



Mapping the Structure of the Global Flow-of-Funds Analysis

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Abstract

Flow-of-funds analysis to monitor the financial risks at the global level is enhanced by the global financial crisis of 2008-2009 and the European debt crisis of 2011. The flow-of-funds matrices have been acknowledged as a key tool at the forefront of the flow-of-funds analysis. However, current flow-of-funds matrices based on the asset and liability tables only focus on a single region or country and thus cannot reflect the multi-region ripple effects in the world. Considering the complexity of global financial risk network can help to effective risk controls for countries. We develop a multi-region flow-of-funds matrix to map the financial flows at the global level. The new matrix significantly advances the previous state of art because of three innovations. First, it is available as the first and global multi-region flow-of-funds matrix for the year 2010 after the global financial crisis. Second, it distinguishes 37 individual countries covering not only developed countries but also developing countries, especially China as the largest emerging country is first included. Third, it reconciles various data resources with national financial accounts from national banks and statistical institutes and two main international databases named Coordinated Portfolio Investment Survey (CPIS) by International Monetary Fund and Consolidated Banking Statistics (CBS) by Bank for International Settlements. Fourth, the new matrix can be extended as a time series for at least from 2001 to 2013 with more detailed institute sectors and financial transactions. Finally, the new matrix can be used to analyze ripple effects of financial crisis such as global financial crisis of 2008–2009 and the European debt crisis of 2011.

Keywords: Flow-of-funds matrix; Global financial flows; Asset tables; Liability tables

1. Introduction

Since pioneer research on money flows in the United States started by Professor Copland in 1952, flow-of-funds accounts have been established by central banks of world's countries. The accounts became one of the cores of the 1968 system of national accounts (SNA1968), and were revisions in the SNA1993 in classifications, transaction items and account settings. Classifications of financial flows and working functions are further enhanced by the latest SNA2008. Furthermore, crossed border flows are included and from whom-to-whom flow of funds accounts are proposed by SNA2008. That is to say flow-of-funds matrices to monitor financial flows at national level are focused by the flow of funds accounts. This trend is also reinforced by urgent needs of controlling financial risks by the global financial crisis of 2008-2009 and the European debt crisis of 2011. Therefore, the development of global flow-of-funds matrices has been acknowledged as a key tool at the forefront of the flow-of-funds analysis.

Flow-of-funds matrices studies are initiated by Norway and Japan. Statistics Norway compiled financial flow matrices and balance sheets year by year since 1952. Japan developed financial matrices from 1952 to 1959 and then balance sheets in 1962. Stone (1966) devised an flow-of-funds matrix by applying use table and supply table in input-output table to

sectoral financial flows and stocks (Stone 1966). Zhang constructed the first Chinese national flow-of-funds matrix for the year 2010 based on the SUT structure and then applied to the analysis of ripple effects (Zhang 2013). However, these previous studies are only focus on a single region or country and cannot reflect the multi-region ripple effects in the world. Thus, there are still research gaps.

This paper considers on the complexity of global financial risk network and attempts to help to effective risk controls for world's countries. It develops a multi-region flow-of-funds matrix to map the financial flows at the global level. The new matrix significantly advances the previous state of art because of three innovations. First, it is available as the first and global multi-region flow-of-funds matrix for the year 2010 after the global financial crisis. Second, it distinguishes 37 individual countries covering not only developed countries but also developing countries, especially China as the largest emerging country is first included. Third, it reconciles various data resources with national financial accounts from national banks and statistical institutes and two main international databases named Coordinated Portfolio Investment Survey (CPIS) by International Monetary Fund and Consolidated Banking Statistics (CBS) by Bank for International Settlements. Fourth, the new matrix can be extended as a time series for at least from 2001 to 2013 with more detailed institute sectors and financial transactions. Finally, the new matrix can be used to analyze ripple effects of financial crisis such as global financial crisis of 2008–2009 and the European debt crisis of 2011.

2. Theoretical framework

Figure 1 presents the global structure of the multi-region flow-of-funds matrices. Matrices locating in the diagonal blocks present the domestic financial transactions. The R is the uses (assets) matrix indicating the uses of financial flows, while the E is the sources (liability) matrix showing the sources of financial flows. The blue and red matrices refer to physical investments and savings linking with the physical economy based on the flow-of-funds accounting theory. The off-diagonal blocks show international trade matrices. The matrices from the row perspective present the exports to foreign countries, and those from the column perspective are imports from foreign countries. Because of the data availability of financial stocks and physical transactions for flow-of-funds, we only focus on the financial flows.

This work covers 37 countries (Table 1) and the rest of the world (RoW). China, India, Indonesia, and Taiwan are not the member countries in the OECD.

The institute sectors include non-financial corporations, financial corporations, general government, and households and non-profit institutions serving households. The financial items are aggregated into 13 transactions: net acquisition of financial assets, currency, transferable deposits, other deposits, short-term securities, long-term securities, financial derivatives, short-term loans, long-term loans, shares and other equity, except mutual funds shares, mutual funds shares, insurance technical reserves, and other accounts receivable/payable.

The basic relationship for the flow-of-funds is total asset equals total liabilities. In figure 1, this rule means the sum of each row (total uses) equals the sum of corresponding each column. This is the most important balance equation for the subsequent table construction.

Flow-of-Funds Matrices		Country 1			country_dest			country_dest			ROW
		n	m	l	n	m	l	n	m	l	
		Financial Products	Institute Sectors	PI	Financial Products	Institute Sectors	PI	Financial Products	Institute Sectors	PI	
Country 1	n		R								
	m	E									
	l										
country_origin	n					R					
	m				E						
	l										
country_origin	n								R		
	m							E			
	l										
		Gross Liability (xin)									
											Gross Investment (x out)

Figure 1. The structure of the multi-region flow-of-funds matrices.

Table 1. Countries covered in this work

No.	Country names	No.	Country names	No.	Country names
1	Australia	14	Greece	27	Poland
2	Austria	15	Hungary	28	Portugal
3	Belgium	16	Iceland	29	Slovak Republic
4	Brazil	17	India	30	Slovenia
5	Canada	18	Indonesia	31	South Africa
6	Chile	19	Ireland	32	Spain
7	China	20	Italy	33	Sweden
8	Czech Republic	21	Japan	34	Switzerland
9	Denmark	22	Korea	35	Taiwan
10	Estonia	23	Luxembourg	36	United Kingdom
11	Finland	24	Mexico	37	United States of America
12	France	25	Netherlands		
13	Germany	26	Norway		

3. Construction Process

The construction workflow employed to solve the reconciliation of the large multi-region flow-of-funds required a specific technique developed by the ISA in the University of Sydney (Geschke et al. 2014). This technique named AISHA (Automated Integration System for Harmonised Accounts), which is a constrained-optimisation algorithm, imposing constraint conditions onto an initial global matrices estimate.

The multi-region matrices are constructed in current US dollars. Raw data in local currency units are converted into US dollars using the International Monetary Fund annual average exchange rate for the year 2010.

There are two main data sources. One is domestic financial transactions taken from the national financial accounts from central banks and national statistical institutes. The other one is two main international databases named Coordinated Portfolio Investment Survey (CPIS) by International Monetary Fund and Consolidated Banking Statistics (CBS) by Bank for International Settlements. Data of some countries in this work are taken from the financial accounts in the OECD statistical database.

We take a two-step construction to obtain the final multi-region flow-of-funds matrices. The first step is to construct the initial estimate for the year 2010. We choose the year 2010 because this year is the best available for all countries. The period of raw data for countries differs largely. The initial estimate includes all financial transactions and institute sectors in both domestic and international trade financial flows. Domestic financial transactions are constructed using the national financial accounts. International financial transaction matrices are constructed using the sectoral RoW data from national financial accounts and the CPIS and CBS. Both the data provide international transaction data by sector (banks, governments, etc.). The sectoral RoW data in national financial accounts are disaggregated into individual countries with four institute sectors using these two databases. The detailed methods for disaggregation can be referenced by Prof Manfred Lenzen (Lenzen et al. 2012).

After finishing the first step, we use AISHA to impose constraint conditions derived from the basic asset-liability balance relationship on the initial estimate to final the multi-region flow-of-funds matrices.

5. Conclusions

In this paper, we show how to construct an global multi-region flow-of-funds matrices for the year 2010 based on the input-output model. To the author's knowledge, our work include 1) the first global financial flow matrices showing as the detailed SUT structure with both institute sectors and financial transactions, 2) the largest flow-of-funds matrices, 3) the first international table includes China.

Due to the standard construction process, people who interested can use it to form a time series of global flow-of-funds matrices.

From the application perspective, the new multi-region flow-of-funds matrices and further the time series can be used to analyze ripple effects of financial crisis such as global financial crisis of 2008–2009 and the European debt crisis of 2011.



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