Sectoral interlinkages in balance sheet approach

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1. Introduction

The financial crises have emphasised the need to identify sectoral interlinkages, which indicate financial linkages either among economic sectors or between residents and non-residents. Sectoral interlinkages provide a useful tool to measure detail capital flows. This is discussed as one of "data gaps" in FSB and IMF (2009) and IMF and OECD (2011). However, it is very difficult to identify sectoral interlinkages, because there are few source data to do it accurately. Actually, there are only a few countries that specify sectoral interlinkages officially.[3]

Therefore, some studies have estimated sectoral interlinkages in balance sheet approach, which uses sectoral balance sheet, i.e. flow of funds accounts (FFA). Castren and Kavonius (2009), Hyun (2010) and Hagino and Takeuchi (2011) are the examples. The methods of estimating sectoral interlinkages by these studies are to allocate each sector's assets to each sector including itself by pro rata of each sector's portfolio of liabilities in the flow of funds accounts. So, these methods are called "the simple-pro-rata method" in this paper.

Although the simple-pro-rata method is easy to estimate, its sectoral interlinkages aren't accurate enough with the two reasons. First, the actual allocation of each sector's assets is different from that of each sector's liabilities. Second, the simple-pro-rata method includes improbable linkages, such as transactions from "central bank" sector to "central bank" sector, from "rest of the world" sector to "rest of the world" sector and so on.[4]

This paper aims to estimate Japanese sectoral interlinkages by more accurate methods than the simple-pro-rata method and to analyze those. For these aim, first, this paper recompiles the Japan's flow of funds accounts (J-FFA) into the sector-by-sector flow of funds accounts, which shows links between assets and liabilities holders for each transaction item, i.e. so-called "from-whom-to-whom" data (FWTW). This paper calls this renewed flow of funds accounts as the inter-sector-FFA. For compiling the inter-sector-FFA, this paper uses not only the J-FFA but also other supporting source data, i.e. the "detailed Japan's flow of funds accounts (D-FFA)", the "shareownership survey" and so on. Moreover, through the inter-sector-FFA, this paper analyzes the structure of sectoral interlinkages and its change in time-series.

Second, this paper applies input-output analysis to the inter-sector-FFA and simulates ripple effects of financial shocks transmitted in sectoral interlinkages. This paper gives a simple example of simulation. The analysis could also be extended to simulate transmission of policy effects among sectors.

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1 Research and Statistics Department, Bank of Japan.

2 The views expressed here are those of the author and do not necessarily represent the views of the Bank of Japan. The author is responsible for any errors and omissions.

3 In Australia, sectoral interlinkages of both net financial flows and net claims are published quarterly by Australian Bureau of Statistics.

4 In Japan, "central bank" sector is composed of only one institution, Bank of Japan. And "rest of the world" sector means the aggregated counterparty with domestic sectors. Therefore, there must not be transactions between central bank sectors and between "rest of the world" sectors.

The contents of chapter 2 through 5 are following. Chapter 2 illustrates the methods of recompiling the inter-sector-FFA. With the inter-sector-FFA, chapter 3 examines time-series analysis. Chapter 4 introduces how to apply input-output analysis into the inter-sector-FFA and gives a simple example to simulate any ripple effects of financial shocks transmitted between sectors. Chapter 5 is conclusion.

2. Methodology

For identifying sectoral interlinkages, this paper recompiles the J-FFA into the inter-sector-FFA. The J-FFA, published by Bank of Japan (BOJ), is statistics that record financial transactions and resulting claim/debt held by each economic entity (= sector) in various financial transactions' form (= transaction item).[5] In the J-FFA, both sectors and transaction items are categorized in so detail that there are 43 sectors and 51 transaction items. Although the J-FFA doesn't directly show the FWTW, these detail-categorized transaction items partially indicate it by each transaction item's features. For compiling the inter-sector-FFA, fundamentally using these features, this paper reallocates each sector's outstanding amount of assets to suitable debtors in the following method.

First, the number of sectors needs to be reduced for presentation, because detailed sectors' categories lower the inter-sector-FFA's accuracy. This paper summarizes sectors' categories into 8 sectors of the J-FFA's large scope sectors, i.e. "central bank (CB)," "depository corporations (DC)," "insurance and pension funds (IP)," "other financial institutions (OFIs)," "nonfinancial corporations (NFC)," "general government (GG)," "households (HH)" and "rest of the world (RoW)."[6]

The second step is to identify links between each sector's outstanding amount of assets and each debtor sector for each transaction item under the 8 sectors. The following four types of methods are applied. The degree of accuracy as a method to compile FWTW descends from type 1 to 4.

Type 1: Rearrangement of transaction items

Type 1 refers to the case where a transaction item can identify FWTW by its definition. For example, "currency" is issued only by central bank. Therefore, each sector's asset of currency has to be allocated to the liabilities of CB. Mostly, in this type's transaction items, there is only one sector on liabilities' side or assets' side.

The transaction item "loans by financial institutions" is another example of this type. D-FFA, which is the supplement of the J-FFA, shows borrower sectors of loans extended by financial institutions, and provides information for FWTW.

Type 2: Rearrangement of transaction items with additional information from other source data

Type 2 refers to the case where FWTW is identified by the J-FFA in combination with other source data. For instance, in "foreign currency deposit," there are two sectors (DC and RoW)

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[5] The annual data of the J-FFA based on the 1993 SNA starts from 1980 on the fiscal year basis and 1998 on the calendar year basis. In order to analyze time-series data on the same basis as long as possible, this paper deals with data on the fiscal year basis. For 2011, however, calendar year basis data are used because 2011's data on the fiscal year basis were unavailable at the timing of writing this paper.

[6] Although there are also "other financial intermediaries," "financial auxiliaries" in the large scope sectors of the J-FFA, this paper settles the aggregation of these sectors equals with OFIs. Moreover, this paper settled HH is including "private nonprofit institutions serving households," which is in the large scope sectors of the J-FFA.

on liabilities' side, and it isn't able to allocate accurately only by the J-FFA. However, CB's asset is clearly allocated to RoW, and the data for the amount from GG to RoW is available from "international reserves/foreign currency liquidity" published by Ministry Finance of Japan. Remaining amount of "foreign currency deposit" liabilities of Row can be linked to DC's asset among other remaining sectors', because it is not common for other sectors to have an account directly at non-resident banks. Instead they tend to have foreign currency deposit at resident banks.

"Shares" is another example. Most information about shares' FWTW is available from "shareownership survey" published by stock exchanges. For details, see *Appendix*.

Type 3: Partial "pro rata" estimation in addition to Type 2

Type 3 refers to the case where FWTW can be identified only partially by the J-FFA and other source data. Unavailable information is complemented by estimation where the amount of asset is allocated proportionately to the amount of liabilities of related sectors. For example, "central government securities and FILP bonds" is issued by two sectors (OFIs and GG) and information is unavailable about who holds which sectors' securities.[7] So, this paper allocates each sector's amount of assets to these two issuing sectors by pro rata of the two sectors' amounts of liabilities in this transaction items.

Type 4: Estimation by "enhanced-pro-rata method"

It is impossible to identify the FWTW in Type 4. Therefore, it should be estimated by pro-rata approach. In order to enhance the estimating accuracy, this paper augments the simple-pro-rata method in chapter 1, which is called enhanced-pro-rata method. The enhanced-pro-rata method is more accurate than the simple-pro-rata method by removing transaction relations that cannot take place by definition. The examples include transactions between CB and CB, and RoW and RoW, which are included in the simple-pro-rata method.

The following example is the enhanced-pro-rata method applied to "accounts receivable/payable." In accounts receivable/payable, all sectors hold amounts on both assets and liabilities side. In the enhanced-pro-rata method, first, CB's amount is allocated. The amount of CB's asset issued by CB, which is CB's liabilities, is set at 0 and the amounts of the other sectors' assets to CB's liabilities are calculated as the following.

$$A_{i,CB} = L_{CB} \times \pi_i \quad , \quad \pi_i = A_i / \left(A - A_{CB} \right)$$

$$i = \left\{ DC, IP, OFIs, NFC, GG, HH \right\}$$

Where $A_{i,CB}$ stands for the amount from i sector to CB, A_i stands for the amount of the i sector's assets, A_{CB} stands for the amount of the CBs' asset, A stands for the aggregate amount of all sectors' assets, L_{CB} stands for the amount of the CB's liability in "accounts receivable/payable." This calculation is also performed in RoW as in CB (in the above calculation, CB is converted to RoW). After these calculations, the amount from each sector to the sectors, which is other than CB and RoW, is calculated in following.

$$A_{i,j} = \left[A_i - \left(A_{i,CB} + A_{i,RoW} \right) \right] \times \lambda_j \quad , \quad \lambda_j = L_j / \left[L - \left(L_{CB} + L_{RoW} \right) \right]$$

$$i, j = \left\{ DC, IP, OFIs, NFC, GG, HH \right\}$$

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7 This item is so-called "JGBs (long-term)."

Where $A_{i,j}$ stands for the amount from i sector to j sector, L_j stands for the amount of j sector's liabilities, L stands for the aggregate amount of all sectors' liabilities in this item. These compose the enhanced-pro-rata method. In this method, the inter-sector-FFA's aggregate amount of each sector or transaction item equals to that of the J-FFA, with removing the linkages of CB-CB and RoW-RoW.[8]

Table 1 summarizes these four types in details of each item's amount by sector in 2011. Through the table, it can be said that the inter-sector-FFA is accurate sufficiently with present source data. On the aggregate assets' side, 82% (81% on the liabilities' side) is identified entirely or partially. Although the residuals must be estimated by the enhanced-pro-rata method, even these are more accurate than prior researches as said above.

3. The results and time-series analysis

Table 2 is the inter-sector-FFA at the end of 2011, in which the J-FFA's detailed transaction items are summarized in larger scope. In the table, rows are kept blank where no assets and liabilities are held. Moreover, this paper compiles the inter-sector-FFA from 1981 to 2011.

Through the inter-sector-FFA, this paper analyzes sectoral interlinkages in time-series. This paper shows financial networks of both gross exposures and net exposures. Gross exposures show the sum of credits and debts between two sectors. On the other hand, net exposures show the difference of the credits and debts between two sectors, and indicate which inter-sector vectors of credit/debts relationships are main channels in the financial system.

Gross exposures

Chart 1 describes the outstanding amounts' networks of inter/each-sector gross exposures, which are settled as aggregate assets' amounts plus aggregate liabilities' amounts, in the end of 1981, 1991, 2001 and 2011. Following features can be observed from the chart. First, DC has the largest gross exposure especially in any time. It is attributable to the fact that indirect financing, which means DC mainly intermediates investors with fundraisers, has developed in Japan. Second, both DC-HH and DC-NFC are main inter-sector connections in the financial system in any time. HH's large amount of deposits explains the DC-HH's large exposure. DC-NFC's large exposure can be explained by DC's loans to NFC, and NFC's deposits and so on. Moreover, it is needed to check the net exposure about DC-NFC in the next section. Third, both DC-GG's and IP-GG's exposure have developed consistently. Specifically, DC-GG's exposure is the 3rd largest among inter-sector exposures in the end of 2011. This is because the JGBs' amounts have increased, and both DC and IP are main purchasers, as indicated in Kobayakawa and Okuma (2011).

Net exposures

Chart 2 shows the outstanding amounts' networks of inter/each-sector net exposures, which are settled as aggregate assets' amounts minus aggregate liabilities' amounts, in the end of

[8] In the result of the enhanced-pro-rata method, all transaction items have no difference between assets' side and liabilities' side in the inter-sector-FFA. However, in the J-FFA, there is a little difference between assets' and liabilities' side of only "other external claims and debts." This is because the item is including in "Gold and SDRs etc," which is outstanding on only assets' side of CB and GG in the J-FFA. On the other hand, in the inter-sector-FFA, this item is outstanding both on assets' side of CB and GG and on liabilities' side of RoW. However, this item's amount is very small relatively (less than 1% of total liabilities' amount of RoW). Therefore, it is no problem to say this difference between the J-FFA and the inter-sector-FFA doesn't lower the accuracy of the inter-sector-FFA.

1981, 1991, 2001 and 2011. Following features can be observed from the chart. First, HH has the largest net exposure in any time. Second, the net exposures from HH to both DC and IP are the 1st and the 2nd largest in the inter-sector net exposures. These are main channels of funding flow in the financial system. Third, the net exposure from DC to NFC has decreased especially from the end of 2001 to 2011. It is attributable to the NFC's financial restructuring that resulted in the reduction of their liabilities and to the increase of NFC's deposits in recent years. This point is made clear by calculating net exposure. Fourth, the net exposures from DC and IP to GG have increased. This is because of the JGBs as mentioned in the former section.

4. Input-output analysis

The inter-sector-FFA has a structure similar to input-output table (IO) and is useful in analyzing ripple effects among sectors by applying input-output analysis. The analysis could also be extended to simulate transmission of policy effects among sectors. This chapter transforms the inter-sector-FFA to IO structure, which is called the financial input-output table (financial-IO), and analyzes how each sector influences other sectors in terms of changes in assets' or liabilities' amounts. This chapter also introduces a simple example that simulates ripple effects of financial shocks transmitted between sectors with the financial-IO.

4.1 The financial input-output table

According to Tsujimura and Mizoshita (2002), the financial-IO is composed of the following matrices.[9]

$$Y = \begin{bmatrix} y_{CB,CB} & y_{CB,DC} & \cdots & y_{CB,RoW} \\ y_{DC,CB} & y_{DC,DC} & \cdots & y_{DC,RoW} \\ \vdots & \vdots & \ddots & \vdots \\ y_{RoW,CB} & y_{RoW,DC} & \cdots & y_{RoW,RoW} \end{bmatrix}, \ \varepsilon = \begin{bmatrix} \varepsilon_{CB} \\ \varepsilon_{DC} \\ \vdots \\ \varepsilon_{RoW} \end{bmatrix}, \ T = \begin{bmatrix} t_{CB} \\ t_{DC} \\ \vdots \\ t_{RoW} \end{bmatrix}$$

$$\rho = \begin{bmatrix} \rho_{CB} & \rho_{DC} & \cdots & \rho_{RoW} \end{bmatrix}$$

Where $y_{i,j}$ stands for the outstanding amount from i sector to j sector, ε_j stands for the amount of j sector's net liabilities (over-financing), ρ_i stands for the amount of i sector's net assets (over-investing), t_i stands for the total amount of i sector' assets or liabilities.[10] Moreover, T' is defined as a transposed matrix of T. Therefore, the financial-IO framework can be shown as a combination of these matrices as the following arrange.

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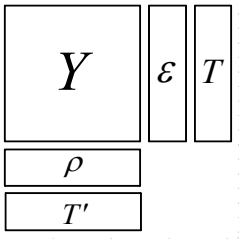
[9] In Tsujimura and Mizoshita (2002), the method to recompile the J-FFA to the financial-IO is like as the simple-pro-rata method. Therefore, it can be said this paper's financial-IO is more accurate than their financial-IO.

[10] If i sector has more total assets than liabilities, ε_i is set at 0. Similarly ρ_i is set at 0 if total liabilities exceed total assets. Therefore, the followings are true. $\sum_{j=1}^{m} y_{i,j} + \varepsilon_i = t_i \ \sum_{i=1}^{m} y_{i,j} + \rho_j = t_j$



The inter-sector-FFA can be transformed to the financial-IO easily: matrix Y is an extract of the inter-sector-FFA's "total" on liabilities' side. Similarly, other matrices can be made from the inter-sector-FFA. Therefore, table 3 is the financial-IO in the end of 2011.[11]

To analyze ripple effects among sectors, Leontief inverse matrix needs to be constructed. For this, first, the following matrix is defined.

$$C = \begin{bmatrix} c_{CB,CB} & c_{CB,DC} & \cdots & c_{CB,RoW} \\ c_{DC,CB} & c_{DC,DC} & \cdots & c_{DC,RoW} \\ \vdots & \vdots & \ddots & \vdots \\ c_{RoW,CB} & c_{RoW,DC} & \cdots & c_{RoW,RoW} \end{bmatrix}, \text{ where } c_{i,j} = y_{i,j} \Big/ t_i$$

C is so-called the input coefficient matrix. Using the matrix, the Leontief inverse matrix for financial-IO is defined as Γ in the followings.

$$CT + \varepsilon = T$$

$$T = (I - C)^{-1} \varepsilon$$

$$\Gamma \equiv (I - C)^{-1} \equiv \begin{bmatrix} \gamma_{CB,CB} & \cdots & \gamma_{RoW,CB} \\ \vdots & \ddots & \vdots \\ \gamma_{RoW,CB} & \cdots & \gamma_{RoW,RoW} \end{bmatrix}$$

The inverse matrix indicates an influence, both directly and indirectly, of a change in a sector's investing (assets') amounts on other sectors' investing amounts directly as well as indirectly. Its amount can also be calculated by multiplying Γ by the scale of changes. Furthermore, Γ can be used to calculate the power-of-dispersion index (PDI, p_j) and the sensitivity-of-dispersion index (SDI, s_i). PDI indicates influence of a unit of shock in j sector's financing demand on other sectors' financing demand. On the other hand, SDI indicates influence of a unit of shock in total sector's financing demand on i sector's financing demand. These indices are defined as follows.

$$p_j \equiv \frac{\sum_{i=1}^{m} \gamma_{i,j}}{\frac{1}{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \gamma_{i,j}}, \quad s_i \equiv \frac{\sum_{j=1}^{m} \gamma_{i,j}}{\frac{1}{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \gamma_{i,j}}$$

[11] According to Tsujimura and Mizoshita (2002), there are 2 types of the financial-IO, i.e. the financial-IO on liabilities' side and the financial-IO on the assets' side, and chart 5 is the former one. It is also easy to recompile the inter-sector-FFA to the latter one, which composes of a transposed matrix of Y, because this matrix equals with the inter-sector-FFA's "total" on assets' side.

Where m stands for the number of sectors, i.e. 8, in this paper. Chart 3 shows these indices in the end of 1981, 1991, 2001 and 2011, and indicates the following features. First, NFC's PDI has decreased and its SDI has increased. This implies NFC has shifted its investment style from the real asset investor to the financial asset investor. Second, GG's PDI has increased and its SDI has decreased. This background is the budget deficit has increased and has limited GG's extra financial investment. Third, DC's PDI has been high relatively. So, DC's financing has led the other sectors' financing. However, this has decreased recently.

4.2 Simulation

As a simple example of simulation with the financial-IO, this section simulates a ripple effect of an increase in "transferable deposits" of HH and NFC. HH and NFC have increased their amounts of this item recently because their preference for liquidity assets has risen through the financial crisis and the Great East Japan Earthquake (March, 2011), as mentioned in Kobayakawa and Okuma (2012). Therefore, DC's liabilities have increased as "transferable deposits" increases because its debtor is DC only.

This section sets 3 scenarios about the growth rate of "transferable deposits" in 2012: 1) rises as same pace as 2011, 2) doesn't change from 2011, 3) falls to the levels of 2010. This section also stimulates what amounts these increases bring to each sector's investment (chart 4).

The simulation's method starts from setting DC as an external variable, i.e. exclude $y_{DC,j}$ and $y_{i,DC}$ from Y, and add $y_{DC,j}$ ($y_{i,DC}$) to ε_j in ε (ρ_i in case of ρ) in 2011's data. This is because a ripple effect of an increase in "transferable deposits" spreads through DC's liabilities. Second, Γ is made from these renewed Y. Finally, this Γ is multiplied by the scenarios' amounts. In these ways, each sector's ripple effect on assets' side in 2012 can be calculated. Chart 5 shows the results. It is apparent that any scenario's increase of "transferable deposits" (the amount to DC) causes larger ripple effects in OFIs', IP's and NFC's assets.

Although the financial-IO is useful to simulate as in this section, this analysis's limitation should be noted; the financial shocks cause not only financial but also real ripple effects and this analysis doesn't capture it. Therefore, it is more appropriate to use the financial-IO's simulation with some macroeconomic models.

5. Conclusion

This paper recompiled the J-FFA to the inter-sector-FFA aiming to clarify sectoral interlinkages more accurately than the former studies and to analyze those. Furthermore, this paper applied input-output analysis to the inter-sector-FFA and simulated ripple effects among sectoral interlinkages.

Although the inter-sector-FFA can suggest more accurate sectoral interlinkages than the former studies, there are some points that should be improved in the inter-sector-FFA. This is because the inter-sector-FFA still had to be made by pro rata partially. More source data needs to be developed to improve FWTW.

Therefore, it is hoped that more source data will be enhanced and sectoral interlinkages will be clarified more accurately in the near future. These efforts will be useful to improve measuring detail cash flows and analyzing transmission of policy effects.

Appendix:
Estimating the FWTW of "shares"

Chapter 2 says the FWTW of "shares" is appeared largely in the "shareownership survey." This appendix explains this survey and how to use its FWTW for the inter-sector-FFA.

The "shareownership survey" is annually published by five domestic stock exchanges and records the FWTW for all listed stocks' outstanding amount on market value in Japanese stock exchanges.[12] The aggregated amount of all listed stocks equals to "shares" in the J-FFA, so the information about FWTW on the survey can used as source data for converting the J-FFA to the inter-sector-FFA. In using the survey, some issues about the category of issuers / investors should be mentioned.

First, issuers' category of the survey is almost the same as that of the J-FFA (table 4-1). Therefore, it is appropriate to allocate each sector's holding amounts to each issuing sector in the J-FFA under issuers' proportions of this survey.[13]

Second, there are some differences between investors' category of the survey and that of the J-FFA (table 4-2). Therefore, it is needed to adjust their differences as the following.

1. Accounts in banks

In the survey, "city & regional banks" and "trust banks" are composed of banking accounts, trust accounts and overseas branches accounts. On the other hand, their equivalent in the J-FFA, "domestically licensed banks" and "foreign banks in Japan," are composed of only banking accounts. Therefore, it is needed to estimate only banking accounts of "city & regional banks" and "trust banks." First, it is assumed that "city & regional banks" has only banking accounts due to limitation of source data.[14] Second, for "trust banks," the paper uses the data for banking accounts' shares in Trust Companies Association of Japan.

2. Holding through trust accounts

In the survey, it is impossible to identify shares' amounts held through trust accounts by some sectors, i.e. CB, "collectively managed trusts (included in DC)," "public pensions (in GG)." On the other hand, "investment trusts" and "annuity trusts" are identified as

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[12] Five domestic stock exchanges are Tokyo, Osaka, Nagoya, Fukuoka and Sapporo Stock Exchange. These are all of Japanese stock exchanges. And this survey's data are on a fiscal year basis.

[13] The outstanding amounts on market value in the "shareownership survey" are slightly different from that in the J-FFA. In this background, the survey is conducted with share units recorded by the shareholder register administrators (it isn't possible to identify and avoid counting a same shareholder among shareholder register administrators), and its total amounts are calculated as the aggregation of each investor's holding amount, which is set as multiplying each listed share's amount on market value basis and the investor's proportion on share units basis. On the other hand, the J-FFA records total amounts of stock issues on market value. Therefore, it is appropriate not to use the survey's amounts directly but proportions of that in order to allocate the J-FFA's amounts.

[14] In fact, just a few of "city & regional banks" have trust accounts and overseas branches accounts. So, this paper assumed that "city & regional banks" is only banking accounts.

components of “trust banks.”[15] Therefore, this paper deducts “investment trusts” and “annuity trusts” from “trust banks,” and allocates the residuals in “trust banks” to those unknown sectors by pro rata under the amounts of these sectors’ shares on assets.

3. Other financial institutions

In the survey, “other financial institutions” is composed some different kinds of the J-FFA’s detailed sectors, i.e. “financial institutions for agriculture, forestry, and fisheries (included in DC),” “financial institutions for small business (in DC),” “government financial institutions (in OFIs)” and “mutual aid insurance (in IP).” Therefore, because of the limitation of the source data to identify their data separately, this paper uses the FWTW data of “other financial institutions” to estimate the FWTW of all their detailed sectors in the J-FFA.

4. Business corporations

In the survey, “business corporations” also includes some different kinds of the J-FFA’s detailed sectors, i.e. “financial companies (included in OFIs),” “financial dealers and brokers (in OFIs),” “financial auxiliaries (in OFIs)” and NFC. Therefore, because of the limitation of the source data to identify their data separately, this paper uses the same method of 3. *Other financial institutions*.

In taking care of the above points, this paper transforms the J-FFA’s “shares” to the inter-sector-FFA using the survey’s FWTW. However, the survey’s data are available on the same basis from 1992, so this paper has to compile the former data by pro rata. Furthermore, the 2011’s survey isn’t published at the timing of writing this paper, so the 2011’s FWTW is assumed to equal that of 2010 in this paper.

[15] According to the guide of this survey, “investment trusts” and “annuity trusts” are included in “city & regional banks” and “trust banks.” However, it is appropriate to think almost all of these trusts are actually included in only “trust banks.” Therefore, this paper assumes “investment trusts” and “annuity trusts” are components of only “trust banks.”

Tables and Charts

Table 1

The Four Types of Transaction Items of the J-FFA in the End of 2011

<< ¥ 100 million >>

Transaction items \ Sectors		CB		DC		IP		OFIs		NFC		GG		HH		RoW	
		(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)
Currency and deposits	Currency		885,465	85,751		3,596		368		238,986		62		556,702		0	
	Deposits with the Bank of Japan		365,323	330,635		0		34,688									
	Government deposits		20,979									20,979					
	Transferable deposits			81,948	4,724,588	9,129		59,979		1,203,154		111,566		3,251,066		7,746	
	Time and savings deposits			1,221,572	6,691,036	31,391		65,617		486,276		141,133		4,766,985		10,081	32,019
	Certificates of deposit			17,606	370,677	69,714		17,279		167,036		97,249		1,782		11	
	Foreign currency deposits	1,452		97,665	230,996	0		6,675		51,565		32,608		57,306		27,222	43,497
Deposits with the Fiscal Loan Fund				0		47,091		3,836	437,006			386,079					
Loans	Bank of Japan loans	406,496			256,657	0			149,839								
	Call loans and money			225,940	223,109	45,872		69,112	153,434	32,292		3,327					
	Bills purchased and sold	0	0	0	0	0		0	0	0		0					
	Loans by private financial institutions			6,084,271	274,003	338,295	16,322	471,258	486,859		2,587,356		522,140		2,589,921		417,223
	Loans by public financial institutions			41,431		139,470		2,740,237	549,418		665,640		1,094,063		451,426		160,591
	Loans by the nonfinancial sector				512,488				128,861	325,623	436,320	257,875	23,506	29,545	90,209	713,836	135,495
	Installment credit (not included in consumer credit)				10,277		7,742	163,895	2,935	41,459	164,882				11,510		8,008
	Repurchase agreements and securities lending transactions	0	122,922	110,853	382,380	19,753	45,996	657,384	571,620	34,553	2,826	101,703	1,520	216	0	289,535	86,733
Securities other than shares	Treasury discount bills	240,564		830,129		33,171		69,001	5,000	741		193,023	1,637,011			275,382	
	Central government securities and FILP bonds	676,307		2,742,246		1,975,753		392,762	1,162,693	109,311		715,410	6,391,210	433,015		509,099	
	Local government securities			309,319		224,676		17,396		24,174	36,375	79,278	695,315	75,574		1,273	
	Public corporation securities			314,188		189,000		30,233	417,364	39,481	80,401	111,323	256,910	40,224		30,226	
	Bank debentures			100,760	154,185	13,655		10,965		7,943		12,881		7,981		0	
	Industrial securities	15,517		338,791	149,833	195,249	3,441	41,357	60,399	25,690	540,276	82,210		38,365		16,770	
	External securities issued by residents			74,204	18,684	5,305	1,698	7,610	46,935	0	71,772	14	1,275			53,231	
	Commercial paper	19,830		54,551	7,561	11,058	0	38,754	54,894	16,856	78,616	22					
	Investment trust beneficiary certificates	8,165		39,775		184,645		1,043	670,540	79,387	41,096	6,145		392,476			
	Trust beneficiary rights			18,391	73,515	3,843		4,157	0	22,168		2,430		22,526			
	Structured-financing instruments	0		72,888		46,516		9,051	260,764	125,352		177				6,780	
	Mortgage securities			0		0			62	25				37			
Shares and other equities	Shares	15,229		126,065	203,366	272,117	46,656	185,534	48,479	643,520	2,350,976	169,930		541,126		695,956	
	Other equities	1,002	1	195,708	329,568	35,470	88,145	162,851	265,717	756,753	1,463,318	765,070	175,925	316,637		89,183	
Financial derivatives	Forward-type instruments			492,916	519,586	16,515	7,854	11,337	17,289	10,395	37,329	0	509		691	224,158	172,063
	Option-type instruments			84,644	72,195	1,325	804	14,929	16,001	1,649	15,445			4,294	4,223	131,864	130,037
Insurance and pension reserves	Insurance reserves						2,204,833							2,204,833			
	Pension reserves						1,999,320							1,999,320			
Deposits money		2	83	22,557	2,546	22,351	20,274	39,875	84,619	294,288	436,831	57,843	2,499	110,160	284	60	
Trade credits and foreign trade credits								64,873		2,145,096	1,687,266	6,510	0		505,493	23,600	47,320
Accounts receivable/payable		1,526	94	34,572	62,170	336,656	323,793	61,262	107,043	115,798	365,004	100,916	80,312	341,183	29,206	35,481	59,772
Outward direct investment				133,668						418,822							552,490
Outward investments in securities		43,679		604,933		656,632		380,610		626,454		1,161,919		107,736			3,581,963
Other external claims and debts		27,992	13,757	433,974	318,301	36,696		1,807		70,995	25,959	78,846	19,060			377,077	592,449
Others		49,246	28	221,628	164,112	29,010	2,384	11,625	42,340	134,339	217,466	40,143	89,698	94,090	64,053	0	0

Table 1 (cont)

The Four Types of Transaction Items of the J-FFA in the End of 2011

																	Total	
																	(A)	(L)
Total financial assets / liabilities		1,507,007	1,408,652	15,543,579	15,751,833	4,993,954	4,769,262	5,847,360	5,740,111	8,250,181	11,305,154	4,736,671	10,990,953	15,393,179	3,747,016	3,518,571	6,019,660	59,790,502	59,732,641
Each type's share of total amounts (%)	Type 1: Rearrangement of transaction items	32%	91%	20%	80%	18%	88%	10%	15%	41%	29%	43%	15%	84%	81%	12%	89%	40%	54%
	Type 2: Rearrangement of transaction items with additional information from other source data	0%	0%	1%	1%	5%	0%	0%	0%	0%	0%	1%	0%	4%	0%	20%	1%	3%	0%
	Type 3: Partial "pro rata" estimation in addition to Type 2	65%	9%	69%	4%	66%	1%	68%	60%	11%	28%	29%	82%	6%	0%	24%	0%	39%	27%
	Type 4: Estimation by "enhanced-pro-rata method"	3%	0%	9%	15%	10%	10%	21%	25%	47%	43%	28%	3%	6%	19%	44%	11%	18%	18%

Note: Gray cells indicate no amounts in those.
Source: BOJ.

Table 2

The Inter-Sector-FFA in the End of 2011

<< ¥ 100 million >>

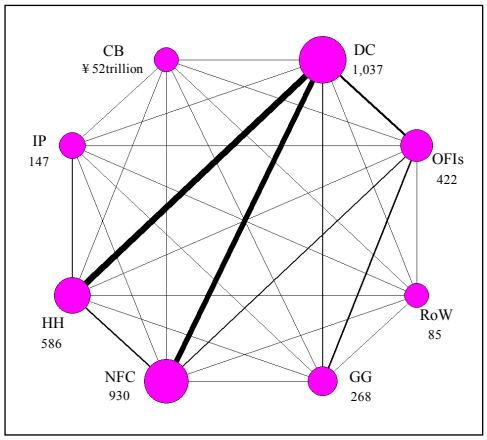
			CB		DC		IP		OFIs		NFC		GG		HH		RoW		Total	
			(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)
Currency and deposits			1,452	1,271,767	1,835,177	12,017,297	160,921		188,442	437,006	2,147,017		789,676		8,633,841		45,060	75,516	13,801,586	13,801,586
	to / from	CB			416,386		3,596		35,056		238,986		21,041		556,702			1,452	1,271,767	1,452
		DC		416,386	1,351,311	1,351,311	110,234		149,550		1,908,031		375,972		8,077,139		45,060	67,480	12,017,297	1,835,177
		IP		3,596		110,234				47,091										160,921
		OFIs		35,056		149,550	47,091		3,836	3,836			386,079						437,006	188,442
		NFC		238,986		1,908,031														2,147,017
		GG		21,041		375,972				386,079								6,584		789,676
		HH		556,702		8,077,139														8,633,841
		RoW	1,452		67,480	45,060							6,584						75,516	45,060
Loans			406,496	122,922	6,462,495	1,658,914	543,390	70,060	4,101,886	2,042,966	433,927	3,857,024	362,905	1,641,229	29,761	3,143,066	1,003,371	808,050	13,344,231	13,344,231
	to / from	CB			17,737	256,657			105,185	149,839									122,922	406,496
		DC	256,657	17,737	405,409	405,409	53,162	18,087	250,700	580,297	142,242	2,229,800	123,470	543,903	9,975	2,245,098	417,299	422,163	1,658,914	6,462,495
		IP			18,087	53,162	1,962	1,962	29,525	63,108	2,997	199,498	4,221	125,822	9	92,525	13,260	7,313	70,060	543,390
		OFIs	149,839	105,185	580,297	250,700	63,108	29,525	870,580	870,580	59,007	956,955	75,536	947,372	2,601	712,910	241,998	228,658	2,042,966	4,101,886
		NFC			2,229,800	142,242	199,498	2,997	956,955	59,007	126,272	126,272	73,827	5,052	8,429	21,530	262,243	76,828	3,857,024	433,927
		GG			543,903	123,470	125,822	4,221	947,372	75,536	5,052	73,827	4,103	4,103	454	15,210	14,522	66,537	1,641,229	362,905
		HH			2,245,098	9,975	92,525	9	712,910	2,601	21,530	8,429	15,210	454	1,743	1,743	54,050	6,550	3,143,066	29,761
		RoW			422,163	417,299	7,313	13,260	228,658	241,998	76,828	262,243	66,537	14,522	6,550	54,050			808,050	1,003,371
Securities other than shares			960,383		4,895,242	403,778	2,882,871	5,139	622,329	2,678,651	451,128	848,536	1,202,913	8,981,721	1,010,198		892,761		12,917,825	12,917,825
	to / from	CB				4,147		71		121,482		22,642		812,042						960,383
		DC	4,147		199,280	199,280	57,599	2,444	26,431	781,917	36,120	362,266	31,652	3,549,335	38,131		10,418		403,778	4,895,242
		IP	71		2,444	57,599	955	955	281	650,948	117	190,757	375	1,982,611	175		720		5,139	2,882,871
		OFIs	121,482		781,917	26,431	650,948	281	108,355	108,355	247,458	59,270	184,835	427,992	461,816		121,838		2,678,651	622,329
		NFC	22,642		362,266	36,120	190,757	117	59,270	247,458	37,795	37,795	75,087	129,637	58,200		42,519		848,536	451,128
		GG	812,042		3,549,335	31,652	1,982,611	375	427,992	184,835	129,637	75,087	910,964	910,964	451,876		717,265		8,981,721	1,202,913
		HH				38,131		175		461,816		58,200		451,876			0			1,010,198
		RoW				10,418		720		121,838		42,519		717,265			0			892,761
Shares and other equities			16,231	1	321,773	532,934	307,587	134,801	348,385	314,196	1,400,273	3,814,294	935,000	175,925	857,763		785,139		4,972,151	4,972,151
	to / from	CB				116		33		1,047		15,034	1				0		1	16,231
		DC	116		40,670	40,670	71,993	11,020	39,492	26,533	126,332	228,720	110,007	14,830	81,845		62,478		532,934	321,773
		IP	33		11,020	71,993	7,609	7,609	10,099	8,534	34,155	216,763	29,402	2,688	19,727		22,756		134,801	307,587
		OFIs	1,047		26,533	39,492	8,534	10,099	23,294	23,294	93,642	263,160	87,716	12,340	46,888		26,541		314,196	348,385
		NFC	15,034		228,720	126,332	216,763	34,155	263,160	93,642	1,088,802	1,088,802	649,900	57,343	685,310		666,606		3,814,294	1,400,273
		GG		1	14,830	110,007	2,688	29,402	12,340	87,716	57,343	649,900	57,973	57,973	23,993		6,758		175,925	935,000
		HH				81,845		19,727		46,888		685,310		23,993						857,763
		RoW				62,478		22,756		26,541		666,606		6,758						785,139
Insurance and pension reserves								4,204,153							4,204,153				4,204,153	4,204,153
	to / from	IP													4,204,153				4,204,153	
		HH						4,204,153												4,204,153
External claims and debts			71,671	13,757	1,172,575	318,301	693,328		382,417		1,116,271	25,959	1,240,765	19,060	107,736		377,077	4,784,763	5,161,840	5,161,840
	to / from	CB															13,757	71,671	13,757	71,671
		DC															318,301	1,172,575	318,301	1,172,575
		IP																693,328		693,328
		OFIs																382,417		382,417
		NFC															25,959	1,116,271	25,959	1,116,271
		GG															19,060	1,240,765	19,060	1,240,765
		HH																107,736		107,736
		RoW	71,671	13,757	1,172,575	318,301	693,328		382,417		1,116,271	25,959	1,240,765	19,060	107,736				4,784,763	377,077
Others			50,774	205	856,317	820,609	405,857	355,109	203,901	267,292	2,701,565	2,759,341	205,412	173,018	549,727	603,950	415,163	409,192	5,388,716	5,388,716
	to / from	CB			18	14,025	36	682	12	3,754	62	19,005	20	7,734	53	5,481	3	92	205	50,774
		DC	14,025	18	349,548	349,548	38,393	16,970	11,848	30,431	52,390	132,066	17,719	37,361	47,112	25,145	289,573	264,778	820,609	856,317
		IP	682	36	16,970	38,393	106,962	106,962	20,869	40,861	47,963	148,734	34,043	30,856	111,751	12,766	15,869	27,249	355,109	405,857
		OFIs	3,754	12	30,431	11,848	40,861	20,869	13,134	13,134	67,513	106,793	22,367	6,765	59,236	17,561	29,995	26,919	267,292	203,901
		NFC	19,005	62	132,066	52,390	148,734	47,963	106,793	67,513	1,942,120	1,942,120	101,906	31,155	244,037	502,214	64,680	58,148	2,759,341	2,701,565
		GG	7,734	20	37,361	17,719	30,856	34,043	6,765	22,367	31,155	101,906	14,343	14,343	41,664	8,794	3,141	6,220	173,018	205,412
		HH	5,481	53	25,145	47,112	12,766	111,751	17,561	59,236	502,214	244,037	8,794	41,664	20,088	20,088	11,901	25,786	603,950	549,727
		RoW	92	3	264,778	289,573	27,249	15,869	26,919	29,995	58,148	64,680	6,220	3,141	25,786	11,901			409,192	415,163
Total			1,507,007	1,408,652	15,543,579	15,751,833	4,993,954	4,769,262	5,847,360	5,740,111	8,250,181	11,305,154	4,736,671	10,990,953	15,393,179	3,747,016	3,518,571	6,077,521	59,790,502	59,790,502
	to / from	CB			434,141	274,945	3,632	787	140,253	276,122	239,048	56,681	21,062	819,776	556,755	5,481	13,760	73,215	1,408,652	1,507,007
		DC	274,945	434,141	2,346,219	2,346,219	331,381	48,521	478,022	1,419,178	2,265,114	2,952,852	658,820	4,145,429	8,254,202	2,270,243	1,143,129	1,926,996	15,751,833	15,543,579
		IP	787	3,632	48,521	331,381	117,487	117,487	60,773	810,543	85,232	755,752	68,041	2,141,977	4,335,815	105,291	52,605	727,890	4,769,262	4,993,954
		OFIs	276,122	140,253	1,419,178	478,022	810,543	60,773	1,019,200	1,019,200	467,620	1,386,178	756,534	1,394,469	570,542	730,471	420,372	637,994	5,740,111	5,847,360
		NFC	56,681	239,048	2,952,852	2,265,114	755,752	85,232	1,386,178	467,620	3,194,989	3,194,989	900,721	223,187	995,975	523,743	1,062,006	1,251,247	11,305,154	8,250,181
		GG	819,776	21,062	4,145,429	658,820	2,141,977	68,041	1,394,469	756,534	223,187	900,721	987,382	987,382	517,987	24,004	760,746	1,320,107	10,990,953	4,736,671
		HH	5,481	556,755	2,270,243	8,254,202	105,291	4,335,815	730,471	570,542	523,743	995,975	24,004	517,987	21,831	21,831	65,952	140,072	3,747,016	15,393,179
		RoW	73,215	13,760	1,926,996	1,143,129	727,890	52,605	637,994	420,372	1,251,247	1,062,006	1,320,107	760,746	140,072	65,952			6,077,521	3,518,571
Difference between financial assets and liabilities				98,355		-208,254		224,692		107,249		-3,054,973		-6,254,282		11,646,163		-2,558,950		0

Note: (A) columns indicates assets' sides and (L) columns inicicates liabilities' sides.
"Currency and deposits" is included "deposits with the Fisical Loans Fund."
"External claims and debts" is composed of "outward direct investment," "outward investments in securities" and "other external claims and debts."
"Others" is included "financial derivatives," "deposits money," "trade credits and foreign trade credits" and "accounts receivable/payable."

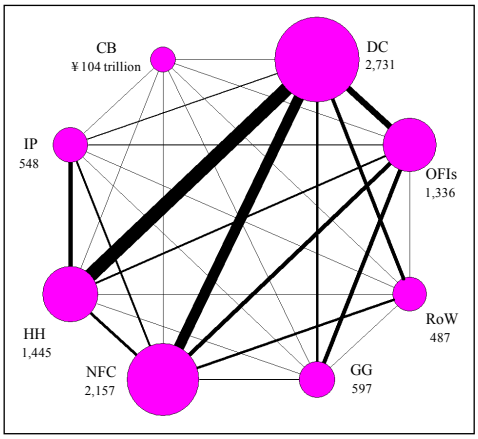
Chart 1

Gross Exposures' Networks in the Financial System of Japan

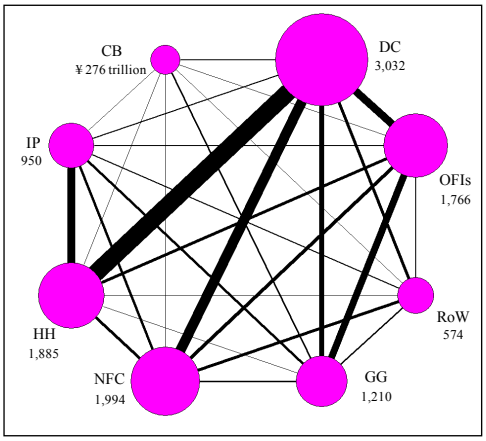
1. The End of 1981



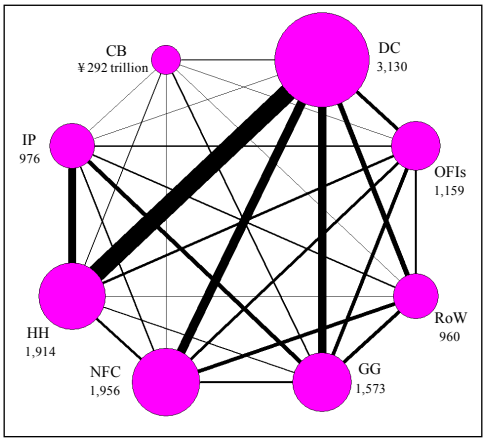
2. The End of 1991



3. The End of 2001



4. The End of 2011

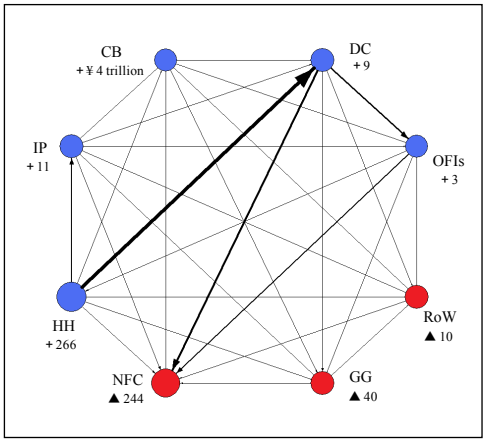


Note: Circles indicate each sector. Both circle's size and amounts of money indicate amounts outstanding of each sector's gross exposure. Lines' thickness indicates amount outstanding of inter-sector gross exposures.

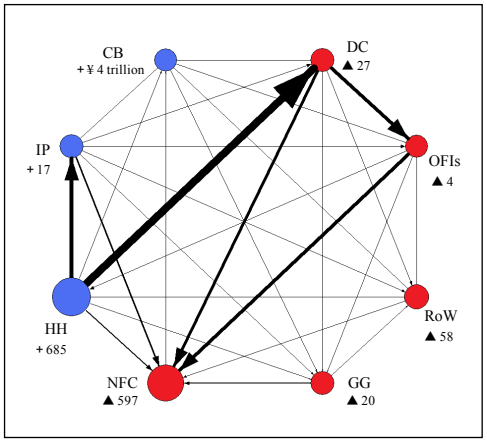
Chart 2

Net Exposures' Networks in the Financial System of Japan

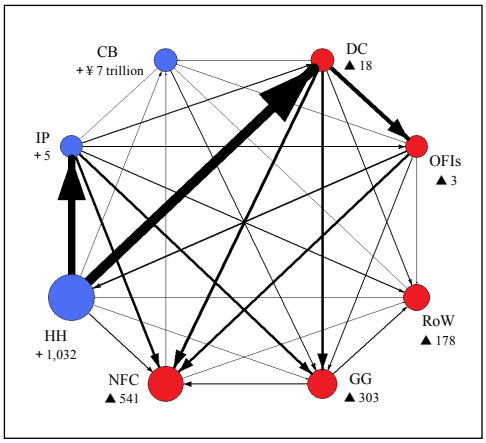
1. The End of 1981



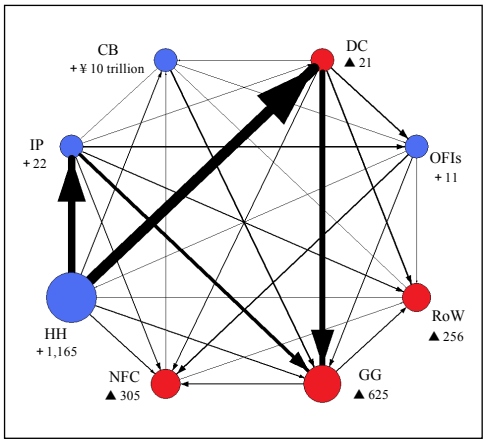
2. The End of 1991



3. The End of 2001



4. The End of 2011



Note: Blue circles indicate over-investing sectors and red circles indicate over-financing sectors. Both circle's size and amounts of money indicate amounts outstanding of each sector's net assets; if a sector's amount is plus (minus), the sector is over-investing (over-financing). Both allows' vectors and thickness indicate amount outstanding of net assets from a sector to the other sector.

Table 3

The financial Input-Output Table in the End of 2011

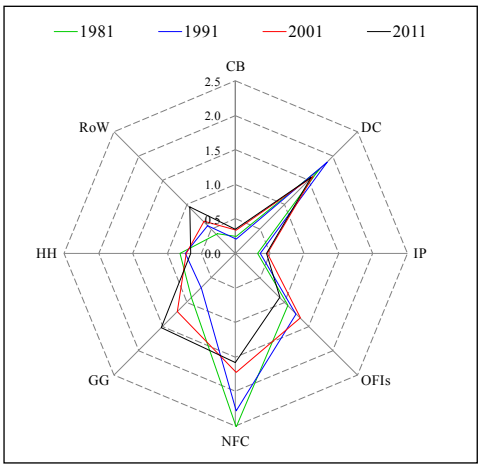
<< ¥ 100 million >>

i (Creditor) \ j (Debtor)		Y								ε (Over-financing)	T (Total assets/liabilities)
		CB	DC	IP	OFIs	NFC	GG	HH	RoW		
Y	CB	0	274,945	787	276,122	56,681	819,776	5,481	73,215	0	1,507,007
	DC	434,141	2,346,219	48,521	1,419,178	2,952,852	4,145,429	2,270,243	1,926,996	208,254	15,751,833
	IP	3,632	331,381	117,487	810,543	755,752	2,141,977	105,291	727,890	0	4,993,954
	OFIs	140,253	478,022	60,773	1,019,200	1,386,178	1,394,469	730,471	637,994	0	5,847,360
	NFC	239,048	2,265,114	85,232	467,620	3,194,989	223,187	523,743	1,251,247	3,054,973	11,305,154
	GG	21,062	658,820	68,041	756,534	900,721	987,382	24,004	1,320,107	6,254,282	10,990,953
	HH	556,755	8,254,202	4,335,815	570,542	995,975	517,987	21,831	140,072	0	15,393,179
	RoW	13,760	1,143,129	52,605	420,372	1,062,006	760,746	65,952	0	2,558,950	6,077,521
ρ (Over-investing)		98,355	0	224,692	107,249	0	0	11,646,163	0		
T (Total assets/liabilities)		1,507,007	15,751,833	4,993,954	5,847,360	11,305,154	10,990,953	15,393,179	6,077,521		

Chart 3

The Power-of-Dispersion Index and the Sensitivity-of-Dispersion Index by Sectors

1. The Power-of-Dispersion Index (PDI)



2. The Sensitivity-of-Dispersion Index (SDI)

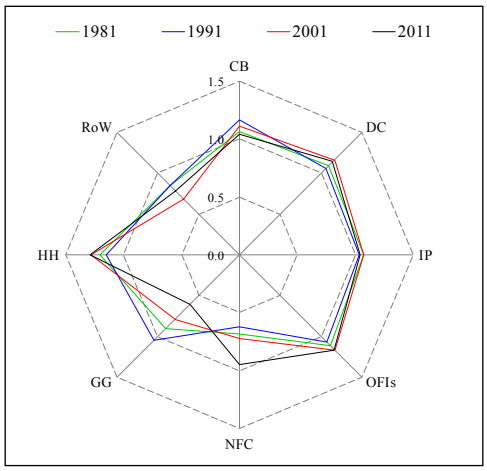
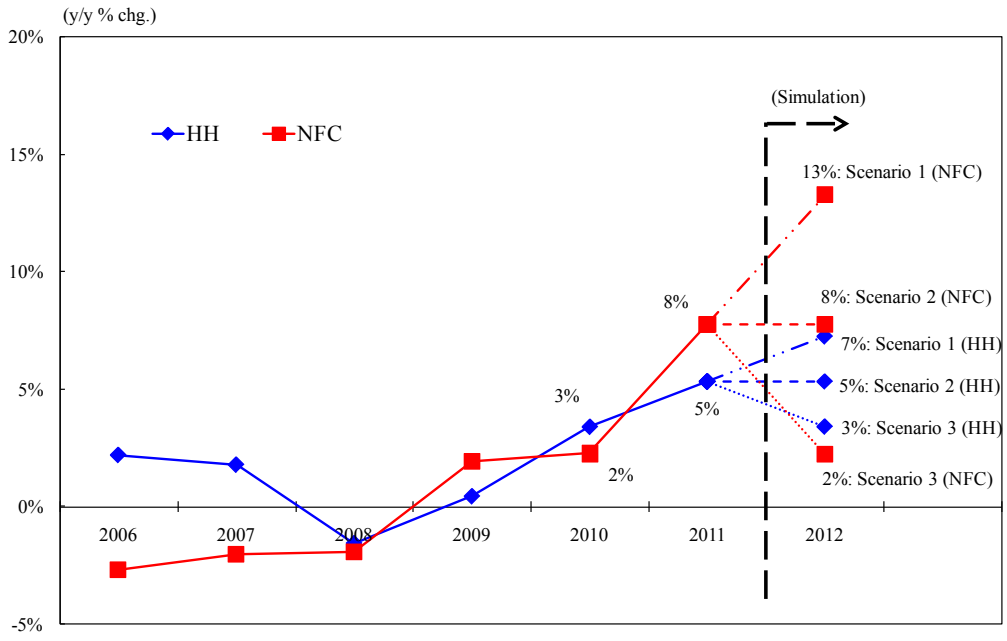


Chart 4

The Development of "Transferable Deposits" held by HH and NFC



Notes: The data is on the calendar year basis in this chart.

Source: BOJ.

Chart 5

The Results of the Simulation Chapter 4

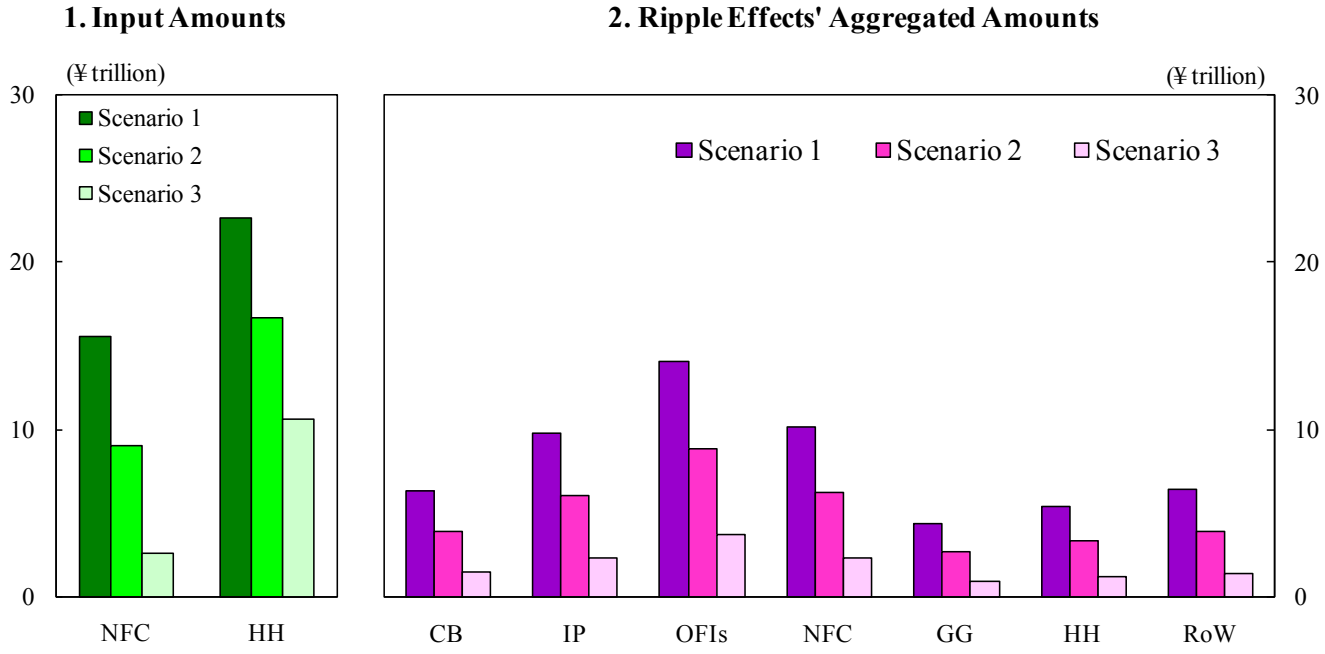


Table 4

The Issuers' and Investors' categories in the Shareownership Survey, the J-FFA and the Inter-Sector-FFA

Table 4-1. Issuers

Shareownership Survey	J-FFA (detailed sectors)	Inter-Sector-FFA
Banks	Domestically licensed banks	DC
Insurance	Life insurance	IP
	Non life insurance	
Securities & commodity futures	Financial dealers and brokers	OFIs
Other financing business	Finance companies	
Others	Private nonfinancial corporations	NFC

Note: "Others" is the total of nonfinancial industrial sectors.
Source: Tokyo Stock Exchange and BOJ.

Table 4-2. Investors

Shareownership Survey		J-FFA (detailed sectors)	Inter-Sector-FFA
Government and local government		Central government	GG
		Loacal governments	
City & regional banks		Domestically licensed banks	DC
		Foreign banks in Japan	
Trust banks	Investment trusts	Stock investment trusts	OFIs
	Annuity trusts	Pension funds	IP
	(Banking accounts)	Domestically licensed banks	DC
	(Others)	Collectively managed trusts	
		Central bank	CB
		Social securities funds	GG
Life insurance companies		Life insurance	IP
Non-life insurance companies		Nonlife insurance	
Securities companies		Securities companies	OFIs
Business corporations		Financial dealers and brokers (excluding securities companies)	OFIs
		Finance companies	
		Financial auxiliaries	
		Nonfinancial corporations	NFC
Foreign corporations		Overseas	RoW
Individuals		Households	HH
		Private nonprofit institutions serving hoseholds	

Note: Although "investment trusts" and "annuity trusts" are included in both "city & regional banks" and "trust banks" in the shareowner survey's explanation, this paper assumes these are included in only "trust banks" because of the actual condition.
In "trust banks," "banking accounts" is caluculated by the data of Trust Companies Association of Japan. So, "others" is calculated by substracting "investment trust," "annuity trusts" and "banking accounts."
Source: Tokyo Stock Exchange, Trust Companies Association of Japan and BOJ.

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