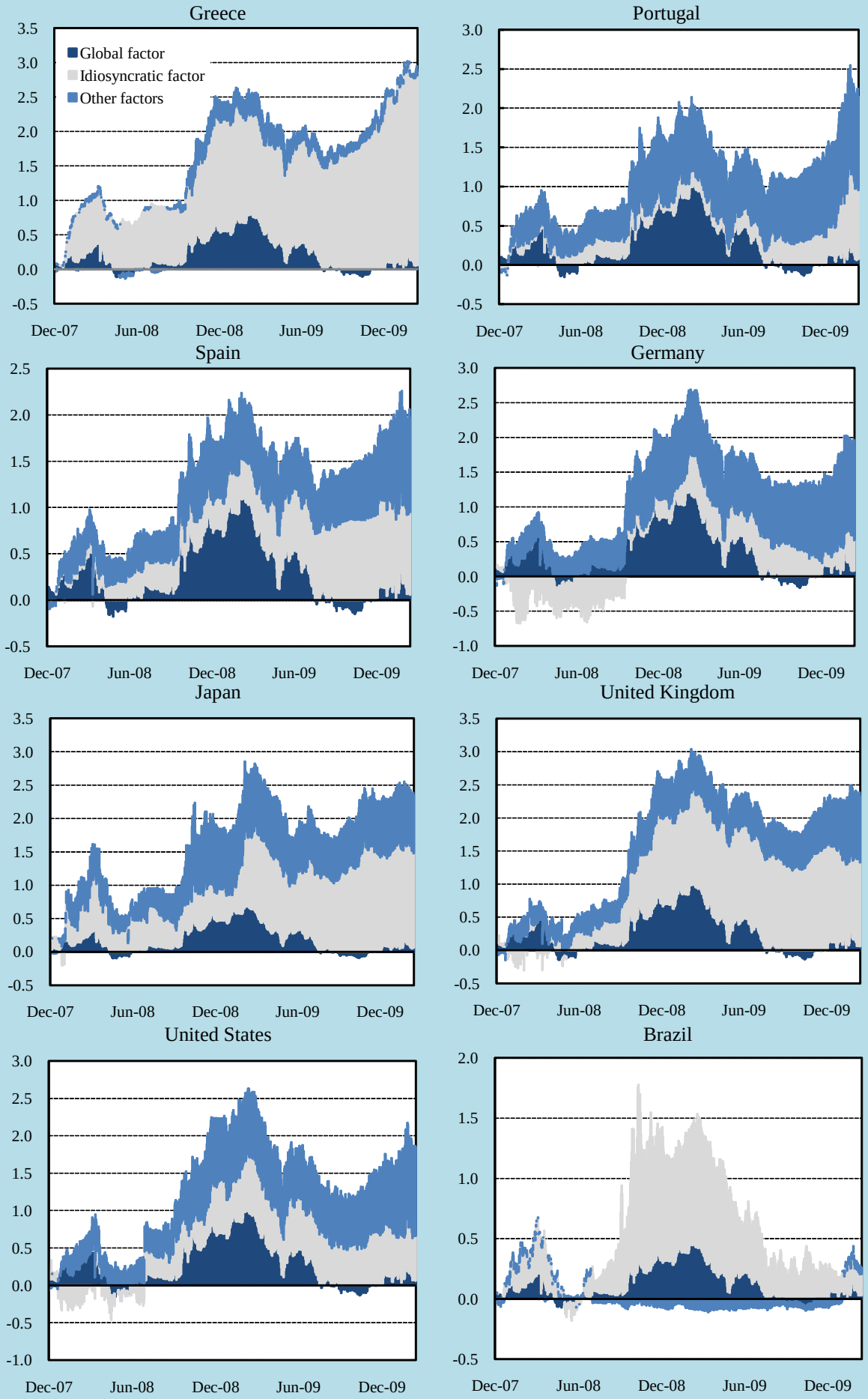
Sources: CMA; Bank of Japan.

Next, we determine whether the growing international co-movement is caused by the globally common factors or the strong effects of sovereign CDS premiums for other countries. In Chart 9, we estimate the international co-movement for countries excluding the United States and the United Kingdom, as the long-term time-series data are not available. In order to conduct an in-depth analysis, we examine sovereign CDS premiums for eight countries including the two just mentioned.

By applying the Kalman filter, we extract the following factors that explain the changes (daily rate of change) in sovereign CDS premiums: (1) shocks that affect the world simultaneously; (2) idiosyncratic factors (shocks that occur only in the specific country); and (3) the spillover effects of a shock in one country to other countries. Then we estimate their contributions to changes in sovereign CDS premiums.[11] By using this method, the changes in Japan's sovereign CDS premiums can be explained by (1) globally common factors;[12] (2) shocks that occur only in Japan (idiosyncratic factors); and (3) the spillover effects of an idiosyncratic shock in other countries to Japan (other factors). For example, if growing concerns over the stability of the U.S. financial system affect the global financial markets simultaneously, this is classified as a globally common factor. On the other hand, if a shock is first considered as an idiosyncratic factor in the United States and this shock influences other countries with a time lag, this is classified as other factors in countries other than the United States.

Sovereign CDS premiums recently seem to follow a similar path in the world as a whole. The results, however, suggest that the effects of the globally common shocks have decreased sharply since the summer of 2009 (Chart 10). The globally common factors seem to have played a significant role given the fact that investors became very risk averse after the failure of Lehman Brothers and paid more attention to public-sector risks than private-sector ones after the turn of the year 2009. After that, however, as the massive expansion of fiscal stimulus measures in order to stabilize the financial systems began to level off, the effects of the globally common shocks subsided.

Chart 10: Factors of sovereign CDS premiums

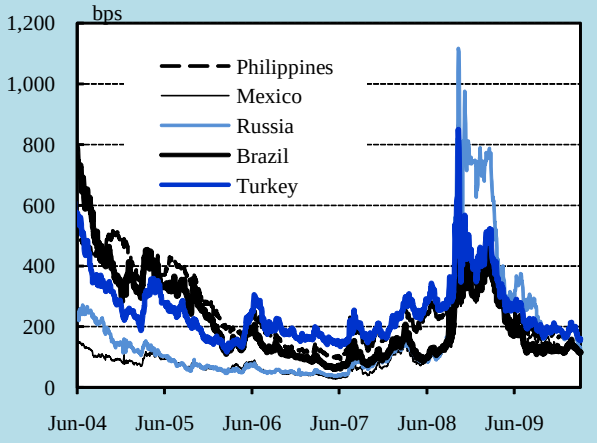


Note: Natural logarithm of return from the start of December 2007.

Sources: CMA; Bank of Japan.

Looking at the developments after the autumn of 2009, it should be noted that changes in Greek sovereign CDS premiums have been caused largely by idiosyncratic factors. In a situation where market participants are aware of the deterioration in the fiscal situation of some countries, Greek sovereign CDS premiums have widened further due to idiosyncratic factors such as the significant upward revision of the outlook for Greece's fiscal deficit in 2009. As for sovereign CDS premiums for other European countries and major countries, an upward trend of the idiosyncratic factors is observed while recently other factors have operated more strongly. Other factors have played a significant role particularly in the United States and Germany. As sovereign risks have attracted attention since the emergence of the fiscal deficit problem in Greece, market participants have begun to increase their speculative purchases of sovereign CDS protection for countries other than Greece and conduct arbitrage transactions.

Chart 11: Sovereign CDS premiums in emerging economies



Source: CMA.

In Brazil, other factors have not played a significant role recently, and Brazilian sovereign CDS premiums have not widened. Reflecting the firm developments in the economy and the relatively sound fiscal situation, sovereign CDS premiums for emerging economies other than emerging Europe, whose amount outstanding of sovereign CDSs is relatively large, have not shown any significant widening (Chart 11). The impact of the fiscal deficit problem in Greece spilled over mainly to Europe, but unlike the case seen in early 2009, it did not spread globally.

Conclusion

The sovereign CDS market is at an early stage of expansion and has yet to sufficiently reflect the views of a wide range of market participants. As market participants invest in sovereign CDSs for a variety of motives, the widening of premiums does not necessarily indicate the rise in governments' fiscal costs and funding costs in a country's private sector.

Meanwhile, as the cost to take a position in the sovereign CDSs is low compared to that in cash bonds, sovereign CDSs could quickly reflect the market participants' views, including longer-term projections, on sovereign risks. For example, if sovereign CDS transactions expand due to concerns over the fiscal situation, participants in the cash bond market will become cautious while facing a surge in premiums, which could in turn lead to a rise in the actual financing costs. Given these points, when evaluating developments in the sovereign CDS market, careful attention should be paid to investors' behavior behind the CDS transactions and its relationship with the government bond cash market.

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[1] In October 2009, the outlook for Greece's fiscal deficit in 2009 was revised upward significantly, and this heightened market participants' concern over a severe deterioration in the fiscal situation, low reliability of fiscal statistics, and sluggishness in economic conditions.

[2] A CDS is a type of credit derivative and a derivative transaction that involves purchases and sales of protection against credit risks of a firm or country. A CDS that deals with risks of a country is called a sovereign CDS.

[3] For information on the structure of the CDS market as a whole and types of transactions, see T. Nakayama and Y. Kawai, "Credit Shijo no Hatten ni Kansuru Ichi Kousatsu -- Credit Derivative Shijo wo Chushin ni (An Observation on the Development of the Credit Market -- Particularly the Credit Derivatives Market)," Bank of Japan Review Paper No. 2005-J-4, 2005 (in Japanese).

[4] In the euro area, discussion on a scenario in which failure to achieve a sound fiscal position results in a withdrawal from the Economic and Monetary Union (EMU) could invoke a confirmation of default in the CDS market and lead to an increase in activity in the sovereign CDS market. A "default" in the CDS market occurs when CDS contracts are settled following the confirmation of a credit event. It has been pointed out that if a withdrawal from the EMU entails a change in the currency of government bonds from the euro to the home currency, this would be confirmed as a restructuring, that is, a credit event.

[5] An OIS is an interest rate swap that exchanges the uncollateralized overnight call rate over a specified period and a certain fixed interest rate. For details, see E. Ooka, T. Nagano, and N. Baba, "Recent Development of the OIS (Overnight Index Swap) Market in Japan," Bank of Japan Review Paper No. 2006-E-4, 2006.

[6] An increase in the fiscal risk premium exerts downward pressure on the relative advantage of government bonds in portfolio selection and leads to a widening in the government bond yield-OIS spread. It should be noted that the heightening of concerns over the fiscal situation through a rise in inflation expectations might be reflected in not only government bond yields but also the OIS rate. The government bond yield-OIS spread includes premiums on the risk of price volatility (term premiums), which reflects not only fiscal factors but also various other factors.

[7] For more information on motives for trading, see the Financial Markets Department, Bank of Japan, *Financial Markets Report*, February 2010.

[8] In this paper, in order to calculate the international co-movement of CDS premiums, we first estimate the vector autoregression (VAR). Then, we conduct a Cholesky decomposition on errors to distinguish the shocks. We estimate the international dependence of sovereign CDS premiums via variance decomposition of ten-period-ahead forecast errors. The international co-movement is computed by aggregating the international dependence. For details, see F. Diebold and K. Yilmaz, "Measuring Financial Asset Return and Volatility Spillovers, with Application to Global Equity Markets," *Economic Journal*, 119 (5), 2009, pp. 158-171.

[9] The international co-movement is shown from 1 to 100 percent. When variance of forecast errors is explained only through the effects of other countries, the international co-movement is 100 percent. Conceptually, the international co-movement in Chart 9 is almost equal to the sum of globally common factors and other factors estimated by using the method in Chart 10.

[10] The possibility cannot be ruled out that economic fundamentals themselves are correlated globally.

[11] They are estimated by applying the method described in T. Sekine, "On the Recent Management of Monetary Policy," a lecture at the Monetary Economics Seminar of Kobe University (jointly supported by Japan Society of Monetary Economics), 2009. Specifically, we estimate the VAR (second lags) by using the ratio of daily change in logarithm of sovereign CDS premiums. Then, using the Kalman filter, we decompose the errors and extract the globally common factors and idiosyncratic factors. For details, see F. X. Diebold, C. Li, and V. Z. Yue, "Global Yield Curve Dynamics and Interactions: A Dynamic Nelson-Siegel Approach," *Journal of Econometrics,* 146 (2), 2008, pp. 351-363, or K. Takahashi, "Kokusai Kin'yu Shijo no Sougorenkan (Correlation in the International Financial Markets) (tentative title)," *Bank of Japan Review Series* (forthcoming, in Japanese).

[12] Taking into account the time-series data, the globally common factors seem to be strongly influenced by investors' risk appetite. For details, see K. Takahashi, "Kokusai Kin'yu Shijo no Sougorenkan (Correlation in the International Financial Markets) (tentative title)," *Bank of Japan Review Series* (forthcoming, in Japanese).

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