ALM BRAZIL: FOF Analysis of the Brazilian economy

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ABSTRACT

In this paper we apply Input-Output Methodology to a matrix which contains the flow of financial resources between agents in an economic system, during a period of time. This approach is called Flow-of-Funds (FOF) Analysis and it aims to analyze the structure of financial flows in an economy and its effects on the real economy. From the Brazilian Financial Sheet Accounts and Balance Sheet of Central Bank of Brazil, we built the Asset Liability Matrix of Brazil and extracted indicators of the Power of Dispersion and the Sensibility of Dispersion to access the effect of financial transactions realized by institutional agents in Brazil. In these preliminary results, we highlight: i) important hole of the Government and of the Central Bank in the Financial Market, ii) Government, Central Bank and the Enterprises work as financial intermediaries in Brazilian economy.
KEYWORDS: Flow of Funds, Assets Liabilities Matrix, Input-Output

1.   INTRODUTION

The contribution of this work is to show the effect of the financial transactions of economic agents in Brazil. As the recent financial crisis has caused adverse effects on the product and on the growth of developing economies, we pretend to stimulate discussion on the topic and guide the search for more effective action.

In this paper, we apply the concepts of Input-Output Methodology to the Assets-Liabilities Matrices (ALM) from the Flow of Funds (FOF) approach, which aims to analyze the structure of financial flows in the economy and its effects on the flow of the real economy.

Copeland (1949) proposed a system to detail the money flow, and explained how the financial account (money flow) can evidence the result of the current account (good and services flow) after the capital formation (capital account). The link between the activities of the real economy and financial market operations can be evidenced by the economic flows, because excess assets and liabilities in the financial account indicate, respectively, investment and savings in non-financial account (real economy = estate transactions and services + income transfers).

Tsujimura and Mizoshita (2003, 2004), described how to apply IO Methodology to a Flow of Funds Account. They presented an application to a worldwide financial account and the FOF of Japanese Economy. The system proposed by Copeland (1949) was improved

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developing the System of Real & Financial National Accounts (ReFiNA) by Tsujimura e Tsujimura (2010). Recently, this approach has being applied to others economies, an example is the study of financial flows in Korean economy (KIM, 2014).

There is an application with similar approach in Brazil, Burkowski (2015) developed the Financial and Social Accounting Matrix (FSAM) to Brazilian Economy to the years 2005 to 2009. The Brazilian FSAM show the interindustry production structure, the generational and allocation of income, the flow of fixed capital and changes in financial assets and liabilities. In this paper we focus on the Financial Account, we tried to describe the flow of funds, because, according to the FOF Analysis, looking to financial flows, specially to the difference between changes in assets and changes in liabilities we can access information about how real economy in going on. The benefits of this research begin with a description of the financial flows and can be important sources of information for analysis, evaluation and formulation of economic policies.

In this sense, the interesting point to investigate the movements of financial accounts is to understand its impact on the real economy. We hope that policy makers may refer to the results of this simulation as indicators to make assessments on their decisions and policies, and to look for effective action.

This study aims to answer the following questions: Does the need for financing (net borrowing) or excess resources (net lending) of a given economic agent affect the total flow of capital (financial and fixed) in the Brazilian economy? How the variation of excess saving or excess investment in the wide economy influence the movement each economic agent flow of funds?

In this application of the FOF Analysis to Brazilian economy, we used 2004 and 2005 data, there are six Institutional Sectors, or economic agents: Households, Enterprises, Government, Central Bank, Financial Sector without Central Bank (Financial Firms) and external sector (ROW). The data used were obtained from Financial Sheet Account of Brazil and from Balance Sheet of Central Bank of Brazil, both published by the Central Bank of Brazil.

From the FOF Matrix or Asset-Liability Matrix (ALM) are calculated Dispersion-Power-Index (DPI) and Sensitivity-of-Dispersion-Index (SDI) for each agent from the perspective of Fund Raising (The Liability-Oriented System) and of Fund Employment (The Asset-Oriented System). The results seek to indicate how variations in the flow of funds, or the "make and use" of financial resources affect the flow of capital in the real economy.

2.   FLOW OF FUNDS ANALYSIS

The Flow of Funds (FOF) approach was initial proposal by Copeland (1949) as a System of four entries organized from accounts of the Financial Balance of the institutions and economic agents. According to Tsujimura and Mizoshita (2004), the FOF analysis refers to the application of techniques of Input-Output (I0) methodology to the Asset-Liability Matrix (ALM), which is a square matrix Sector by Sector (Institutional Sectors), in which the values represent the flow of financial instruments, assets (financial investments) and liabilities (financial source of resources), the transactions of funds occurred among agents.

The approach evolves algebraic operations analogous to the IO Methodology, the "Asset and Liability" Table behave as the "Make and Use" Table, but the intermediary consumption refers to funds instead of goods. The IO matrix show the supply and use of goods, services and factors of production (intermediate flow of production), while the ALM show the supply and demand of assets and liabilities (financial flow of funds). Given this configuration, the ALM can be understand as an IO matrix and many of the techniques developed by IO theory and applications of the Leontief Inverse can be applied to ALM.

Most of the IO methodology was developed based on a demand driven system, few studies have tried to understand the supply driven system[3]. When we look to the flow of funds, we can see that assets and liabilities are "two sides of the same coin", so it makes sense to think of two systems.

Assets and Liabilities are counterparts of the same Balance Sheet for each institution (or individual), and between institutions (individuals), these assets and liabilities are separately negotiated. When some agent need funds it comes to the financial market to raise resources (goes to the credit market and borrow loans, or goes to the capital market and issue shares and bonds). The liability of one individual is an asset to the other individual (who lend the money). In a different transaction, independent transaction, when some agent have excess funds, it goes to the financial market to employ its money. At this operation, the asset of the individual is the liability to the other individual (who receive the money). So assets and liabilities are treated separately in the financial market, each one with its terms of features and costs or returns, which are not necessarily the same for the two agents involved in the transaction, and therefore the changes in assets and changes in liabilities generate different effects on the economy.

When it is the Asset-Oriented System, the analysis will focus supply and demand for financial assets. Financial assets are instruments in which economic agents employ their surplus

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[3] To see some examples go to: MILLER and BLAIR, 1999.

funds. Financial assets in excess indicates financing capacity in the non-financial account (net lending), this means that when an agent has the resources surplus relative to their capital expenditures, this surplus is invested in financial instruments (such as bank deposits, stocks and bonds).

The counterpart of any application of funds in financial assets, there is the creation of a financial liability of the agent who is supplying the asset (deficit agent or financial intermediary - in Brazil, this role is undertaken almost exclusively by banks) to the agent that is demanding financial assets (surplus agent). By creating this obligation, the employed resource is available to the financial intermediary, who in turn will "re-employ" the funds in the economy, for example, lending to other agents, which in turn will use these resources to make more investments. Thus, the flow of assets reflect the effects of the employ of resources in the economy.

The same, however on the other hand, happens in the Liability-Oriented System. Excess liabilities indicates a need for funding in the non-financial account (net borrowing) and when a deficit agent raises new funds, the counterpart is the creation of an asset (a credit) on the Balance Sheet of the supplier of funds agent (surplus agent or financial intermediary) towards to the deficit agent. If we look to the intermediary agent Balance, the creation of this liability make them seek new sources of funding (because within individual Balance Sheet, all of new change in assets side will have a counterpart change on the liability side). It can be contracting new liabilities from other financial institutions or from Central Bank (intermediary financial flow). Thus, the flow of liabilities will reflect the effects of raising funds in the economy.

3. METHODOLOGY

To apply the Flow of Funds Analysis to Brazilian economy in 2005, initially we will set up an Assets Table and a Liabilities Table with the flow of funds transacted in the year 2005. Then these two tables are combined generating the two Flow of Funds Accounts or Assets and Liabilities Matrices (ALM) to the Brazilian economy for the year 2005. The first will be in ALM in the Liability-Oriented System (or Fund Raising = Y) and the second is the ALM in the Asset-Oriented System (or Fund Employ = Y *).

Thereafter, for each one (Y and Y*) is given a similar treatment to impact analysis in the Input-Output (IO) Methodology in order to extract of the flow of funds (so we will have four indexes: Dispersion-Power-Index in the Liability System, Sensitivity-Dispersion-Index in the Liability System, Dispersion-Power-Index in the Asset System, Sensitivity-Dispersion-

Index in the Asset System). They indicate the resources scattering effect in economy caused by changes in the raising and employing financial funds.

3.1 Asset Table and Libility Table

From the Financial Sheet Account of Brazil and Balance Sheet of Central Bank of Brazil (BCB, 2011, BCB 2004 e BCB 2005) for the year 2005, an Asset Table (ASSET TABLE - E) will be built and Liability Table (LIABILITY TABLE - R) for the Brazilian economy. Tables E and R, are composed by six (6) economic agents or Institutional Sectors: Enterprises, Households, Government, Central Bank, Financial Sector without the Central Bank and Rest of the World; and six (6) Financial Instruments: Cash and Deposits, Bonds, Loans, Shares, Technical Insurance and Others Debts and Credits. Financial Instruments are in rows and Institutional Sector are in the columns.

The monetary values expressed in Brazilian currency (Real) were obtained in Financial Sheet Account, which is a demonstration that shows the stock of financial assets held by economic agents in a given initial date, the changes occurred in these assets and liabilities during a period of time, and the assets and liabilities holdings in the final date. This Financial Balance Sheet Account was published in detail for the years 2004-2009, as part of Integrated Economic Accounts (CEI). In the original publication are detailed, five (5) economic sectors: Non-Financial Companies, Financial Companies, Families, Government and Rest of World.

We intend to disaggregate the "Financial Companies" in two "sub-groups": the "Central Bank" and "Financial Firms" which will represent the "Financial Sector without Central Bank" by subtracting the flows of assets and liabilities of the Central Bank of Brazil from the asset and liabilities flows of the Institutional Agent aggregated in "Financial Companies".

To access this objective, we will use the balance sheet of the Central Bank of Brazil (BCB). The BCB monthly publishes its Balance Sheet and others Accounting Statements. The balance sheets also represent stock accounts indicating the stock of assets (left side) and liabilities and net worth (right side) held by the entity at a given date. We study the "Accounting Plan" of the Balance Sheet of the BCB, which is based on the Brazilian Financial Institutional Accounting Plan (COSIF) to linkage the assets and liability accounts of the Balance Sheet to the assets and liabilities Financial Instruments on the Financial Sheet Account.

We identified the financial instruments used by the BCB, linking them to financial instruments highlighted in the Assets and Liabilities Matrices. Then, we made a "Codification Plan" from the accounts of the Balance Sheet and financial instruments on the Financial Sheet

Account, following the principles of the SNA 2008, the Methodological Notes of Financial Sheet Account (IBGE, 2011) and the Accounting Plan of the Balance Sheet of the Central Bank.

Tsujimura and Mizoshita (2004) describe the structure of Assets Table (E) as being composed by the following partitions: the matrix with different assets employed by the different sectors and complementary vectors. Since n is the number of financial instruments and m is the number of institutional sectors, the Asset Table (E) can be expressed by equation 1:

$$E = \begin{bmatrix} e_{11} & e_{12} & \cdots & e_{1m} \\ e_{21} & e_{22} & \cdots & e_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ e_{n1} & e_{n2} & \cdots & e_{nm} \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_m \end{bmatrix} \quad sE = \begin{bmatrix} s_1^E \\ s_2^E \\ \vdots \\ s_n^E \end{bmatrix} \quad z = \begin{bmatrix} z_1 \\ z_2 \\ \vdots \\ z_m \end{bmatrix} \qquad (E.1)$$

Where:

e_{ij} = amount of funds allocated to the i-th financial instrument by the j-th institutional sector;

ε_j = excess liabilities in sector j. Liabilities minus assets. If the difference is negative, the value is zero, because there are not excess liability;

s_i^E = total quantity of financial instruments in terms of assets. Is the sum of assets for each sector;

z_j = sum of assets or liabilities of the sector j, whichever is greater. Add excess of liabilities to the total assets;

Similarly, the Liabilities Table (Table R) consists of a matrix representing the amount of funds obtained through liabilities by institutional sectors and complementary vectors. The equation 2 expresses the Table R (TSUJIMURA and MIZOSHITA, 2003):

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \quad \rho = \begin{bmatrix} \rho_1 \\ \rho_2 \\ \vdots \\ \rho_m \end{bmatrix} \quad sR = \begin{bmatrix} s_1^R \\ s_2^R \\ \vdots \\ s_n^R \end{bmatrix} \quad z = \begin{bmatrix} z_1 \\ z_2 \\ \vdots \\ z_m \end{bmatrix} \qquad (E.2)$$

Where:

r_{ij} = amount of funds raised by the j-th institutional sector from i-th financial instrument;

ρ_j = excess assets in the sector j; Have to be zero if liabilities are bigger than assets;

s_i^R = total quantity of financial instruments in terms of liabilities;

z_j = sum of assets or liabilities of the sector j, whichever is greater.

After building the Tables R (liabilities) and E (assets), we will derive two square Assets-Liabilities Matrices (ALM), which are matrices of financial transactions sector by sector. In both of them, on the rows and on the columns are the Institutional Sectors (agents), and the intersections between the rows and columns, represents the financial transactions carried out by them. However, first one shows the effects of the supply of funds, whose origin is on the flow of financial assets (fund-employment) and the other one shows the effects of funds demand, the impact generated from financial liabilities flow (fund-raising).

The Assets-Liabilities Matrix (ALM) in the Liability-Oriented System, defined as Y, the sectors are in rows and columns, and intersections represent the flow of funds occurred between Institutional Sectors using financial liabilities.

To get to the Y matrix, we have to the express matrices E and R, are in terms of portfolio of uses, percentage shares of each financial instrument in relation to the total agent transaction. We define two matrices of technical coefficients (matrices B and D).

The matrix B is the matrix of technical coefficients of the use of liabilities, each element of B (b_{ij}) is formed by the ratio between each element of R (r_{ij}) and the total financial resources raised by sector (z_j) (r_{ij} and z_j were defined in Equation 2).

The matrix D is the matrix of technical coefficients of assets in the Liability-Oriented system. Each element of D (d_{ij}) is formed by the ratio between each element of E´ ($e´_{ij}$) (transposed matrix E defined in equation 1) and the amount of instruments in terms of assets (s_i^E). It is analogous to operations with the "Use Table" (U) and "Make Table" (V), the input-output methodology to find the square matrix Sector by sector.

Using the "Portfolio assumption of the institutional sector" we define the matrix C like C = DB. C is a square matrix formed by technical coefficients that indicate, in relative terms, the amount of funds that sector j obtains from the sector i.

To return to the matrix of monetary values, we pre-multiplies the matrix C by the vector representing the total financial resources transacted by j sectors (z_j), and define the Y matrix, Flow of Funds Matrix or Assets-Liabilities Matrix in Liability-Oriented system, as can be expressed in equation 3:

$$Y = \begin{bmatrix} y_{11} & \cdots & y_{1j} \\ \vdots & \ddots & \vdots \\ y_{i1} & \cdots & y_{ij} \end{bmatrix} \qquad (E.3)$$

Where: $y_{ij} = c_{ij}z_j$, how many funds the sector j raises from sector i (in monetary values).

The procedure to get to the Funds Flow Matrix or Assets-Liabilities Matrix in the Asset-Oriented system, defined as Y *, is analogous. However, we define the two technical coefficient matrix: B* and D*, where $d_{ij}^* = r'_{ij}/s_i^R$ and $b_{ij}^* = e_{ij}/z_{ij}$. Using the "Portfolio assumption of the institutional sector", we define $C^* = D^*B^*$, and them we define the Flow of Funds Matrix or Asset-Liabilities Matrix in the Asset-Oriented system (Y *):

$$Y^* = \begin{bmatrix} y_{11}^* & \cdots & y_{1j}^* \\ \vdots & \ddots & \vdots \\ y_{i1}^* & \cdots & y_{ij}^* \end{bmatrix} \qquad \text{(E.4)}$$

Where:

$y_{ij}^* = c_{ij}^* z_i$, which represents how many funds the sector i apply in the sector j (in monetary terms).

3.2 Impact Analysis in Flow of Funds Account

From the two Flow of Funds Matrices (Asset-Liability Matrices: Y and Y *), presented in the previous section, we can examine the direct and indirect effect of changes in flow of funds.

When one agent raises new liabilities, for example, when a company obtains new bank loans, there is an increase in financial liabilities of the company and, on the other hand, an increase (of equal value) in financial assets of the other agent, in this case of a bank. This would be the direct effect. To increase their financial investments (increase in banks assets), banks seek new sources of funding (increase in banks liabilities), for example, sell securities to other financial firm, rediscount with the Central Bank. By the way, this operation needs a counterpart, which is an increase on the amount of assets of other agent. Therefore, the direct effect of raising liabilities is the increase on bank assets, which will generate another effect on the financial structure of other agents. This would be the indirect effect.

To analyze the direct and indirect effect of the financial transactions of a particular Institutional Sector we calculate indexes from the Leontief Inverse of the two ALM (Y e Y*). The four indexes calculated are:

i) Dispersion-Power Index Fund-Raising;

ii) Sensibility-of-Dispersion Index Fund-Raising;

iii) Dispersion-Power Index Fund-Employ;

iv) Sensibility-of-Dispersion Index Fund-Employ;

To calculate the indexes, we will derive the Leontief Inverse of Y, and the Leontief Inverse of Y*. We will briefly describe the procedure, for a detail see Tsujimura e Mizoshita (2004): First, start from the ALM in the Liability-Oriented System. The equation 5 establish the relation behind the ALM in matrix notation:

$$C.Z^Y + \varepsilon^Y = Z^Y \qquad (E.5)$$

Where:

C = matrix of technical coefficient fund-raising;

Z^Y = vector with sum of assets and liabilities, whichever is greater;

ε^Y = vector of excess of liabilities.

Solving the equation 5 by Z^Y (analog to what we do in the IO Methodology), we find the equation 6:

$$Z^Y = (I - C)^{-1}\varepsilon^Y \qquad (E.\ 6)$$

We can highlight the inverse Leontief for the ALM in the Liability-Oriented system, expressed by equation 7:

$$\Gamma = (I - C)^{-1} = \begin{bmatrix} \gamma 11 & \cdots & \gamma 1m \\ \vdots & \ddots & \vdots \\ \gamma m1 & \cdots & \gamma mm \end{bmatrix} \qquad (E.7)$$

From the Leontief Inverse of the ALM in the Liability-Oriented system, we can derive Dispersion-Power Index Fund-Raising (expressed in the equation 8) and the Sensibility-of-Dispersion Index Fund-Raising (expressed in the equation 9):

$$\omega_j^Y = \frac{\sum_{i=1}^{m} \gamma ij}{\frac{1}{m} + \sum_{j=1}^{m}\sum_{i=1}^{m} \gamma ij}$$

$$\varphi_j^Y = \frac{\sum_{j=1}^{m} \gamma ji}{\frac{1}{m} + \sum_{i=1}^{m}\sum_{j=1}^{m} \gamma ij}$$

Where:

m = is the number of Institutional Sectors;

y_{ij} = are elements of Leontief Inverse ALM (Y);

According to Mizoshita and Tsujimura (2004), the Dispersion-Power Index Fund-Raising (DPI-FR) indicates the total demand for funds, direct and indirect, induced by an increase in demand for funds of a given sector j (excess of investments in terms of the real economy).

The Sensibility-of-Dispersion Index Fund-Raising indicates the direct and indirect demand for funds in a given sector j induced by increases in demand for funds from wide economy.

These indicators show "how far" the influence spreads when a certain economic agent raises new money in the financial market (JIYOUNG, 2014).

As the supply and demand of funds spreads across different systems, there is an asymmetry in the effect induced by supply and demand of funds. This is one of the most important properties of Funds Flow Analysis (MIZOSHITA and TSUJIMURA, 2004).

Thus, while in the Liability-Oriented system shows the spreading effect of funds when there are variations in the demand for funds, in the Asset-Oriented system, it shows the effect of scattering funds when there are variations in supply of funds.

To the Asset-Oriented system, we will apply the same algebraic procedure developed for the Liability-Oriented system, however it will start with the ALM in the Asset-Oriented system (Y*). We present in the equation 10, the Leontief Inverse of Y* (Γ^*), in the equation 11, the Dispersion-Power Index Fund-Employ (ω^*) and, in the equation 12, the Sensibility-of-Dispersion Index Fund-Employ (φ^*):

$$\Gamma^* = (I - C^*)^{-1} = \begin{bmatrix} \gamma 11^* & \cdots & \gamma 1m^* \\ \vdots & \ddots & \vdots \\ \gamma m1^* & \cdots & \gamma mm^* \end{bmatrix} \qquad \text{(E.10)}$$

$$\omega_j^{Y^*} = \frac{\sum_{i=1}^{m} \gamma^* ij}{\frac{1}{m} + \sum_{j=1}^{m} \sum_{i=1}^{m} \gamma^* ij} \qquad \text{(E.11)}$$

$$\varphi_j^{Y^*} = \frac{\sum_{i=1}^{m} \gamma^* ji}{\frac{1}{m} + \sum_{i=1}^{m} \sum_{j=1}^{m} \gamma^* ij} \qquad \text{(E.12)}$$

Where:

y_{ij}^* = elements of the Leontief Inverse of the ALM in the Asset-Oriented system.

Mizoshita and Tsujimura (2004) point that the Dispersion-Power Index Fund-Employ (DPI-FE) indicates the supply of funds of total economy, direct and indirectly, induced by increases in fund supply of a given sector j (excess savings in relation to current account).

The Sensitivity-of-Dispersion Index Fund Employ shows the direct and indirect effect on funds of a given sector i, induced by increases in the supply of funds from other wide economy.

In the Asset-Oriented system, the indices show "how far" the influence spreads when a certain economic agent applies new funds on the market (JIYOUNG, 2014).

In short, the Liability-Oriented system, the indexes represent the chain reaction caused by demand for funds (excesses of investment in terms of the real economy) and in the Asset-Oriented system, the indices represent the reaction originated by the supply of funds (excess savings in terms of the real economy).

4. BRAZILIAN FLOW OF FUNDS

We collect the stock data for the years 2004 and 2005, than we calculate the flow of 2005 (Flow of 2005 = Stock 2005 - Stock 2004) and build the Flow of Funds Account for the Brazilian economy in 2005. We detailed the assets and liabilities in the following financial instruments: Cash and Deposits, Bonds, Loans, Shares, Technical Reserves, Others Debts or Credits.

The data basis were:

i)   The Financial Balance Sheet Account: published by Central Bank of Brazil along with Financial Account (2005-2009), presents stock of assets and liabilities, and the changes occurred during a period. Present 6 financial instruments and 6 institutional sectors: Enterprises, Financial Firms, Government, Households and Rest of the World (ROW);

ii)   The Balance Sheet of Central Bank: published monthly by Central Bank of Brazil (we use annually data of the year 2004 and 2005). Presents all of assets, liabilities and net worth of the entity, others accountable statements and explanatory notes.

In Brazilian Flow of Funds Account we extracted the Brazilian Central Bank data to the "Financial Firms". To do that, we design a "Codification Plan" that links the assets and liabilities accounts from BCB Balance Sheet to the Financial Instruments in the Financial Balance Sheet Account. It is in the Annex 1.

Tables 1 and 2 present the Flow of Funds Account for the year 2004 and 2005, respectively.

Tables 3 and 4 present the Asset Table and the Liability Table, respectively, to the flow of year 2005 (Flow 2005 = Stock 2005 – Stock 2004).

In Table 1 and in Table 2, we can see the inter-relation between the flow of financial assets and liabilities in the economy. It represents the quadruple entry system proposed by Copeland (1949). We can see the effect of the financial transactions within each agent and the transactions occurred between all of them.

We can see the vertical double entry that ensures the internal consistency within an institutional unit, look that in the last row in table 1 and 2 we can observe that there are consistence for each one individually (Total asset + excess liability = Total liability + excess assets to each institutional sector).

Since each financial transaction evolves at least two different agents, creditor and debtor, we can also see the horizontal double entry that assures the inter-consistency between institutional units. In the two last column in table 1 and 2, we can see that the consistence is maintained throughout the financial market (total asset = total liability and total excess = total assets to the total of the economy).

With this kind of account we can have a notion about the relation between financial and real economy. This is the peculiar feature of Flow of Funds Analysis. Since excess assets in the financial account represent excess saving in the current account and excess liabilities in the financial account represent excess investments in the current account. Thereafter, the sequence of the accounts is not one-way relation but it consist of a loop. This loop explains the feedback process between real and financial markets.

Table 1: The Quadruply-Entry-System to Brazilian Economy – 2004.

Institutional Sectors	Financial Firms		Central Bank		Enterprises		Governement		Household		ROW		Total (Instruments)	
Instruments	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY
Cash and Depósits	227228	864157	76836	179795	206243	0	381815	0	228661	0	7824	84655	1128607	1128607
Bonds	942146	340188	384828	13644	100487	112963	40952	1228089	46959	0	281205	101693	1796578	1796578
Loans	819069	264712	22869	228167	110422	461218	461639	518530	9514	193655	244521	1752	1668034	1668034
Shares	814491	1336120	0	0	1220302	1765791	219413	0	411859	0	588038	152192	3254102	3254102
Tecnichal Insurance	1481	316383	0	3831	4932	0	142	0	312953	0	706	0	320214	320214
Other Deb./Credit	293387	347769	110	677	735382	1196085	724958	233824	357063	346889	62465	48122	2173366	2173366
Difference	371528	0	0	58529	1158289	0	151522	0	0	826466	0	796345	1681339	1681339
Total (Sector)	3469329	3469329	484643	484643	3536057	3536057	1980442	1980442	1367009	1367009	1184760	1184760	12022240	12022240

Source: Elaborated by authors from Financial Balance Sheet of Brazil (2011) and Balance Sheet of Central Bank of Brazil (2004).

Table 2: The Quadruple-Entry-System to Brazilian Economy – 2005.

Institutional Sectors	Financial Firms		Central Bank		Enterprises		Governement		Household		ROW		Total (Instruments)	
Instruments	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY	ASSET	LIABILITY
Cash and Depósits	309570	1094528	62950	182327	251974	0	468331	0	244935	0	7858	68764	1345618	1345618
Bonds	1186902	455209	373957	6959	119637	102919	46864	1354435	63536	0	243889	115261	2034784	2034784
Loans	974296	259256	34319	212830	131772	525944	461982	509666	10004	249627	146806	1854	1759177	1759177
Shares	1058454	1711510	0	0	1502395	2135830	265632	0	501726	0	681367	162234	4009575	4009575
Tecnichal Insurance	1640	365080	0	2099	5962	0	172	0	358734	0	671	0	367179	367179
Other Deb./Credit	308273	377799	117	1121	812906	1209642	738048	239157	330071	375158	54549	41085	2243963	2243963
Difference	424248	0	0	66006	1149690	0	122231	0	0	884221	0	745942	1696169	1696169
Total (Sector)	4263382	4263382	471343	471343	3974336	3974336	2103258	2103258	1509005	1509005	1135140	1135140	13456465	13456465

Source: Elaborated by authors from Financial Balance Sheet of Brazil (2011) and Balance Sheet of Central Bank of Brazil (2005).

Table 3: Asset Table (E) – Brazil, 2005

	Financial Firms	Central Bank	Enterprises	Governement	Household	ROW	Total (Instrument)
Cash and Depósits	82342	-13886	45730,70519	86515,23108	16274,23072	34,116067	217011,0029
Bonds	244755,5249	-10870,788	19149,32586	5911,889446	16576,67045	-37315,9957	238206,627
Loans	155226,7437	11449,941	21350,11875	342,57	489,765705	-97715,63885	91143,50026
Shares	243963,4995	0	282093,345	46218,86702	89866,93894	93329,74528	755472,3956
Tecnichal Insurance	159,31	0	1030,63	29,7	45781,19	-35,32	46965,51
Other Deb./Credit	14885,59642	6,288	77523,56506	13089,59419	-26992,3432	-7916,437384	70596,26308
Diff. (Excess Liability)	52719,65916	0	0	0	0	50403,43783	103123,097
Total (Sector)	794052,7934	-13300,299	446877,6898	152107,8517	141996,4526	783,90723	1522518,396

Source: Elaborated by authors from the Flow of Funds Account.

Table 4: Liability Table (R) – Brazil, 2005

	Financial firms wi	Central Bank	Enterprises	Governement	Household	ROW	Total (Instrument)
Cash and Depósits	230371	2532	0	0	0	-15891,78321	217011,0029
Bonds	115020,5226	-6684,864	-10043,93256	126346,6105	0	13568,2904	238206,627
Loans	-5455,704847	-15337,501	64726,33069	-8863,43536	55971,96166	101,849118	91143,50026
Shares	375390,1853	0	370039,94	0	0	10042,27037	755472,3956
Tecnichal Insurance	48697,288	-1731,778	0	0	0	0	46965,51
Other Deb./Credit	30029,70526	443,978	13556,99043	5333,112899	28269,19594	-7036,719445	70596,26308
Diff. (Excess Assets)	0	7477,877	8598,361265	29291,56371	57755,29501		103123,097
Total (Sector)	794052,7934	-13300,299	446877,6898	152107,8517	141996,4526	783,90723	1522518,396

Source: Elaborated by authors from the Flow of Funds Account.

In Table 3, we can see the Asset Table (E-Table), from Flow of Funds Account 2005. The main bloc of accounts represent how much funds the Institutional Sector employed to each Financial Instrument, all of assets investments – the portfolio investment of each sector. In the equation 1 (on the Methodology topic) these elements was defined: e_{ij} . The row named "Diff. (Excess Liability)" express the excess of liabilities. Looking at each sector it is the difference observed in its Balance Sheet, which revels that this sector has saving excess or net financing capability (net lending), in the real economy. In the equation 1, it was referred to vector ε_j. In this same equation, we can identify the total of instruments in terms of assets (vector s_i^E), it is the last column in table 3, and the total of resources of each sector (vector z_j - the last row in table 3)

In Table 4, we can see the Liability Table (R-Table), from Flow of Funds Account 2005. The main bloc of accounts in the R Table, are elements that represents how much funds the Sector raised from each Financial Instrument, all of financial liabilities used by this sector (the liability portfolio or capital structure of the institutional sector). The elements of R-Table described in the equation 2 can be highlight in the table 4. The row named "Diff. (Excess Assets)" represent the vector ρ_j, which express the excess of assets related to those sources of funds and in the real economy it indicates that these Institutional Sector has investment excess or net financing necessity (net borrowing). The last column in table 4, represents the vector s_i^R, which is the sum of liabilities and the last row in table 4, represents the vector z_j , which refers to the total of financial funds of each sector.

4.2 Dispersion-Power Index and Sensibility-of-Dispersion Index of funds in Brazil

In Dispersion-Power Index we observe that Households, as primarily "Saving Sector", display DPI-FR <1 and DPI-FE> 1, this Institutional Sector commonly presents excess savings in the real economy (current account).

On the other hand, the Enterprises show profiles like "Investors Sectors" with DPI-FR> 1 and DPI-EF <1. This sector usually has excess investments in the real economy, usually need to borrowing financial liabilities to financing its fixed investment in the real economy.

These profiles are close to the observed behavior on Japan, by Tsujimura and Mizoshita (2003), and on Korea by Jiyoung (2014). Households tends to have positive net savings and in this sense, to apply surplus funds in financial assets which influence the flow of funds in the economy. On the other hand, enterprises tend to have higher capital spending (investments in

gross fixed capital formation), and they use their internal cash flow and external liabilities to finance their investments. Thus, to Enterprises, the effect of spreading funds is higher when they raise new funds.

The Financial Firms, which represent all of financial institution except the Central Bank, the Central Bank and the Government, have Dispersion-Power Indexes close to 1, that is because they work as financial intermediaries in the financial market. Financial Firms exhibits a lower power of dispersion in relation to fund employment. It exhibits a profile which approximate the profile of the Enterprises (DPI-FR> 1 and DPI-EF <1), however, closer to 1. The effect of spreading it´s funds is higher when raises new funds. When a Financial Firm or an Enterprise borrow new funds, there are a scattering of funds in the economy.

Both the Government and the Central Bank have DPI-FR> 1 and DPI-FE> 1. The scattering effect of the influence generated by financial transactions of these agents is relevant both when they have excess investment, as when there is excess savings. When they borrow new funds, these sectors stimulate financial transactions throughout the economy, as well as when they lend funds.

The Table 5 present the Dispersion-Power Index Fund-Raising (DPI – FR); the Sensibility-of-Dispersion Index Fund-Raising (SDI – FR); the Dispersion-Power Index Fund-Employment (DPI – FE) and; the Sensibility-of-Dispersion Index Fund-Employ (SDI – FE), to the sis Institutional Sectors described in the Brazilian Asset-Liability Matriz.

Table 5: Flow of Funds Indexes to Brazil, 2005.

	DPI - FR	DPI-FE	SDI-FR	SDI-FE
Financial Firms	1,201	0,983	1,866	1,962
Governement	1,270	1,011	1,027	1,124
Enterprises	1,239	0,771	1,305	1,864
Household	0,630	1,063	0,794	0,421
ROW	0,525	1,045	0,629	0,307
Central Bank	1,135	1,127	0,380	0,322

Source: Elaborated by authors, from Brazilian ALM, 2005.

These results are interesting as pointing out that the Government and the Central Bank take on more important roles, with greater influence in the financial market, over Financial Firms (financial sector without the Central Bank). It highlight the greatest power of the Government and the Central Bank too conduce monetary policies and raises the question in relation to the financial intermediation performance.

The Government and the Central Bank take similar roles in the financial market, but we can say that the effect of the Government's influence is greater than the Central Bank when the Government borrow new funds, while the Central Bank would have greater ability to spread funds when lend new funds.

The Government borrow new sources of financing by issuing Government bonds and/ or borrowing new loans. The funds spreads in the economy with the financial transactions generated from these changes in liabilities. One of the fundamental characteristics of a Central Bank is that it is the "bank of banks", and should provide funds to finance ultimately the needs of all other financial institutions as well as the government's deficits. Thus, when the Central Bank employ new funds, this transaction generate a wide spread of funds in the economy.

Another evaluation that presents interesting is to analyze the DPI-FR together with the SDI-FE. The DPI-FR indicates how certain sector influences the rest of the economy when this sector raises new funds while the SDI-FE indicates how employment of funds in the wide economy influences the particular sector. Therefore, the joint analysis involves presenting the continuity of the flow of funds. When an industry borrow funds (increasing the deficit sector liabilities), necessarily another sector is providing these resources (assets increased in the creditor sector). The increase of the deficit sector liabilities will generate a certain effect on the economy, increasing the asset in the creditor sector (thus increasing the total assets of the economy), and all of increases in wide economy assets will generate a certain effect on all of sectors and the SDI-FE reveals this effect on the deficit sector.

Combining these two indices, we see that Household has little effect on the flow of funds. They do not cause a relevant spread of funds and neither do not suffer when there are excess saving in the economy. On the other hand, Enterprises generates a significant effect on financial flows when borrowing and, at the same time, suffer intensely the influence of the effect of increasing in total savings in the economy. As well as companies, the Financial Firms are strongly influenced by increases in total savings. The Central Bank and the Government have low SDI-FE, indicating that these sectors do not immediately react to savings increases.

Another interesting combination is DPI-FE with SDI-FR, displaying how an agent affects the economy when it has excess savings and how this agent suffers when the rest of the economy has excess investments. In this way, we highlight that enterprises work as financial intermediaries for other enterprises, because Enterprises generate great influence when lending and are strongly affected when there are investment excess in the wide economy.

In all of indexes, the Government shows values near to 1, indicating that it is acting as a financial intermediary. Excess savings as well as excess investments affect Government

funds. The Central Bank also acts as an intermediary, showing that his flow of funds have a great impact on the wide economy, but his flow of funds is not affected by excess savings (SDI-EF <1) neither than by excess investments (SDI-FR <1).

According to the order of the SDI-FR, we can see that individuals tend to borrow first with Financial Firms ("Financial System without the Central Bank"), then with Enterprises, and after from Government.

5 FINAL REMARKS

In this paper we applied Input-Output Methodology to investigate the flow of funds in Brazilian economy. We design de Asset-Liability Matrix and derived flow of funds indexes (Dispersion-Power Index and Sensibility-of-Dispersion Index) in the Asset-Oriented system and in the Liability-Oriented system.

We highlight that the Government and the Central Bank play important role in the Financial Market, both of them have high flow of funds indices. Another remark is that Government, Central Bank and the Enterprises work as financial intermediaries in Brazilian economy. We also observe that individuals tend to borrow first from Financial Firms, then from Enterprises, and after from Government.

The limitations of the paper relates to the Input-Output Methodology assumption of fixed coefficient, which is especially important when we work with financial flow, because the amount of funds usually show higher volatility than consumption of goods and services. Thus, this king of approach should be applied in short-term analysis.

To future work, we hope to expand the years of analysis, it should be done to the years 2006 to 2009, which the same kind of data-base used in this paper are disposable to Brazilian economy by Central Bank of Brazil. To others years we have to develop a methodology to obtain the needed information that are assets and liabilities employed and raised by economic agents.

We also intend to expand the Institutional Sectors, the Balance Sheet of all of Financial Institution, as well as, that of Central Bank are disposable. Thus, we should expand Financial Firms in other "groups" of Financial Institution, for example Commercial Banks, Investment Banks and Financial Cooperatives.

We suggest that future research investigates the asset portfolio and liability portfolio of institutional sectors in many different periods. We should observe if the structure of flows of funds changed within individuals and between individuals in Brazilian economy along the years

and access its impact in the real flow of goods and services to propose effective monetary and credit policies.

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ANEXX 1: Codification Plan linking Balance Sheet of Central Bank assets and liabilities with financial instruments (assets and liabilities) of the Financial Balance Sheet Account.

Balance Sheet of Central Bank Account	Flow of Funds Account
ASSETS	
Gold	F1-Gold & SDR
Participation on International Financial Organization	
Available (Foreign)	F2 - Cash and Depósits
Repurchase Agreement (Foreign)	
Deposits in terms on Financial Institutions (Foreign)	
Repurchase Agreements (Local Currency)	
Deposits (Local)	
Bonds	F3 - Bonds
Derivatives (local)	
Federal Public Bonds (Local)	
Receivable credits	F4 - Loans
Credits with Federal Governemnt (Local)	
Receivable credits (local)	
Others	F7 - Other Deb./Credit
Others	
LIABILITIY	
Contracted Exigibles Operations	F2 - Cash and Depósits
Repurchase Agreements	
Deposits	
Deposits on Financial Institutions (Local)	
Contracted Exigibles Operations	
Repurchase Agreements	
Derivatives (Local)	F3 - Bonds
Bonds emited by Central Bank	
Loans to pay	F4 - Loans
Liabilities with Federal Governemnt (Local)	
Actuarial liabilities (Local)	F6 - Technical Insurance
Provisions	
Others Foreign)	F7 - Other Deb./Credit
Others (Local)	

Source Elaborated by authors.