

Enhancing Intersectoral Dimension of Flow of Funds and Measuring Investment Risk

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1. Introduction

Japan's quarterly Flow of Funds Accounts (JFFA) records the financial transactions and the resulting claim/debt held by each economic sector, including household, nonfinancial corporations, general government, financial institutions overseas, as well as their sub-sectors. The JFFA represent data in balance sheet matrix forms with economic sectors in rows and financial instrument categories in columns. Financial instruments are classified into, among others, deposits, loans, and securities, as well as their sub-items. Thus, the JFFA is useful in understanding detailed financial behavior within each sector.

Under the SNA framework, the JFFA has adopted the quadruple entry system. A change in financial assets of a sector accompanies a change in financial liabilities of the same sector, as well as changes in financial assets/ liabilities of nonfinancial accounts of counterparty sectors of equivalent amounts. However, the JFFA does not directly represent the interconnectedness among sectors or intersectoral relationships (the Sector-to-Sector or so called "from-whom-to-whom (W-to-W) data" as long as it adopts the sector/instrument matrix balance-sheet form.

This paper first introduces one approach in compiling Japanese W-to-W FFA. The paper also attempts to measure the risk value of foreign-currency-denominated assets and liabilities held by households and nonfinancial corporations sectors by using FFA data.

2. Japan's W-to-W FFA

(1) Compiling Procedures of the W-to-W FFA

A careful way of compiling W-to-W data is to convert the current balance sheet form into the W-to-W table form item by item for financial assets and liabilities. Compiling W-to-W tables for currency is the simplest example, since the issuer of currency is confined to the central bank and thus, W-to-W relationships are easily specified by identifying its holding sectors (Table 1). In total, 21 financial asset/liability items of W-to-W tables can be compiled in this way.

However, the W-to-W tables of other financial transactions need some estimation because they have multiple issuers and holders, and source data are not sufficient for specifying W-to-W relationships. The first step of the conversion into W-to-W form is to separate asset and liability data in the JFFA from one another. Then, assumptions are made that financial assets of a certain instrument category are allocated to counterparty sectors in proportion to the share of liability of respective sectors for the same instrument category. For example, "shares and other equities" assets are allocated to each issuing sector by such an

assumption (Table 2).

The second step is to incorporate supplemental source data showing more accurate W-to-W relationships. For example, the reduction in the accuracy of W-to-W tables associated with the above assumption can be partly mitigated by using “Detailed Data of Flow of Funds Accounts” for loans and deposits, which identify borrowing sectors of loans and sub-sectors of depository institutions with which households hold their deposits. Based on these source data, more accurate W-to-W tables for loans by private financial institutions and loans by public financial institutions are compiled (Table 3, 4).

The third step is to aggregate all W-to-W tables, which was made by using all the procedures described above (Table 5).

(2) Developments of Shadow Banking in the W-to-W FFA

The interconnectedness among sectors, which is not directly observed in the balance-sheet form of the JFFA, can be found easily by compiling the W-to-W FFA. For example, From W-to-W table for total business lending, strong interconnectedness between shadow banking, i.e., other financial corporations (OFCs) and rest of the world (overseas) by means of business lending can be observed. OFCs refer to financial institutions. In the form of JFFA, other financial intermediates and financial auxiliaries represent OFCs. W-to-W table for total business lending can be compiled by aggregating Bank of Japan loans, call loans and money, bills purchased and sold, loans by private financial institutions, loans by the nonfinancial sector, installment credit (not included in consumer credit), as well as repurchase agreements and securities lending transactions (Table 6).

Interconnectedness among sectors becomes more evident by showing gross exposure in the form of a node-line graph (Table 7). The size of nodes represents the amount of gross exposure (assets plus liabilities) within sectors. The thickness of lines represents the size of the gross exposure among sectors. The strong interconnectedness between ODCs and OFCs is clearly identified from their mutual exposure by means of loans. Interconnectedness between OFCs and Households (including NPISHs)/non-financial corporations are weak compared to that of ODCs and households/non-financial corporations. However, gross exposure of OFCs to ROW sector is approximately the same level as that of ODCs to ROW (see red lines).

(3) Strengthening Source Data for the W-to-W FFA

Although source data for W-to-W relationships are relatively available for deposits and loans as discussed above, strengthening the source data for securities is necessary to improve the accuracy of the W-to-W FFA. Ideally, such data gaps should be closed by developing security-by-security (S-by-S) data that specify both issuing and holding sectors. In Japan, only issuing information is provided on an S-by-S basis by the Japan Securities Depository Center (Sato (2010)).

Regarding securities other than shares, JFFA’s instrument classification such as central government securities and Fiscal Investment and Loan Program bonds, local government securities, public corporation securities, bank debentures, and industrial securities, broadly provides information on issuers. Thus, JFFA’s specification of their holding sectors provides basic information to the W-to-W tables for these securities. However, in the absence of precise information for connecting issuing and holding sectors, it is necessary to use a mechanical proration of holding amounts into different issuing sectors. For example, central government securities are issued by the central government sector and the Fiscal Investment and Loan Program bonds are issued by the financial institutions sector. In the holding sectors, however, the Fiscal Investment and Loan Program bonds are not separated from central government securities.

Regarding shares and other securities, the JFFA does not have any instrument classification other than a separate classification item for shares. Accordingly, connecting issuing and holding sectors is more difficult. As a result, the mechanical proration of holding amounts into different issuing sectors is more frequently used than that for securities other than shares. For example, shares are issued by different subsectors of financial institutions as well as by private nonfinancial corporations. However, in the holding sectors, issuers

of shares are not classified by sector.

3. Applying Japan's W-to-W Table for Analyzing Cross-border Transactions

(1) W-to-W FFA with Risk Value

The W-to-W FFA is considered useful for the analysis of financial risks, since it clarifies the financial interconnectedness among sectors. For example, by incorporating data related to financial risks in the W-to-W FFA, distribution of risks among sectors could be analyzed. Among a variety of financial risks, risks of foreign-currency-related assets appear important for entities in Japan. Based on the current availability of source data at present, foreign currency risks of the household and nonfinancial corporation sectors could be measured by such an approach.

For this purpose, the foreign currency related assets of Japanese households need to be identified. Japan's households hold foreign-currency-related assets that are comprised of foreign currency deposits, foreign-currency investment trusts, and outward investments in foreign-currency-denominated securities. Although the weight of foreign-currency-related assets in households remains low (2.51% of total household financial assets), most holders of such assets are considered to be households with large incomes. They are important as individual investors.

Foreign currency deposits are denominated in the following currencies: US dollar, Euro, Swiss Franc, British pound, Australian dollar, and NZ dollar. The weights of currency composition for foreign currency deposits are provided by major banks, while those of foreign-currency-related investment trusts are provided by the Japan Securities Dealers Association.

For both foreign currency deposits and foreign-currency-related investment trusts, more than half of outstanding amounts are denominated in US dollars. At the same time, the weight of the total of NZ dollar and Australian dollar reaches about the half of that of US dollar. These dollar-denominated assets are followed by Euro-denominated assets. The currency composition of outward investments in foreign-currency-denominated securities is assumed to be the same as that of foreign-currency-related investment trusts in the absence of sufficient source data.

With respect to the foreign currency liabilities of nonfinancial entities, Japanese nonfinancial corporations issue foreign-currency denominated bonds either in US dollars, Euros, Swiss Francs, or British Pounds. Source data derive from "Issuance of Public and Corporate Bonds" compiled by the Bank of Japan. Such statistics contain information on currency composition. However, only issuance data are available. In the absence of any stock data and redemption data, issuance data are accumulated on the assumption that maturities of those bonds are five years.

At the end of the fourth quarter of 2009, US-dollar-denominated bonds represented about two-thirds of the total stock; the weight of Euro-denominated bonds was 21 percent and that of the Swiss franc was 7 percent. The weight of the British Pound was 5 percent. The weight of Euro-denominated bonds, which follows that of US-dollar-denominated bonds, has decreased in recent years after the Lehman shock in 2008.

Such an analysis may eventually lead to the adoption of the IMF's "Balance Sheet Approach," which was introduced after the Asian currency crisis in the late 1990s. This approach incorporates currency and maturity breakdown in a W-to-W stock table in light of the analysis that, in Asian emerging countries such as Thailand, Malaysia and the Philippines, currency and maturity mismatches triggered currency crises. Although Japan has not experienced currency crises, the share of foreign-currency-denominated assets and liabilities of nonfinancial sectors are considered useful for the analysis of sectoral financial positions as well as that of cross-border capital flows, including yen carry trades.

(2) The Measurement of Risks

Households and nonfinancial corporations are subject to gains or losses for their financial assets and

liabilities due to the fluctuation of their market/fair value. Meanwhile, these entities can reduce such risks by changing the amounts of such positions. In this light, risk value can be measured by multiplying outstanding amounts of certain types of financial assets and liabilities by their market/fair value volatilities.

Household risks of holding foreign-currency-related assets are calculated by multiplying their outstanding amounts by the volatilities of foreign exchange rates. Regarding the exchange rates to be used, US dollar, Euro, Swiss Franc, British pound, Australian dollar, and NZ dollar were chosen based on the list of products of foreign currency deposits provided by major banks. Volatilities of foreign currency exchange rates were calculated by averaging daily volatilities during the recent quarter. The volatilities of exchange rates are weighted by the outstanding amounts of foreign currency deposits by currency in major banks. Similarly, the volatilities of exchange rates for foreign-currency-related investment trusts and outward investments in foreign-currency-denominated securities are weighted by the share of foreign-currency-related investment by currency published by the Japan Securities Dealers Association (Figure 1).

The risks associated with issuing foreign-currency-related bonds among nonfinancial corporations are also calculated by multiplying their outstanding amounts by the volatilities of foreign exchange rates. Regarding the exchange rates to be used, US dollar, Euro, Swiss Franc, and British Pound are chosen, based on the Bank of Japan "Issuance of Public and Corporate Bonds." Volatilities of foreign currency exchange rates were calculated by averaging daily volatilities during the recent quarter. The volatilities by exchange rates are weighted by the share of foreign currency corporate bonds, as discussed above (Figure 2).

(3) Developments of Foreign Currency Risks

With respect to household foreign currency assets, the risk value for household assets has two peaks, namely in the fourth quarter of 2007, when the Bear Stearns shock increased the volatilities of foreign exchange rates, and in the third quarter of 2008, when the Lehman shock increased such volatilities. It appears that Bear Stearns shock had more impact, though the decrease in outstanding amounts mitigated the impact. The risk value of fourth quarter of 2008 became smaller than that of third quarter of 2007, because the outstanding amount decreased after the Bear Stearns shock in 2007, in particular in foreign-currency-denominated securities. In the same period, the volatility remained high.

In this respect, when the covariances of foreign exchange rates are taken into consideration, the risk value of households decreases largely before the first quarter of 2007 due to lower volatilities of the US dollar having a larger share in household foreign currency assets than those of other foreign exchange rates. Such effects are not observed at present, because the volatilities of the US dollar have increased since then.

With respect to the foreign currency liabilities of nonfinancial corporations, the risk value reached its peak in the third quarter of 2008, when the Lehman shock increased the volatilities of foreign exchange rates. In the fourth quarter of 2009, the risk value decreased to the same level as the first quarter of 2007, when the value hit bottom. When the risk value is broken down into two elements -- outstanding amounts of foreign currency liabilities and volatilities of foreign exchange rates -- there seems to be a structural change in the first quarter of 2007. Before then, the developments of the risk value were mainly caused by changes in outstanding amounts. After the first quarter of 2007, such developments are caused mainly by volatilities. This suggests that financial shocks such as the Bear Stearns shock and the Lehman shock had significant impacts on the financial behavior of nonfinancial corporations.

Meanwhile, it is generally considered that nonfinancial corporations normally hedge their foreign currency risks by currency swaps or other financial derivatives. Therefore, the foreign currency risks associated with financial derivatives among nonfinancial corporations need to be considered. Such risks are measured based on the assumption that all nonfinancial corporations derivatives recorded in the JFFA are foreign-currency-related derivatives (Figure 3). The risk value of financial derivative liabilities increased in the fourth quarter of 2008, in particular. Such analysis will be improved if information on currency-weight of nonfinancial corporations' derivatives becomes available in Japan.

With the respect to the relationship between the W-to-W FFA and the risk value analysis, the incorporation of the risk value of foreign-currency-related assets and liabilities into the FFA become W-to-W FFA abolished the classification of financial assets and liabilities and the developments of risk values can be analyzed in comparison with financial interconnectedness among sectors (Table 7).

4. Conclusion

This paper discussed the procedures of compiling the W-to-W FFA and measuring risks of holding foreign-currency-related assets and liabilities for the household and nonfinancial corporations sectors. Such risk value can be analyzed together with the outstanding amounts of foreign-currency-related assets and liabilities of those sectors.

In doing so, the shortcomings of source data for compiling the W-to-W FFA and measuring risk value have been identified as follows.

First, to improve the accuracy of W-to-W FFA, it is necessary to strengthen the source data for securities. At present, the JFFA falls short of the W-to-W information for securities other than shares as well as shares and other equity. As discussed above, instrument classification of these securities contain helpful but insufficient information for connecting issuing and holding sectors. Ideally, such data gaps should be closed by developing security-by-security (S-by-S) data that specify both issuing and holding sectors.

Second, to improve the accuracy and usefulness of the breakdown of foreign currency assets and liabilities, exact weights of foreign currency composition for household holdings of foreign currency deposits, investment trusts, and securities as well as nonfinancial corporations' issues of foreign currency bonds all need to be identified. Such information is useful when measuring the risk value of holding/issuing foreign currency assets and liabilities. Given that financial derivatives are often used for hedging foreign currency risks, any information on shares of foreign-currency-related derivatives and their breakdown by currency would be useful.

Third, stronger source data are needed for measuring foreign currency assets and liabilities more comprehensively. In addition to foreign currency positions of the household and nonfinancial corporations sector treated in this paper, a government position on foreign currency would draw attention. At present, only local governments issue foreign currency bonds, and their magnitude is limited. Nevertheless, it would be useful in the future to incorporate the development of government foreign currency positions in the framework of W-to-W FFA.

Table 1
W-to-W Table for Currency (2009)

	Currency											
	Household	Central gov	Local govern	Social secur	Overseas	Private nonfin	Public nonfin	Private nonprofit	Central bank	Depository corp	Insurance	Other financial auxiliaries
Households	0	0	0	0	0	0	0	0	510,423	0	0	0
Central government	0	0	0	0	0	0	0	0	34	0	0	0
Local governments	0	0	0	0	0	0	0	0	0	0	0	0
Social security funds	0	0	0	0	0	0	0	0	14	0	0	0
Overseas	0	0	0	0	0	0	0	0	0	0	0	0
Private nonfinancial corporations	0	0	0	0	0	0	0	0	218,753	0	0	0
Public nonfinancial corporations	0	0	0	0	0	0	0	0	1,345	0	0	0
Private nonprofit institutions serving households	0	0	0	0	0	0	0	0	172	0	0	0
Central bank	0	0	0	0	0	0	0	0	0	0	0	0
Depository corporations	0	0	0	0	0	0	0	0	80,841	0	0	0
Insurance and pension funds	0	0	0	0	0	0	0	0	2,791	0	0	0
Other financial intermediations	0	0	0	0	0	0	0	0	4,151	0	0	0
Financial auxiliaries	0	0	0	0	0	0	0	0	0	0	0	0

Table 2
W-to-W Table for Shares and Other Equities (2009)

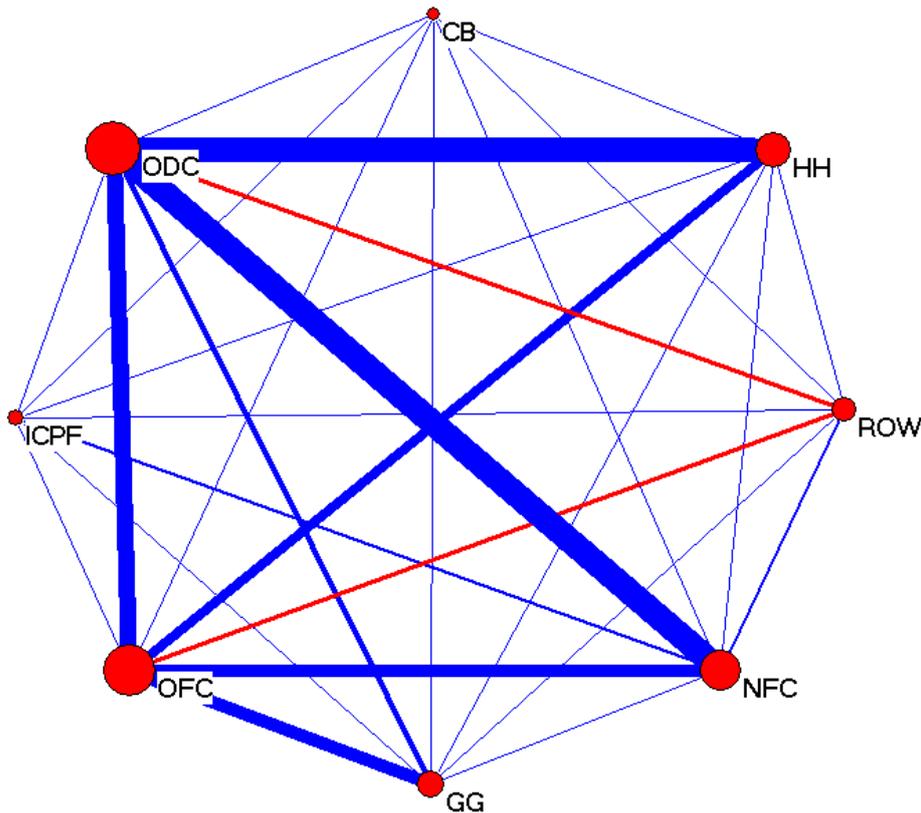
	Shares and Equities											Assets per section		
	Household	Central gov	Local govern	Social secur	Overseas	Private nonfin	Public nonfin	Private nonprofit	Central bank	Depository corp	Insurance		Other financial auxiliaries	
Households	0	29,385	0	176	0	703,308	21,292	0	0	113,113	25,393	80,300	1,380	1,006,394
Central government	0	12,385	0	73	0	291,454	29,726	0	0	46,875	10,772	25,275	493	417,652
Local governments	0	9,703	0	57	0	228,354	23,290	0	0	36,726	8,439	19,803	386	326,760
Social security funds	0	7,059	0	42	0	166,128	16,944	0	0	26,719	6,140	14,406	281	237,718
Overseas	0	30,093	0	177	0	708,193	72,230	0	0	113,899	26,173	61,414	1,197	1,013,378
Private nonfinancial corporations	0	42,832	0	253	0	1,007,987	102,807	0	0	162,116	37,253	87,411	1,704	1,442,363
Public nonfinancial corporations	0	2,826	0	17	0	68,511	6,784	0	0	10,697	2,458	5,768	112	95,173
Private nonprofit institutions serving households	0	53	0	0	0	179	79	0	0	125	29	88	1	1,115
Central bank	0	604	0	4	0	14,221	1,450	0	0	2,297	526	1,233	24	29,349
Depository corporations	0	13,549	0	80	0	318,855	32,521	0	0	51,282	11,784	27,651	539	456,261
Insurance and pension funds	0	12,440	0	73	0	292,746	29,858	0	0	47,083	10,819	25,387	495	418,900
Other financial intermediations	0	11,964	0	71	0	281,559	28,717	0	0	45,283	10,406	24,416	476	402,893
Financial auxiliaries	0	644	0	4	0	15,160	1,545	0	0	2,438	560	1,315	26	21,693
Weight of liabilities	0.00000	0.02970	0.00000	0.00018	0.00000	0.69884	0.17228	0.00000	0.00000	0.11240	0.02583	0.06060	0.00118	5.860039
Liabilities per section	0	174,018	0	1,026	0	4,095,255	417,685	0	1	658,844	151,352	355,135	6,923	5,860,039

NOTE: First, we lead the rate of liabilities per section (4,095,255/5,860,059=0.69884).

Households	Central government	Local governments	Social security funds	Overseas	Private nonfinancial corporations	Public nonfinancial corporations	Private nonprofit institutions	Central bank	Depository corporations	Insurance and pension funds	Other financial intermediation	Financial auxiliaries
22,099	12,460	18,801	160	13,541	60,765	8,882	2,834	2,146	30,785	1,502	43,319	536
8,818	4,972	7,502	64	5,403	24,247	3,544	1,131	856	12,284	599	17,286	214
4,354	2,793	4,215	36	3,036	13,622	1,991	635	461	6,901	337	9,711	126
87,238	40,189	74,219	631	53,457	239,877	35,064	11,187	8,470	121,530	5,929	171,008	2,117
40,529	22,852	34,480	293	24,835	111,440	16,290	5,197	3,935	56,460	2,754	79,446	984
4,627	2,609	3,937	33	2,835	12,723	1,860	593	449	6,446	314	9,070	112
3,474	1,959	2,956	25	2,129	9,553	1,396	446	337	4,940	236	6,811	84
41,358	23,320	35,186	299	25,343	113,722	16,623	5,303	4,016	57,615	2,811	81,072	1,004
2,292,682	253,828	253,847	272,030	2,244,814	108,470	82,821	48,956	702,398	34,265	968,366	12,236	
109,933	3,151	150,466	6,976	235,109		1,215	5,599	60,332	3,919	113,036	1,399	
951,169	533,029	780,047	3,834	214,375	725,889	418,422	219	40,981	587,968	28,683	827,348	10,242
2,960	1,669	2,519	21	1,814	8,140	1,190	380	287	4,124	201	5,803	72

Table 7

The node-line graph of balance sheet exposure for total business lending



NOTE: The size of the node represents the amount of gross exposure (assets plus liabilities) within sectors. The thickness of the lines represents the size of the gross exposure among sectors.

Table 8

The Aggregated W-to-W Table with Risk Value

Households	Central government	Local government	Social security funds	Overseas	Private nonfinancial corporations	Public nonfinancial corporations	Private nonprofit institutions	Central bank	Depository corporations	Insurance and pension funds	Other financial intermediation	Financial auxiliaries	The volume of risk value
22,099	12,460	14,711	1,308	144,485	359,666	88,544	13,442	35	4,884	315,325	383	715,965	6,338
5,093	18,983	5,558	72	11,448	254,437	26,498	3,518	41	180,887	8,705	31,385	395	
8,401	645,915	69,911	1,853	332,000	236,859	26,086	63,748	584	159,673	32,966	405,532	1,636	
39,884	464,692	5,138	1,151	473,994	886,049	95,330	36,470	18,176	941,388	54,415	332,094	1,760	
547,402	124,900	22,777	2,691	1,092,621	3,009,792	131,903	43,658	3,389	1,077,227	73,974	431,846	6,863	132,011
3,919	13,925	2,992	562	3,622	113,736	8,402	132	71	84,758	12,054	11,607	451	
2,515	118,556	56,757	15	4,802	15,546	4,378	17,115	3	143,563	390	36,813	10	
4,761	654,211	185	37	52,290	35,883	2,763	3,602	4,634	177,846	3,322	331,632	46	
2,213,038	3,258,298	473,877	1,136	563,465	2,760,615	149,783	339,376	13,026	2,611,194	58,074	1,477,163	18,167	
122,229	1,470,392	259,771	7,924	769,518	840,923	76,870	159,353	1,230	313,574	122,126	759,657	6,833	
711,683	810,873	752,455	7,663	705,817	1,109,087	346,364	54,119	67,952	515,166	73,667	1,116,673	12,444	
3,904	21,136	10,529	28	2,339	30,181	2,699	6,839	0	16,653	1,054	9,202	156	

Figure 1

The Volatility and Risk Value of Household Sector

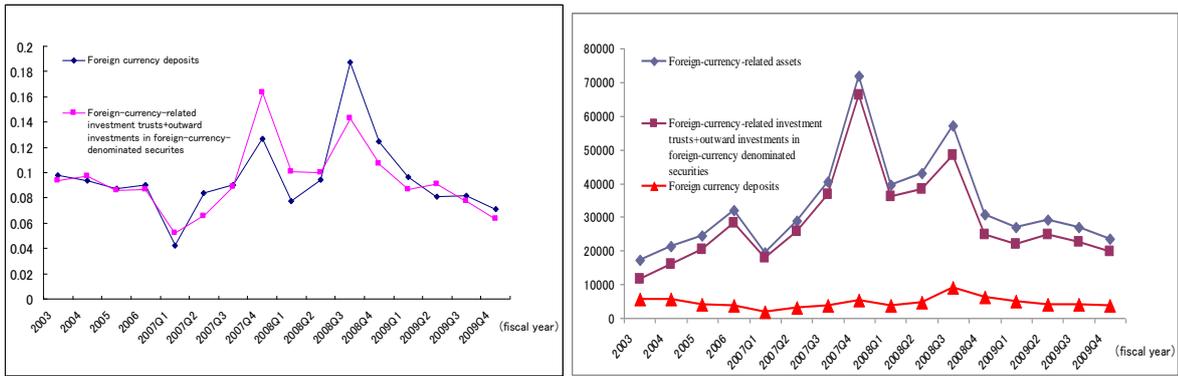


Figure 2
The Risk Value of Nonfinancial Corporations Sector

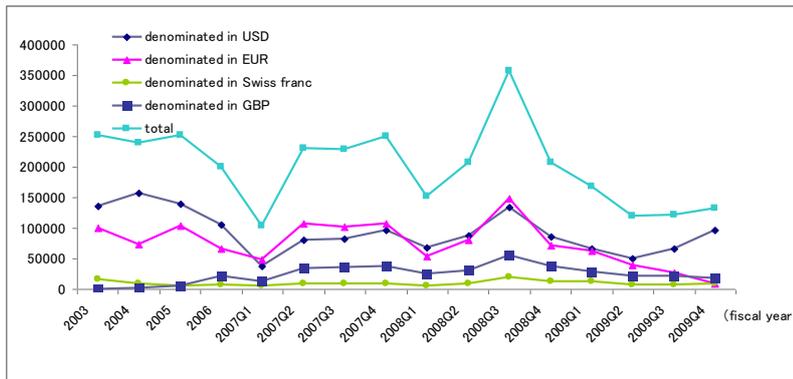
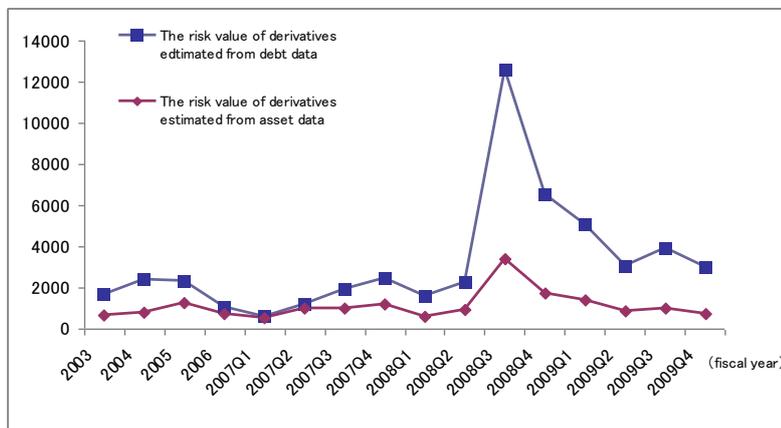


Figure 3
The Risk Value of Derivatives Estimated from Both Liability and Asset Data



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