Securities Holdings Statistics Database (SHSDB):
The new ESCB micro database on holdings of securities[1]

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Abstract

In response to the need for additional data revealed by the recent financial turmoil, the European System of Central Banks (ESCB) has set up a Securities Holdings Statistics Database (SHSDB) containing new granular data on holdings of securities. As risks to financial stability due to contagion mechanisms at the level of individual institutions could not be properly identified from aggregated data, the importance of having accurate information on the exposure of economic sectors and of banking groups to specific classes of securities at a very disaggregated level became evident. The database allows for the creation of standard output and tailor-made reports in a timely and efficient manner and takes advantage of standardised identifiers to link with other data sources. This paper describes the design of the database and shows how the security-by-security holdings data can fulfil the needs of a wide range of users, providing specific examples.

Keywords: micro data; granular; exposure; financial integration.

1. Introduction

During the recent financial turmoil, most of the available official statistics could only provide aggregated information on the securities exposures of market participants. Consequently, it was very difficult to assess the exposures of economic sectors and banking groups to specific classes of securities and individual issuers in a timely manner. Thus, the financial crisis revealed that data on a disaggregated level are necessary to properly identify risks to financial stability due to contagion mechanisms at the level of individual institutions.

In order to close this information gap on securities holdings, the European System of Central Banks (ESCB) decided to initiate a new statistical dataset, the Securities Holdings Statistics Database (SHSDB). This project was launched to set up a steady-state infrastructure in which securities holdings data are pooled together (Sola and Strobbe, 2010).

These new data are compiled quarterly on a security-by-security level. They fulfil a wide range of policy needs and allow answering analytical questions, like "Who holds what?", "Risk exposure to whom?", "What is the total exposure of specific economic sectors to specific classes of securities?" in a much more detailed way than possible before (see also European Central Bank, 2015 and Deutsche Bundesbank, 2015).

The remainder of this paper is structured as follows. Section 2 describes the data collection, scope and content of the securities holdings statistics and highlights the advantage of using standardised identifiers to link micro data on securities holdings with other data sources. Section 3 elaborates on the design of the database and explains the interaction between the two parts of the system – the Transactional System and the Analytical System. Section 4 illustrates on the basis of one specific

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example how the new data collection can be used for the creation of standard output and tailor-made reports in a timely and efficient manner. Section 5 concludes and ventures a look ahead.

2. Data collection, scope and content of the SHSDB

Holdings data have been collected on the level of individual securities (security-by-security) based on two legal frameworks since early 2014 with first data referring to end of 2013 holdings[2]. The data provided by reporting agents to national central banks (NCBs) cover debt securities and equity securities (including quoted shares and investment fund shares). This information is collected in 25 EU countries (all euro area countries plus Bulgaria, Czech Republic, Denmark, Hungary, Poland and Romania).

The SHSDB itself consists of the SHS Sector and the SHS Group module, which differ mainly in the granularity of information on the holder's side. The SHS Sector module contains aggregated holdings by investors belonging to the same institutional sector. It includes information on (i) holdings of securities by investors resident in the euro area and (ii) holdings by non-resident investors of euro area securities which they hold with euro area custodians. The SHS Group module includes information on individual holdings for the 25 largest banking groups with head offices in the euro area (i.e. holder-by-holder information) (see also European Central Bank, 2015).

The collection of such highly granular data has a number of advantages for the reporting agents, statistical compilers and data users (see also Schrape, 2011). Firstly, the reporting agents do no longer need to deliver pre-defined aggregates, reducing the reporting burden for them. They report a limited set of individual records, including the International Securities Identification Number (ISIN) which is a standard security identifier, information on the holder and corresponding amounts at nominal and/or market value. In addition, it is easier and less error prone for them to send raw data on individual securities than to aggregate the data according to several details and breakdowns. Secondly, the SHSDB uses the ISIN to retrieve securities' reference and price data from the Centralised Securities Database (CSDB)[3] and - in case of SHS Group data – benefits from the entity identifier by receiving entity reference information from the Register of Institutions and Affiliates Database (RIAD). This process ensures consistency and the use of common reference data for securities and entities. Thirdly, statistical compilers and users are able to calculate in a very flexible way the required aggregates. This also allows compiling new breakdowns not only for the most recent period but also for the past without the need to repeatedly request additional reports (see also Lavrador, 2011).

3. Design of the SHSDB: from raw input data to aggregated output

The SHSDB (see Chart 1) consists of two parts – a Transactional System operated by the Deutsche Bundesbank and an Analytical System operated by the European Central Bank (the ECB).

Individual-security-holdings data are sent by the reporting agents to the NCBs, who submit the data according to a pre-defined reporting scheme to the Transactional System, where they are validated, checked for plausibility, harmonised and then transmitted to the Analytical System. Here the harmonised data are stored on the granular level and a number of standard aggregates are calculated. Additional quality checks are then carried out by comparing the aggregates with other reference statistics before completing the compilation with the dissemination to final users.
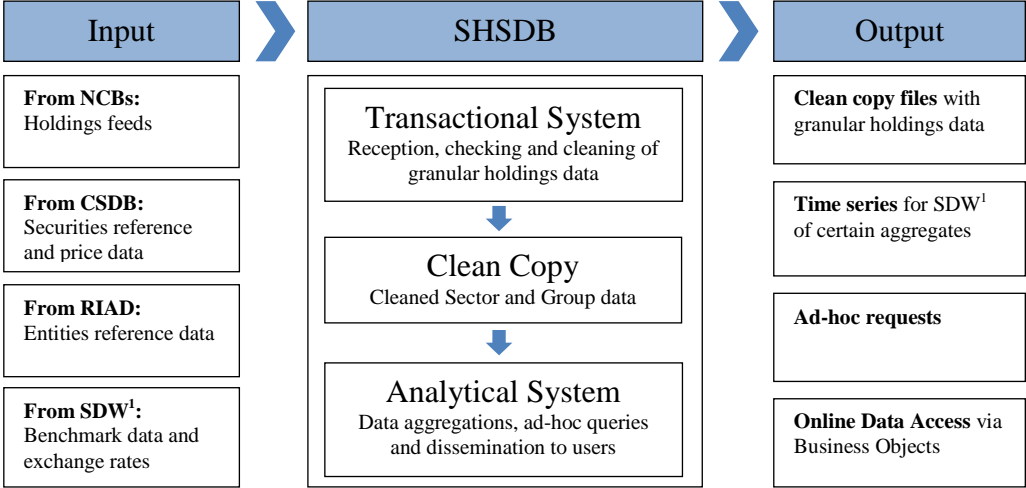
3.1 SHSDB Transactional System

The holdings data files are transmitted to the Transactional System in an SDMX (Statistical Data and Metadata Exchange) format via an ESCB interface which verifies the files against a pre-defined SDMX scheme, providing immediate feedback to the reporting NCBs. Valid files are received by the Transactional System and subjected to automated formal checks, which e.g. detect duplicates or unexpected combinations of sector and holder country in the data.

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[2] Regulation (EU) No 1011/2012 of the European Central Bank of October 2012 concerning statistics on holdings of securities (ECB/2012/24) and Guideline of the European Central Bank of 22 March 2013 concerning statistics on holdings of securities (ECB/2013/7).

[3] The CSDB is operated by the ESCB and covers security and issuer reference information on over six million outstanding debt securities, equities and investment fund shares.

The SHSDB covers data on positions, transactions, other flows and investment income. The holdings amounts for positions may be reported in nominal or market valuation and in different measures of units, i.e. in number of shares held or in any specific currency. For analytical purposes, the data are transformed into harmonised values in Euro including early redemptions and accrued interest. The reference data necessary for this transformation are obtained by merging the reported data with the CSDB via the ISIN.

Chart 1. Overview of the SHSDB

Input	SHSDB	Output
From NCBs: Holdings feeds	**Transactional System** Reception, checking and cleaning of granular holdings data	**Clean copy files** with granular holdings data
From CSDB: Securities reference and price data	**Clean Copy** Cleaned Sector and Group data	**Time series** for SDW[1] of certain aggregates
From RIAD: Entities reference data	**Analytical System** Data aggregations, ad-hoc queries and dissemination to users	**Ad-hoc requests**
From SDW[1]: Benchmark data and exchange rates		**Online Data Access** via Business Objects

1) SDW: ESCB Statistical Data Warehouse

NCBs can choose to report either quarterly positions and the corresponding transactions or only monthly positions. In the latter case, quarterly financial transactions are derived by the SHSDB from month-to-month nominal positions changes (valued by monthly mean exchange rates and mean prices of the securities). The remainder of the changes in positions at market value is attributable to exchange rate and price effects which are also calculated by the SHSDB.[4]

The harmonised data on positions and transactions are used for several automated plausibility checks which might be operated on granular and more aggregated layers but always aim at identifying inconsistencies on the most disaggregated level. For example, for each security the system checks whether the total reported positions exceed outstanding amounts (for debt securities) and market capitalisation (for equity securities). In a different check, the difference in positions between quarters is compared to the reported or derived transactions on a country/sector aggregate level. Moreover, some NCBs report positions amounts in both market and nominal valuation which allows for a comparison between the reported market amounts and the market amounts derived by the SHSDB from the reported nominal amounts and price data.

Feedback on inconsistencies revealed by these checks may trigger revisions of the reported data by the NCBs as well as the reporting agents. Many of the inconsistencies detected thus far underscore the advantages of operating on the micro data-level as even small holdings which would not be suspected of having a considerable influence on aggregates may imply distortive effects on the macro level in case they are given in a wrong currency or in a wrong dimension. On the other hand, the checks might also indicate implausible reference (i.e. CSDB) data, like implausible changes in prices which are then corrected in the Transactional System.

The Transactional System also compares time series data to reference statistics which include securities holdings data on an aggregated level, e.g. the monetary financial institutions balance item sheet statistics. The Transactional System allows for a drill-down of the aggregated securities holdings in order to find candidates responsible for discrepancies on the security-by-security level. Apart from detecting inconsistencies in the reported holdings amounts or in the reference data, these checks may also reveal structural differences between the SHSDB and other statistics or even trigger revisions in the more aggregated benchmark statistics. Relevant information gained throughout the compilation

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[4] For more details on the SHSDB calculations of flows see Deutsche Bundesbank (2015).

process on e.g. certain investments or securities is stored separately. This information is used to support future compilation rounds as well as for answering questions by data users.

Finally, the Transactional System produces a clean copy file in the SDMX format to be transmitted to the Analytical System. The clean copy file includes the harmonised and verified holdings amounts and most relevant attributes from available reference data.

3.2 SHSDB Analytical System

The Analytical System of the SHSDB serves as a data warehouse to further process the information received. Data are stored in a business intelligence tool which allows performing robust and complex statistical analyses on different levels of granularity. These analyses serve to assess the data quality, to detect any inconsistencies in the aggregate data that may only be adjusted on the macro level, and to identify and evaluate the confidentiality constraints. The production process concludes with the dissemination of output data to internal users with the same business intelligence tool and to external users via the ESCB Statistical Data Warehouse (SDW).

First, the Analytical System calculates pre-defined aggregate output tables from the granular security-by-security data available in the clean copy. Those pre-defined tables are then used, in addition to the granular data, as a source for further investigations on the holdings of securities reported.

The data exploration also benefits from the possibility to link the pre-defined aggregates with other statistics available in the SDW. This process serves further checking and assessment of data quality by allowing the comparison of securities holdings aggregates with similar aggregates from other reference statistics. Examples of such statistics are the euro area and national accounts statistics, balance of payments and international investment position statistics, and monetary and financial institution statistics (see also Aguiar and Lavrador, 2012).

During the exploration process and in close cooperation with the relevant NCBs macro-adjustments at aggregate level can be incorporated in the system in case some inconsistencies are found, for which no micro corrections are possible or which can only be incorporated to the country reports at a later stage.

In addition, the Analytical System derives the confidentiality status of aggregated data, marking the calculated aggregates as either potentially confidential or non-confidential, based on the status of granular holdings reported by NCBs. Those confidentiality restrictions are then taken into account to produce output that can be more widely disseminated.

Finally, the Analytical System is used to disseminate the data to the users. The system allows performing detailed ad hoc investigations and creating reports tailored for the targeted user groups, and makes the data available to them in a flexible, timely and efficient manner. Final data (including granular data, aggregate statistics and time-series) are made available to ESCB statisticians and internal users via the business intelligence tool according to pre-defined rules. In the system, the users have the possibility to explore the data with different breakdowns and aggregation levels, as needed.

The SHS data are foreseen to serve a wide range of activities relevant for the tasks of the ESCB. In particular, they are already being used for monetary policy and financial stability analyses.

4. From-whom-to-whom – Use of SHS sector data in euro area accounts (EAA)

One of many potential uses of the new SHS sector data[5] is the derivation of from-whom-to-whom tables for the euro area, as well as for individual countries. The from-whom-to-whom tables show the interdependencies between the holder and issuer sectors of the economy and provide a comprehensive overview of the euro area economy (see also Lavrador et al, 2012).

The derivation of from-whom-to-whom tables for securities is an important development in the euro area statistics as, until now, such detailed data have only been available for deposits and loans. In addition to providing new information on a previously-not-available level of detail, the SHS sector data may also be used as a building block for the compilation of integrated euro area accounts (EAA) starting in 2016 (see also European Central Bank, 2015).

Table 1 shows from-whom-to-whom information derived from the SHS sector data for the four instrument types, as well as corresponding aggregates from the EAA. While the data on the aggregate

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[5] The use of SHS data for economic analyses is also presented by the European Central Bank (2015). The use of SHS data for development of financial integration indicators is illustrated by Fache Rousová and Rodríguez Caloca (2014).

level do not fully match due to a number of practical differences, granular SHS sector data are used to allow more insight into the EAA aggregates. For example, while the EAA data provide information on total holdings of long-term debt securities by euro area households, with the SHS sector data it becomes apparent that ca. 50% of those holdings are securities issued by euro area MFIs and ca. 25% by euro area governments.

Table 1. Holdings of securities by euro area investors at the end of the third quarter of 2014

(EUR billion, market values)

Holder sector	Instrument type	Issuer sector[1]						Total	Total EAA assets
		NFCs	MFIs[2]	ICPFs	OFIs	General gov.	RoW		
Households and NPISH[3]	Short-term debt securities	1	3	0	1	10	1	**16**	**52**
	Long-term debt securities	63	526	3	85	250	107	**1,034**	**1,032**
	Listed shares	488	128	24	33	0	121	**794**	**831**
	Investment fund shares	0	40	0	1,371	0	30	**1,440**	**1,634**
Non-financial corporations	Short-term debt securities	5	10	0	4	9	3	**32**	**46**
	Long-term debt securities	20	56	1	22	81	21	**201**	**254**
	Listed shares	780	19	9	29	0	37	**874**	**1,232**
	Investment fund shares	0	77	0	249	0	7	**333**	**437**
Monetary financial institutions	Short-term debt securities	41	242	1	65	161	211	**721**	**462**
	Long-term debt securities	98	1,381	4	1,055	1,763	698	**4,999**	**5,940**
	Listed shares	119	66	11	7	0	98	**301**	**372**
	Investment fund shares	0	42	0	210	0	14	**266**	**235**
Insurance corporations and pension funds	Short-term debt securities	4	19	0	2	14	4	**43**	**57**
	Long-term debt securities	310	506	15	274	1,458	515	**3,077**	**3,374**
	Listed shares	121	14	4	27	0	108	**274**	**385**
	Investment fund shares	0	90	0	1,989	0	68	**2,147**	**2,446**
Other financial institutions	Short-term debt securities	10	29	0	8	68	86	**201**	**361**
	Long-term debt securities	261	464	13	423	980	1,570	**3,712**	**3,920**
	Listed shares	826	165	45	80	0	1,791	**2,908**	**3,092**
	Investment fund shares	1	115	0	1,054	0	141	**1,311**	**1,552**
General government	Short-term debt securities	0	2	0	0	7	0	**9**	**22**
	Long-term debt securities	14	37	1	24	257	36	**370**	**431**
	Listed shares	152	22	1	6	0	19	**201**	**297**
	Investment fund shares	1	19	0	181	0	10	**211**	**210**
Total	**Short-term debt securities**	**62**	**305**	**1**	**80**	**269**	**305**	1,022	1,002
	Long-term debt securities	**766**	**2,971**	**37**	**1,883**	**4,789**	**2,949**	13,394	14,952
	Listed shares	**2,485**	**414**	**96**	**183**	**0**	**2,174**	5,352	6,209
	Investment fund shares	**3**	**384**	**0**	**5,053**	**0**	**270**	5,709	6,514
Total EAA liabilities	**Short-term debt securities**	**66**	**575**	**1**	**138**	**632**		**1,411**	
	Long-term debt securities	**1,115**	**4,372**	**62**	**3,036**	**7,822**		**16,407**	
	Listed shares	**4,564**	**656**	**154**	**540**	**1**		**5,914**	
	Investment fund shares	**0**	**924**	**1**	**8,190**	**0**		**9,116**	

1) ICPFs: insurance corporations and pension funds, MFIs: monetary financial institutions, OFIs: other financial institutions, NFCs: non-financial companies, RoW: rest of the world.
2) In the SHS data, the MFI sector comprises deposit-taking corporations and money-market funds, excluding central banks. In the EAA data, the MFI sector comprises also monetary authorities.
3) NPISH stands for non-profit institutions serving households.
Source: ECB (SHS Sector and EAA)

The main differences between the SHS sector and EAA data stem from the data collection and compilation methods. While the SHS sector data are collected on a security-by-security level directly from most financial investors and, for the remaining investors, from custodians on behalf of their customers, the EAA sources also include the balance sheet data. Furthermore, the EAA data are subject to a number of adjustments and estimations in order to ensure consistency across institutional

sectors and financial instruments on the aggregate level, which is not the case in the SHS Sector data. Finally, the data on holdings of securities without ISIN codes, included in the EAA data, are only reported on a voluntary basis in the SHS Sector data (currently by five countries).

5. Conclusions

The article provides a detailed description of the design and scope of the Securities Holdings Statistics Database, a new comprehensive and granular database on securities holdings, operated by the European Central Bank and the Deutsche Bundesbank, and used by twenty-five NCBs resident in the European Union. This system has been designed to efficiently receive, verify, harmonise, and disseminate large volumes of multidimensional securities holdings data.

With the SHSDB, users and statisticians benefit from the advantages of a harmonised micro data set including the increase in coverage, quality and accuracy for evaluating the exposure of investors. Furthermore, the analytical tools provided by the SHSDB allow for cost-efficient and ad hoc tailor-made insights into securities holdings – both on granular and aggregate level. Using standard identifiers, in particular the ISIN code, reported holdings are enriched with reference and price information on securities and issuers from the ESCB's securities database CSDB. Quarterly data are already used for the purposes of monetary analysis and other policy purposes and for the assessment of financial developments, financial integration and financial stability within the Eurosystem/ESCB.

The article also provides an example of the future use of securities holdings data for statistical purposes with the foreseen enhancement of from-whom-to-whom tables within the euro area accounts. Additional information on individual investors and on the composition of banking groups can be obtained from institutional databases via entity identifiers. Finally, micro data on securities holdings will be linked to granular credit data in order to assess debtors' total exposures.

The database and the statistical framework are subject to continuous enhancements. While currently security holdings of insurance corporations are collected mostly via custodians, they will be directly reported by the insurance corporations themselves which is expected to improve the data coverage (i.e. by also covering securities held by insurance corporations with non-euro-area custodians) and quality for this sector. In the short-term, the recent assumption of supervisory functions by the ECB may trigger further enhancements of the scope and functionalities of the SHSDB.

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