Handling systems challenges from the compilation of flow of funds – the case of South Africa[1]

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1. Introduction

The flow of funds (FoF) is a financial analysis system that shows the uses of savings and other sources of funds as well as the borrowings of funds by institutions to finance real or financial investment through financial instruments. It is a systematic recording of financial transactions between different sectors of the economy. Its main aim is to assist policymakers to assess the financial position of the national economy and that of the various sectors of the economy. The South African Reserve Bank (SARB) is the official compiler of South Africa's FoF.

This paper intends to share South Africa's FoF compilation experience while highlighting the importance of liaising with other institutions to learn from them. The FoF theoretical framework and the analytical uses of FoF are beyond the scope of this paper. The paper begins by defining the compilation framework of FoF in South Africa. An account of systems challenges and the solutions preferred is then made. FoF compilation lessons from other institutions are then briefly outlined before concluding.

2. FoF compilation framework in South Africa

The FoF framework used by the SARB is in line with the one suggested by the IMF in the System of National Accounts (SNA) and the Monetary and Financial Statistics Manual (MFSM). The main difference is that the SARB analyses its data using the balance sheet approach as opposed to the transaction approach. The balance sheet approach calculates flows based on changes in balance sheet positions of institutions, while the transaction approach calculates flows based on detailed transactions data.

The data are presented in terms of sources and uses of funds. These data pieces are seldom equal, hence the need to process individual data pieces during compilation. Since June 2009, the SARB has published the quarterly FoF tables every quarter with a lag of two quarters, and the full preceding year is published every June. Only the flow data as opposed to the stock data are currently published. The South African FoF structure consists of five main economic sectors (A–E in Table 1), which are subdivided into 22 institutional groupings or 11 sectors (1–11 in Table 1) of the economy. It covers 32 non-financial and financial transactions. Source data formats include hard copies, spreadsheets, time series and electronic reporting systems.

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Table 1

A	B										C		D		E
FOREIGN	*FINANCIAL INTERMEDIARIES*										*GENERAL GOVERNMENT*		*CORPORATE BUSINESS ENTERPRISES*		*HOUSEHOLDS*
1	2		3			4	5			6			7	8	9	10	11
Foreign sector	*Monetary authority*		*Other monetary institutions (banks)*			*Public Investment Corporation (PIC)*	*Insurers and retirement funds*			*Other financial institutions*			*Central and provincial governments*	*Local governments*	*Public sector*	*Private sector*	*Household sector*
	South African Reserve Bank	Corporation for Public Deposit	Land bank	Private banks	Mutual and Post Office savings banks		Long-term insurers	Short-term insurers	Public pension funds	Private pension funds	Trust companies	Unit trusts	Finance companies	Participation bond schemes	Public sector financial intermediaries	Central and provincial governments	Social security funds				

South Africa's financial system[3] consists of several institutional sectors. Institutional units in the non-financial sector consist of private and public incorporated companies and quasi corporations. For the purposes of compiling the FoF, economic activity and transactions between resident and non-resident units are recorded. The rest of the world is defined as the foreign institutional sector, while resident institutional units are grouped into the private sector and the public sector. The private sector consists of resident institutional units not controlled or owned by institutional units in the general government sector. The public sector consists of institutional units in the general government sector, and corporate institutional units in the financial and non-financial sectors owned or controlled by units in the general government sector. The public sector therefore consists of the public financial corporate sector, the public non-financial corporate sector and the general government sector.

A contra-entry accounting method is used to record transactions. Each of the 22 institutions is first balanced within itself before processing. The balanced individual institutions are consolidated into the 11 sectors. The data is then transferred manually to a final processing Excel spreadsheet. The final processing spreadsheet is a semi-automatic macro-driven tool of aligning transactions and making alterations to figures that may have been wrongly recorded in the database from source files. Visual basic code is used to drive the macros in the spreadsheet.

Processing involves making sure that corresponding sectors have the same sources and uses by using the macro-driven spreadsheet. In order to balance the data between any two sectors for any transaction, the following information should be taken into account:

i. Which of the compared sectors is actively involved, as part of its main business activity, in the transaction in question?

ii. How much is the deviation of each sector's data piece from the guide figures as published in the SARB *Quarterly Bulletin* balance sheets? (A guide document with specific item-by-item notes and reminders is used during the data processing phases.)

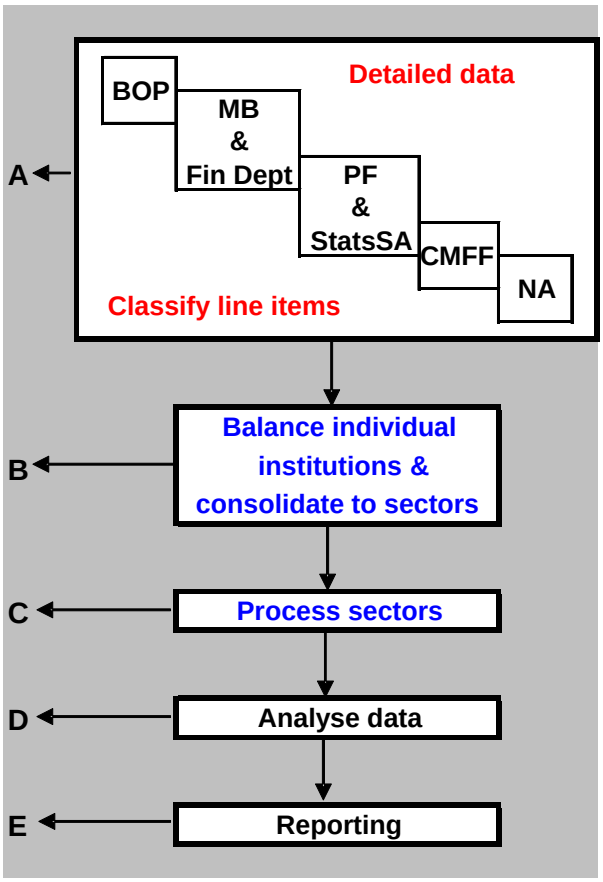
iii. Since it is impossible to have a perfectly balancing economy due to many factors, including timing in reporting and general errors, the data may need to be adjusted using financial market performance trends, the source data integrity of the sectors and the economic intuition of the compiler(s).

The processing involves entering savings and investment data, as taken from the national and production accounts, into the final spreadsheet. This represents the real sector data or the top-down calculation of the net lending/borrowing position. The financial sector data represents the bottom-up calculation of the net lending/borrowing position. There are always some discrepancies between these two data sets which are always addressed by discussing with the respective source divisions. The discrepancies have historically been corrected in the financial sector data.[4] The compilation of FoF consists of five steps (A–E in Figure 1).

[3] "Financial system" refers to the financial institutions, processes, rules and regulations forming the South African financial sector.

[4] This is not cast in stone – the error can be corrected on either side of the flows.

Figure 1



Legend to data sources:

BOP: Balance of payments

MB: Money and banking

Fin Dept: Financial services

PF: Public finance

Stats SA: Statistics South Africa

CMFF: Capital market and flow of funds

NA: National accounts

3. Systems challenges from FoF compilation

There are several challenges that are encountered during the processing of the FoF. Some are inherent and may not be detected or may only be picked up late in the processing stage. These challenges may reveal that the data used is incomplete or incorrect, eg accuracy of data and reporting timing. Some challenges may be resolved and/or reduced before or during processing. The main compilation challenges are discussed below.

3.1 Sources of data

Sources of data refer to the raw input provided to the Capital Market and Flow of Funds Division (CMFF) for FoF compilation purposes. Data providers are mostly divisions within the Research Department of the Bank (see Figure 1). Very often, the data provided or the methods of collecting the data affect the calculation and ultimate analysis of FoF. The various data formats are converted into Excel spreadsheets. Both application and human errors occur from time to time. For example, Excel may misread data from other systems (numeric versus text) and numbers do get wrongly keyed in from hard copy sources.

The practical solution to this is to enter and store data at an adequate level of detail, and the system should support a hierarchy of database setup. The SARB currently uses Oracle for that purpose and is developing a new database system under the Research Department's project Equilibrium.

Some data issues are much more difficult to resolve. For example, there are several possible reasons for the large and unexplained jumps in data; one is timing of reporting. Large and unexplained jumps or omissions in raw data make the interpretation of FoF very difficult. Visits to respondents should be ongoing and regular. This normally helps compilers to have a feel for the numbers while at the same time aiding the judgment that goes into deciding an acceptable magnitude of an unexplained deviation.

3.2 Preparation of data

The preparation of data refers to the conversion of files into the desired Excel format, the classification of balance sheet line items and both the identification and correction of artificial flows (ie movements in assets not caused by transacting). The automatic classification of transactions for FoF purposes in Excel may be challenging. Excel sometimes misreads data from other systems, eg when searching for a code XR005A, a space before the letter X will render this code invalid and cause Excel to ignore it. Although it is acknowledged that it may be impossible to identify wrong classifications by respondents, eg recording a wrong counterparty for a share buy/sell transaction in a survey form, the practical solution here is to have simple and incorruptible classification criteria that are based on the source data.

3.3 Compilation of matrices

The extent of automating FoF compilation processes is sometimes a subject for debate. The compilation process of FoF involves judgmental processing; computer algorithms can be designed to mimic such judgments. However, this becomes problematic and may not be easy to detect if the situation for which those algorithms were designed changes and requires different approaches. The practical solution is to avoid too much automation and have human intervention instead, which is critical for processing.

3.4 Analysis and reporting

The current practice in FoF analysis in South Africa consists of drawing comparison tables and graphs of various sectors and publishing findings in the *Quarterly Bulletin*. FoF reporting may be affected by the size of the tables and increase the frequency of reporting. In order to generate interest for the usage of FoF, it is advisable to reduce the size of the tables published as well as the frequency. The SARB is currently working on reducing the size of the FoF tables published in the *Quarterly Bulletin* and has, since June 2009, started to publish the FoF tables and analysis on a quarterly basis with a two quarter lag.

4. FoF compilation lessons from other institutions

A very important aspect of FoF compilation is that it is crucial to constantly liaise with other compilers and learn how they deal with compilation challenges. This has helped the SARB in various ways over the past decade. A number of discussions on compilation methodology were held with compilers from London, Sweden, Canada, the United States and Portugal. Some of the lessons learned are highlighted below.

4.1 Office for National Statistics (ONS)

The FoF unit specialises in coordinating the data received and not collecting and preparing data. The structure of the tables is in line with the structure of the source data forms – this helps to streamline the processing. Their processing system is tailor-made for the ONS and

geared towards flows. Several meetings involving all parties concerned are held to decide reconciliations and to view the stories behind large data movements. Lessons include:

i. if compilers are only involved in analysing the data and compiling the flows, they have enough time to do a thorough economic analysis

ii. constant communication with other divisions involved ensures that the same interpretation of the data is reached. This also helps to search for discrepancies in all areas

iii. it is easier to collect data if institutions are compelled by law to supply such data.

4.2 Statistika Centralbyrån (SCB)

Several people in the FoF unit process and publish parts of the data. Some industries are sampled while others are fully covered. Institutions are compelled by law to submit information and may even lose their licences if they refuse to do so. All source items are coded and calculations on the data can be updated if desired. Note, however, that the system used is not so flexible; therefore, it may take some time to update data. Data processing takes place mostly in Excel. Although discrepancies between the financial and real sectors are not corrected, the national accounts data is accepted as official. Residuals or balancing items are only calculated in the yearly tables and not quarterly. A lesson is:

i. if various people perform different activities, it may take some time to coordinate all the tables.

4.3 Statistics Canada (STATCAN)

The FoF unit specialises in coordinating the data received. Data are presented in annual and quarterly tables. The economy is split into approximately 30 sectors. The naming of sectors in this system is kept short and simple. Updates are easy, fast and online. The data is processed in a system called FAME. The balancing of sectors in the master database depends on the credibility of data sources: items in which there is certainty are done first. Several meetings involving all parties concerned are held to confirm data. Adjustments can be made on either side of the data (financial or real). A lesson is:

i. a flexible database system enhances the analysis because changes and results are effected quickly.

4.4 Board of Governors of the Federal Reserve System

The FoF unit specialises in coordinating the data received, mostly from other areas such as the Department of Treasury, the Department of Commerce and the Census Bureau. Processing takes place mostly in Excel and FAME. The data are accessed through the Statistical Data and Metadata Exchange (SDMX) system. Data are presented quarterly by sector and by instrument. A lesson is:

i. it is always advisable to create FoF compilation systems in-house.

4.5 Bank of Portugal

The FoF unit specialises in coordinating the data received. The in-house security-by-security database greatly enhances sector identification. There are also some legislative arrangements with other institutions, such as the national statistical office (Instituto Nacional de Estatística), that assist in compelling respondents to submit information. Data processing takes place in a system developed in-house called MASCOT. Estimating counterparty

information is an important aspect of the compilation. The data are presented in monthly, quarterly and annual tables. A lesson is:

(i) instead of having gaps, it may be useful to find other sources of data to estimate counterparty information.

5. Conclusion

The FoF compilation process lends itself to many systems challenges due to its complexity. The compilation framework of the South African FoF is informed by international best practice. Systems challenges can be addressed by consulting other compilers and there are many lessons to be learned in that process. FoF compilation systems in general have limitations and cannot solve all FoF compilation challenges.

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