

Driven by data:  
Papers presented  
at national and  
international  
conferences | 2018

May 2019



BANCO DE  
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# Foreword

*Driven by Data* is a new publication series of Banco de Portugal (hereinafter referred to as “the Bank”) that aims to disseminate the articles and technical papers prepared each year by the staff of the Bank’s Statistics Department for presentation at national and international *fora* and, in this way, help revealing to the general public the nature and diversity of the statistics under the Bank’s responsibility. This publication replaces the Supplement to the Statistical Bulletin that used to be dedicated to the same purpose.

This first issue of *Driven by Data* comprises four sections: (i) Micro-databases – Potential for statistics; (ii) Commitment to quality; (iii) Communicating statistics; and (iv) Compiling statistics – Special case studies. To guide the reader throughout the collection of papers, a brief summary is provided for each one. In this context, I would like to stress a few key takeaways.

Firstly, let me mention the paper about INEXDA, the International Network for Exchanging Experience on Statistical Handling of Granular Data. This international network was launched in 2017 by five central banks (Banca d’Italia, Bank of England, Banque de France, Deutsche Bundesbank and Banco de Portugal) during a meeting held in Lisbon at the Bank’s premises. INEXDA’s ultimate goal is to facilitate the international use of granular data for analytical and research purposes, which allows exploring the heterogeneity hidden behind aggregate numbers and deeply enriches the analysis and studies conducted. The importance of the Bank’s participation in this international network and of being at the forefront of the developments in this area cannot be stressed enough.

Secondly, a special reference to an aspect of statistics which is seldom mentioned but deserves being brought to the limelight — data quality control. This point is fundamental given that the intrinsic quality that underpins the statistics produced by the Bank is what ultimately guarantees its relevance and usefulness for the users. This issue of *Driven by Data* includes two papers that clearly illustrate how the Bank is betting on the development and implementation of quality control processes and procedures in the production of statistics and the high importance assigned to them by the Bank’s Statistics Department.

Thirdly, I want to emphasize the significant positive impact of available granular databases on the Bank’s analytical capacity, as well as how cross-referencing these databases contributes to better consistency, higher statistical quality standards, greater comparability between different statistical domains and, in short, a more effective and efficient statistical compilation process. This fundamental issue is addressed in several of the articles included in this publication, namely those related to Balance of Payments and Financial Accounts. Moreover, the work done jointly with the Bank for International Settlements is a perfect illustration of the great potential from these methodologies to enhance the overall quality of statistics worldwide.

Finally, I would like to encourage all staff members of the Bank’s Statistics Department to continue to invest in the development of scientific knowledge in the area of Central Banking Statistics and to share such knowledge with all interested users and the society at large through the publication of stimulating research such as the one presented in this first issue of *Driven by Data*.

Pedro Duarte Neves

President of the Commission for the Coordination of Publications of *Banco de Portugal*

Former Vice-Governor of *Banco de Portugal*

## I Micro-databases – Potential for Statistics

**Carla Ferreira, Cloé Magalhães, Mariana Oliveira e Mário Lourenço, “Regional clusters in Portugal: an overview of the 2010-16 period”, 25<sup>th</sup> APDR Congress, Lisbon, Portugal, July 2018**

The perception that the geographical location of economic activities is not homogeneous, but rather the result of enterprises' choices, has led to several empirical studies exploring the dissimilarities between different geographical regions, in Portugal as in other countries. Considering that Portuguese municipalities can be grouped in clusters which share a number of common features (regarding business structure, enterprise dynamics, profitability, productivity, indebtedness, etc), this paper presents a classification according to four different clusters (based on data from Banco de Portugal's Central Balance Sheet Database and Central Credit Register, as well as from INE – Instituto Nacional de Estatística). According to this classification, in a number of municipalities located in Portugal's coastal areas, indebtedness is lower while productivity and profitability are higher. These municipalities also show the lowest share of proximity services and the highest share of high/medium-high tech industries. On the contrary, the least dynamic group of municipalities, mainly located in the countryside and in the Autonomous Regions of Azores and Madeira, tend to exhibit lower companies' churn rate, lower levels of productivity and profitability, with a higher weight of proximity services. The two remaining clusters show intermediate levels of profitability; the differences between them are related to risk indicators and churn rates. Moreover, results show that this categorization has been somewhat stable across the 2010-16 period. More than half of Portuguese municipalities did not change its allocation over the years. Additionally, results point to an increased weight of the most dynamic cluster, so as the intermediate cluster presenting satisfactory levels of return on assets despite its exposure to bank credit. On the contrary, there has been a decrease in the relevance of the most depressed cluster (with the highest percentage of exits from 2010 to 2016), as well as the cluster with higher risk indicators and churn rate.

**Ana Bárbara Pinto, José Alexandre Neves e Tiago Pinho Pereira, “Keeping track of MNEs through business group databases: The experience of Banco de Portugal”, 9th Irving Fischer Committee Conference “Are post-crisis statistical initiatives completed?”, Basel, Switzerland, August 2018**

The world has gone global and statistics developed at national level will miss the global picture if we do not react accordingly. Our national economies are impacted not only by local firms but also by multinational enterprises (MNEs) which operate around the globe and organize themselves in various complex and interconnected ways hardly captured by the current statistical standards and definitions. Several statistical domains are therefore likely affected by this phenomenon, namely in the field of balance of payments and related statistics such as foreign affiliates statistics. There are already a number of ongoing initiatives lead by international organizations such as the OECD and the Eurostat and in this paper we present the contribution of Banco de Portugal in this respect. The presence of MNEs in Portugal, as well as Portuguese groups across the world, has several implications in our economy through the interlinkages they establish with the domestic agents. To address this issue, Banco de Portugal developed its own business groups' database that clearly depicts the group structure of Portuguese non-financial corporations (NFCs), showing all the relationships within the group, covering both the resident and non-resident members of the group. This paper presents the architecture and the methodology underlying the design of the database and provides some highlights about its geographical dispersion. Namely, it shows the

countries of the ultimate controlling institutional units (UCIs) of multinational groups in Portugal and the host countries of Portuguese groups.

Prepared by members of the INEXDA network<sup>1</sup>, “INEXDA – the Granular Data Network”, 9th Irving Fischer Committee Conference “Are post-crisis statistical initiatives completed?”, Basel, Switzerland, August 2018

The financial crisis of 2007-08 has highlighted the need for using granular data on financial institutions and markets to detect risks and imbalances in the financial sector. Data producers such as central banks and national statistical institutes are witnessing a growing need to improve granular-data access and sharing. When making granular data available, data producers face significant legal and technical challenges related to, among others, safeguarding statistical confidentiality. This paper introduces the INEXDA international network, which provides a platform for data producers to exchange practical experiences on the accessibility of granular data, metadata as well as techniques for statistical analysis and data protection.

## II Commitment to Quality

Paula Silva, Margarida Pinto, António Agostinho, “How to turn quality into a habit in the statistical production?”, Q2018 – European Conference on Quality in Official Statistics, Krakow, Poland, June 2018

One of the main purposes of the Statistics Department of Banco de Portugal is to ensure a statistical production with high quality standards aiming at fully meeting users’ needs, aligned with the best practices and procedures recommended by the international organizations. Following its commitment to quality, one of the Bank’s priorities is to develop a wide set of quality control procedures that ensure high levels of regular and thorough review of the key statistical outputs. Statistical quality control is based on different procedures and working arrangements that make sure that processes are effective and efficient and the risks are mitigated. In order to achieve higher quality statistics, there are several quality indicators performed by the primary statistics’ compilers. This paper will present the main quality indicators used and the ongoing process to improve the model of regular and systematic quality controls.

Susana Santos e Margarida Pinto, “Boomerang effect of quality control on the compilation of Financial Accounts and flow of funds – The experience of Banco de Portugal”, Q2018 – European Conference on Quality in Official Statistics, Krakow, Poland, June 2018

Financial Accounts are fundamental to monitor financial stability by quantifying the impact of financial decisions of a host of economic agents. In Portugal, the compilation of these statistics is a responsibility of Banco de Portugal. One of the main purposes of the Statistics Department of Banco de Portugal is to ensure this statistical production with high quality standards, aiming at fully meeting user’s needs, by developing a wide set of quality control procedures. Financial

<sup>1</sup> Stefan Bender, Christian Hirsch, Robert Kirchner (Deutsche Bundesbank); Olympia Bover, Manuel Ortega (Banco de España); Giovanni D’Alessio (Banca d’Italia); Luís Teles Dias, Paulo Guimarães (Banco de Portugal); Renaud Lacroix (Banque de France); Michael Lyon (Bank of England); Emily Witt (European Central Bank).

accounts are derived statistics stemmed from a vast array of other primary statistics, including balance of payments and monetary and financial statistics. In this context, Banco de Portugal developed a multidisciplinary team with experts from financial accounts and from the different underlying primary statistics. Within this format, all team members are co-responsible for producing national financial accounts, on a bottom-up approach, thus improving both the quality of these statistics, as well as the quality of primary statistics. This is the result of a systematic iterative process of data cross-check and reconciliation which may represent an opportunity to validate the soundness of microdata, on a top-down approach. To better understanding economic sectors' interlinkages and to assess how intersectoral financial linkages have changed, flow of funds is a powerful analytical tool.

### III Communicating statistics

Lígia Maria Nunes, "Storytelling: adding value to numbers", XXV JOCLAD – Jornadas de Classificação e Análise de Dados, Almada, Portugal, April 2018

One of the biggest challenges of statisticians working with official statistics is to develop the ability to translate collections of information into guidance for citizens, so they can make informed decisions. In this paper we present storytelling and data visualization as powerful tools to make data meaningful, using Balance of Payments as an example.

### IV Compiling Statistics – Special case studies

Sónia Mota, "Developments in public debt in euro area countries before, during and after the last financial crisis", XXV JOCLAD – Jornadas de Classificação e Análise de Dados, Almada, Portugal, April 2018

In 2000, around half euro area countries met the limits imposed by the Maastricht Treaty for public debt and deficit. However, in the aftermath of the 2008 financial crisis and the sovereign debt crisis in Europe, some countries struggled to obtain funding in the markets and/or had to implement measures to support financial institutions, which eventually forced them to call for international assistance programs. This new reality lead to some changes, not only in terms of the levels of deficit and debt, but also in terms of debt's structure both for financial instruments and creditors.

Gonçalo Amado, "Analysis of international services in Portugal", XXV JOCLAD – Jornadas de Classificação e Análise de Dados, Almada, Portugal, April 2018

In the last decade, the value of services transacted between Portugal and the rest of the world increased considerably, following the phenomenon of globalization. The "Travel" item represents the largest weight on the services account in those years but the country, for example, did not recover the volume of exports of financial services reached before the crisis. Nevertheless, Portugal has been improving, on a sustained basis, the balance on technological services and diversifying its export markets.

Rita Pisco, João Falcão e Paula Menezes, “From Balance of Payments and International Investment Position to the Rest of the World account: Roadmap to Banco de Portugal’s experience”, Irving Fischer Committee – Central Bank of Armenia workshop on “External sector statistics”, Dilijan, Armenia, June 2018

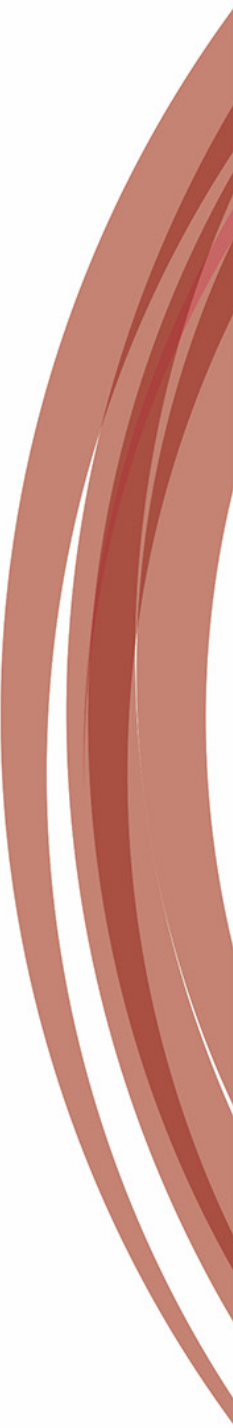
In Portugal, external statistics (Balance of Payments/International Investment Position – BoP/IIP) and financial accounts are a responsibility of *Banco de Portugal*. The non-financial accounts are compiled by *INE-Portugal*. The methodological manuals suggest a high degree of consistency and harmonization between the BoP/IIP statistics and the Rest of the World (RoW) account. *Banco de Portugal*’s compilation process of BoP/IIP and RoW account statistics was improved in 2014 to reinforce its consistency, achieving higher statistical quality standards, increasing the comparability between the two domains and obtaining a more efficient compilation process. One example is the internalization of quarterly analysis of the RoW financial account into a monthly BoP/IIP process, implying changes in procedures and IT developments. There is also a strong link between the BoP and the national sector accounts given that net lending/ borrowing of the economy is obtained through the balancing item of the current and capital accounts.

André Dias, “Estimating a country’s currency circulation within a monetary union”, 9th Irving Fischer Committee Conference “Are post-crisis statistical initiatives completed?”, Basel, Switzerland, August 2018

We discuss the non-trivial problem of a country’s currency circulation within a monetary union, focusing on an internationally relevant currency with significant intra monetary union cash flows: the euro. We compare the results currently published with a set of alternatives to estimate the Euros in circulation in some Euro area countries, based on different hypothesis, techniques and data. Although using a structural money demand model may be useful for some countries, our conclusions suggest that allocating a proportion of the Euros estimated to circulate in the Euro area to each country is more adoption ready and could offer relatively harmonized estimates.

João Falcão Silva, Swapan-Kumar Pradhan, “Uses of mirror data: examples from the BIS international banking statistics and other external statistics”, 9th Irving Fischer Committee Conference “Are post-crisis statistical initiatives completed?”, Basel, Switzerland, August 2018

This study examines the data elements that are common to the BIS international financial statistics and other external statistics such as the Balance of Payments, International Investment Position and Coordinated Portfolio Investment Survey. We enlist several conceptual relationships between various data sources and demonstrate the validity of relationships with country data at an aggregate level. In addition, the differences between mirror data items provide deeper insight into relevant data sets. The paper’s approach elucidates the methodological framework and data gaps, helping users to properly use the information. It also addresses quality issues and the statistical links between different domains.





# I Micro-databases – Potential for Statistics

Regional clusters in Portugal:  
an overview of the 2010-16 period

Keeping track of MNEs through  
business group databases:  
The experience of Banco de Portugal

INEXDA – the Granular Data Network





# Regional clusters in Portugal: an overview of the 2010-16 period

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**Abstract**

The perception that the geographical location of economic activities is not homogeneous, but rather the result of enterprises' choices, has led to several empirical studies exploring the dissimilarities between different geographical regions, in Portugal as in other countries. Considering that Portuguese municipalities can be grouped in clusters which share a number of common features (regarding business structure, enterprise dynamics, profitability, productivity, indebtedness, etc.), this paper presents a classification according to four different clusters (based on data from Banco de Portugal's Central Balance Sheet Database and Central Credit Register, as well as from INE – Instituto Nacional de Estatística).

According to this classification, in a number of municipalities located in Portugal's coastal areas, indebtedness is lower while productivity and profitability are higher. These municipalities also show the lowest share of proximity services and the highest share of high/medium-high tech industries. On the contrary, the least dynamic group of municipalities, mainly located in the countryside and in the Autonomous Regions of Azores and Madeira, tend to exhibit lower companies' churn rate, lower levels of productivity and profitability, with a higher weight of proximity services. The two remaining clusters show intermediate levels of profitability; the differences between them are related to risk indicators and churn rates.

Moreover, results show that this categorization has been somewhat stable across the 2010-16 period. More than half of Portuguese municipalities did not change its allocation over the years. Additionally, results point to an increased weight of the most dynamic cluster, so as the intermediate cluster presenting satisfactory levels of return on assets despite its exposure to bank credit. On the contrary, there has been a decrease in the relevance of the most depressed cluster (with the highest percentage of exits from 2010 to 2016), as well as the cluster with higher risk indicators and churn rate.

**Keywords:** clusters, corporations, municipalities, regional clusters.

# 1 Introduction

Analysts have long perceived that the geographical location of some economic activities is not homogeneous, but rather the result of enterprises' choices in order to minimize costs or maximize profits, leading to different levels of regional specialization and the definition of areas of influence. With this in mind, a number of studies can be found which explore the dissimilarities between Portuguese regions based on different methodologies and criteria (Costa, 2005; Verspagen, 1997).

In this paper we propose to group the Portuguese municipalities based on the characteristics of the firms operating there. The objective was to assess whether it is possible to identify regional clusters in Portugal and, if so, to distinguish them based on a set of clustering variables that were regarded as discriminatory<sup>2</sup>. No contiguity conditions were imposed to form the clusters, as our main goal was not to divide the national territory into regions but rather to assemble municipalities according to its enterprises' characteristics, independently of its geographical location.

The analysis includes a set of 13 indicators, covering different aspects of the economic activity such as business structure, enterprise dynamics, profitability, productivity, indebtedness, etc. (Table 1). The diversity of the indicators selected provide a more complete overview of the economic and financial situation of the companies, avoiding the bias towards a specific dimension.

**Table 1 • Indicators considered**

Indicator	Definition
Share of enterprises with overdue loans (%) <sup>3</sup>	Number of enterprises with overdue loans/Number of enterprises with loans
Share of enterprises with negative equity (%)	Number of enterprises with negative equity/Total
Bank loans over liabilities (%)	Bank loans/Liabilities
Capital ratio (%)	Equity/Total assets
Labour productivity (thousand €)	Gross value added/Number of employees
Share of proximity services (%)	Turnover of Sections G,I,P,Q,R, S (NACE Rev.2)/Total
Churn rate (%)	Number of created + number of ceased enterprises/Total
Average employee expenses (thousand €)	Employee expenses/Number of employees
Average turnover (thousand €)	Turnover/Number of enterprises
Number of employees per capita	Number of employees/Total population
Establishments per capita	Number of establishments/Total population
Return on assets (%)	Net profit/Total assets
Share of high/medium-high tech. industries (%) <sup>4</sup>	Turnover of high and medium-high tech. industries/Turnover of manufacturing

Source: own elaboration.

<sup>2</sup> In order to support our decision, an exploratory analysis (univariate and bivariate) of an extended set of variables was undertaken prior to the choice of the clustering variables.

<sup>3</sup> In this paper, please consider the reference of non-performing enterprises as equivalent to enterprises with overdue loans.

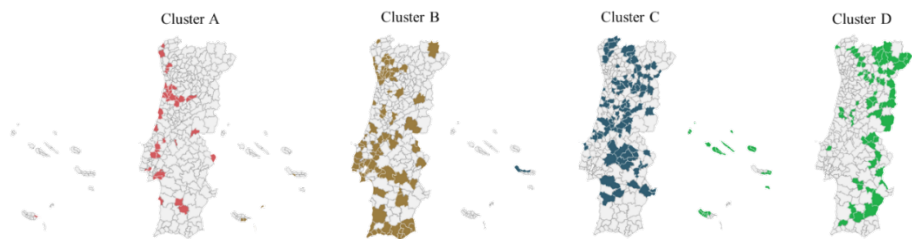
<sup>4</sup> High and medium-high tech. industries defined according to OECD's definition.

These indicators were compiled for companies located in the 308 Portuguese municipalities (full coverage) based on data from Banco de Portugal's Central Balance Sheet Database and Central Credit Register, as well as data on inhabitants *per* municipality provided by INE – Instituto Nacional de Estatística.

## 2 Cluster analysis with average data for the 2014-16 period

Following the non-hierarchical method *k-means*, imposing no conditions on the contiguity between municipalities in the same cluster and using average values for the 2014-16 period, four different clusters were identified. Figure 1 exhibits the spatial distribution of each cluster.

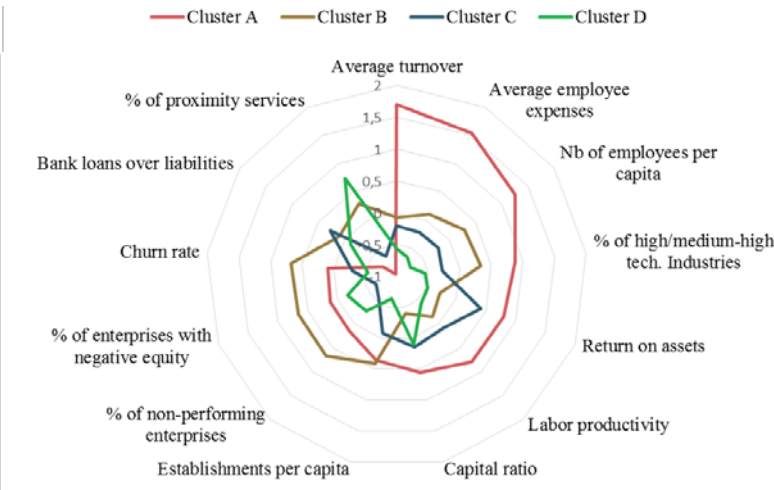
**Figure 1 • Municipalities belonging to each one of the identified clusters**



Source: own elaboration.

The radar graph containing standardized data complements the analysis by highlighting each cluster's distinctive features (Figure 2).

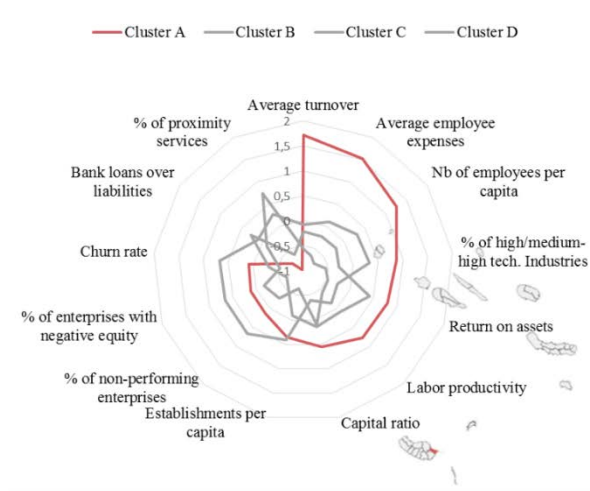
**Figure 2 • Radar graph with standardized data for the 2014-16 period**



Source: own elaboration.

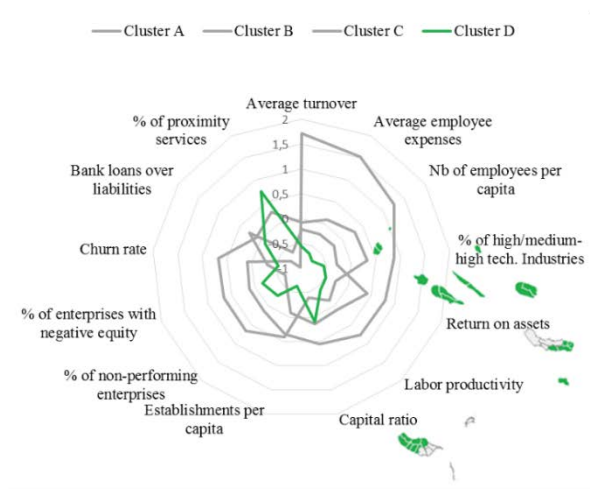
Considering both figures presented above it is possible to observe notorious differences between each cluster. This is even more evident if we compare cluster A (Figure 3) and cluster D (Figure 4).

**Figure 3 • Cluster A: Radar graph and map**



Source: own elaboration.

**Figure 4 • Cluster D: Radar graph and map**

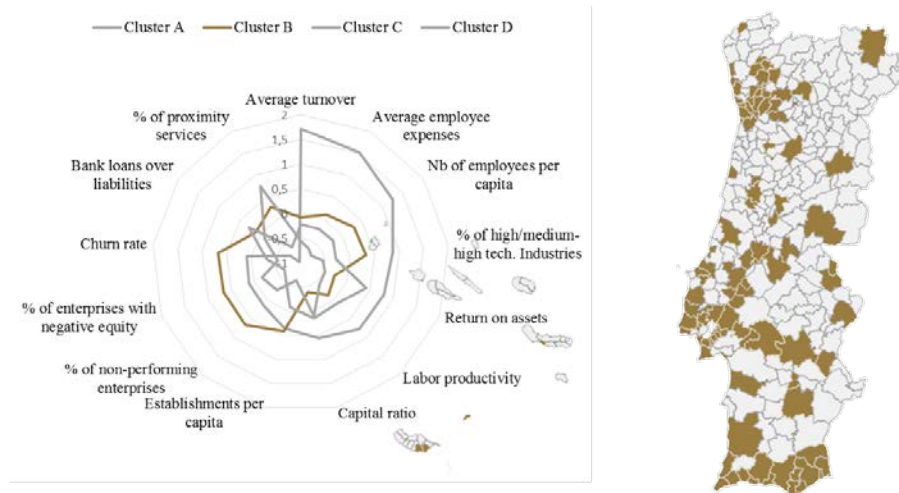


Source: own elaboration.

Cluster A (36 municipalities, the majority of which located in Portugal's coastal area) presents high productivity and high profitability levels while keeping its indebtedness at low levels. It also shows the highest share of high/medium-high technology industries in manufacturing which contrasts with its low share of proximity services in the region's overall turnover. On the opposite side, cluster D (83 municipalities, mainly located in Portugal's countryside and the Autonomous Regions of Azores and Madeira) records the highest value for the weight of proximity services, whereas company's churn rate, productivity and profitability are lower.

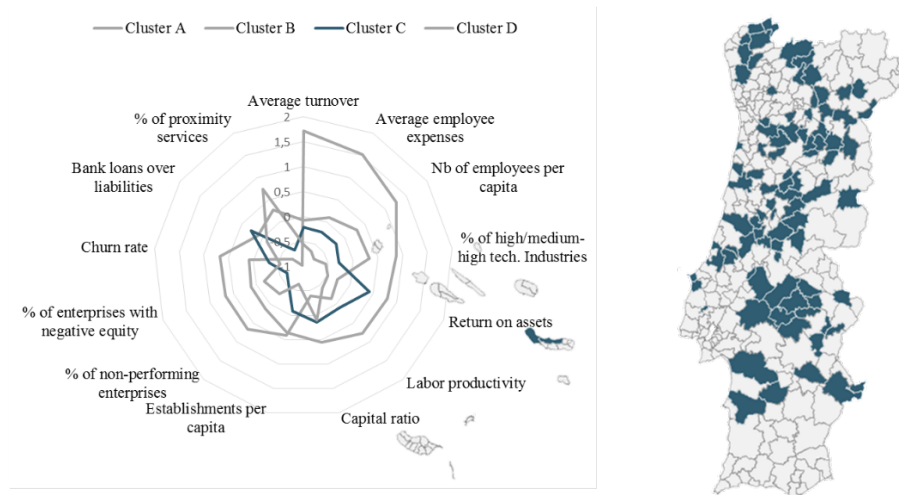
The two remaining clusters show intermediate levels of profitability and the differences between them are related to risk indicators and churn rates (Figures 5 and 6).

**Figure 5 • Cluster B: Radar graph and map**



Source: own elaboration.

**Figure 6 • Cluster C: Radar graph and map**



Source: own elaboration.

On the one hand, cluster B (101 municipalities) is characterised by high churn rates and overall indebtedness, as well as the highest shares of enterprises with negative equity and of enterprises with overdue loans. On the other hand, cluster C (88 municipalities) exhibits low churn rates, low shares of enterprises with negative equity and low shares of non-performing enterprises. It can also be found that besides presenting the largest exposure to bank loans, cluster C also registers the second highest return on assets and capital ratio.

In order to evaluate how each cluster differs from one another, a regression of the referred indicators ( $y_i, i = 1 \text{ to } 13$ ) on cluster dummies ( $CL_k, k = A \text{ to } D$ ) was conducted. The results point

to the general significance of the estimated coefficients (Table 2), thus providing evidence that the clusters are statistically different.

**Table 2 • Expected values for each cluster, by indicator (average values for the 2014-16 period)**

Indicator	Cluster A	Cluster B	Cluster C	Cluster D
Share of enterprises with overdue loans (%)	27.2**	30.7**	22.6**	24.5**
Share of enterprises with negative equity (%)	26.8**	29.5**	22.9**	25.3**
Bank loans over liabilities (%)	22.9**	31.9**	34.0	29.6
Capital ratio (%)	39.7**	30.0**	35.4**	35.0**
Labor productivity (thousand €)	43.6**	22.3**	27.6**	17.2**
Share of population proximity services in turnover (%)	29.6**	50.7**	35.2**	58.4**
Churn rate (%)	11.2**	12.6**	10.3**	9.8**
Average employee expenses (thousand €)	20.0**	14.2**	13.1**	11.6**
Average turnover (thousand €)	1298.4**	495.3**	441.7	307**
Number of employees per capita	0.298**	0.198**	0.153**	0.104**
Establishments per 1000 inhabitants	38.3	38.3**	32.6**	26.7**
Return on assets (%)	9.5**	5.8**	8.1**	5.1
High/medium-high tech. industries in manufacturing (%)	30.6**	18.9**	7.1**	2.0**

Source: own elaboration.

Notes: High and medium-high tech. industries defined according to OECD's definition. Establishments per 1000 inhabitants correspond to the number of establishments per capita (clustering indicator) multiplied by 1000. Cluster B was omitted from the regression procedures to avoid multicollinearity; regarding cluster B, \*\* and \* indicate the intercept significance at 5% and 10% level, respectively. For cluster A, C and D, \*\* and \* indicate the significance of the cluster dummy coefficients at 5% and 10% level, respectively. Highlighted cells with darker colour signal the highest expected value for each indicator, while underlined values highlighted with a lighter colour represent the lowest expected value for each indicator. Several estimations were performed considering different methodologies (hierarchical methods, for instance), different numbers of clusters (from 3 to 6) and different sets of indicators. The results presented in this paper combine both the statistical significance of the difference between clusters, as well as the economic interpretation of the clusters.

### 3 Clusters' stability over the 2010-16 period

It was deemed relevant to assess the stability of the previous results by conducting a parallel analysis over a longer time span – from 2010 to 2016 – instead of considering only the average values for the 2014-16 period. For this purpose, the concept of stability can be twofold: first, stability in terms of the clusters' distinctive features, and, second, stability in terms of the municipalities' allocation to the clusters over time.

The former aims at determining whether the abovementioned results reflect the cyclical position of the Portuguese economy or a structural behavior of the different clusters. In other words, if the results of this analysis are similar when compared with the previous section, then, it can be concluded that this clusters' characterization is valid for an extended period and does not only

constitute a snapshot of the economy at a specific point in time. On the other hand, the second analysis reveals if the municipalities tend to maintain its allocation over time, or if they are constantly changing its characteristics in a way that would make them switch from one cluster to another. The following sections present the outcome of both analyses.

### 3.1 Stability of clusters' distinctive features

By considering pooled observations of the municipalities for the 2010-16 period it became possible to conclude that this categorization of the Portuguese municipalities has been somewhat stable over this time span. Table 3 exhibits the expected values for each cluster, by indicator, highlighting the highest and lowest average values with a darker and a lighter color, respectively. The regression of the indicators on clusters dummies, similar to the one performed in the previous section, still points to the general significance of the estimated coefficients.

**Table 3 • Expected values for each cluster, by indicator (pooled observations for the 2010-16 period)**

Indicator	Cluster A	Cluster B	Cluster C	Cluster D
Share of enterprises with overdue loans (%)	25.8**	29.0**	24.2**	19.6**
Share of enterprises with negative equity (%)	26.5**	29.6**	22.0**	21.8**
Bank loans over liabilities (%)	28.2**	32.7**	43.1**	27.5**
Capital ratio (%)	34.5**	27.8**	29.5**	36.7**
Labor productivity (thousand €)	33.0**	18.8**	27.8**	18.1
Share of population proximity services in turnover (%)	33.3**	54.4**	34.9**	52.3**
Churn rate (%)	12.3**	13.3**	10.0**	11.7**
Average employee expenses (thousand €)	17.7**	13.1**	12.5**	11.5**
Average turnover (thousand €)	977.5**	417.2**	418.6	331.3**
Number of employees per capita	0.270**	0.166**	0.127**	0.108**
Establishments per 1000 inhabitants	38.5**	33.8**	29.3**	26**
Return on assets (%)	7.5**	4.3**	6.6**	5.8**
High/medium-high tech. industries in manufacturing (%)	31.5**	10.1**	4.1**	3.9**

Source: own elaboration.

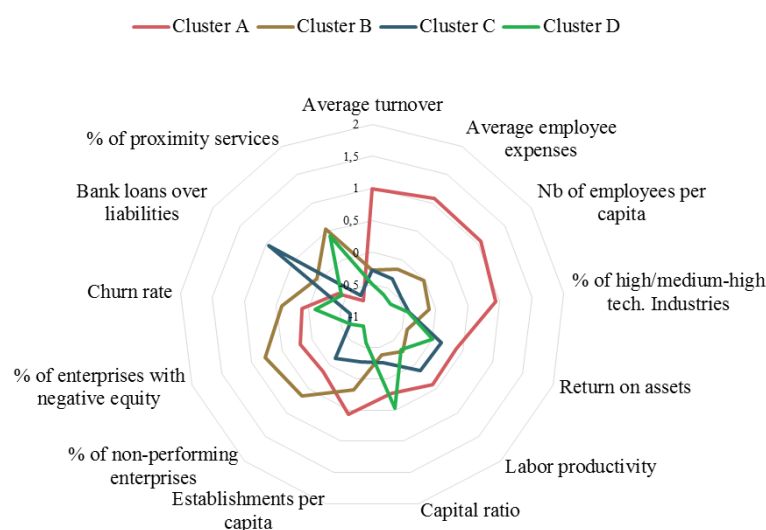
Notes: High and medium-high tech. industries defined according to OECD's definition. Establishments per 1000 inhabitants correspond to the number of establishments per capita (clustering indicator) multiplied by 1000. Cluster A was omitted from the regression procedures to avoid multicollinearity; regarding cluster A, \*\* and \* indicate the intercept significance at 5% and 10% level, respectively. For cluster B, C and D, \*\* and \* indicate the significance of the cluster dummy coefficients at 5% and 10% level, respectively. Highlighted cells with darker colour signal the highest expected value for each indicator, while underlined values highlighted with a lighter colour represent the lowest expected value for each indicator.

It is important to notice that the average values for the 2010-16 period, immediately after the financial crisis of 2007-2009, may have been affected by this global phenomenon. Nevertheless, it appears that the clusters' distinctive features (the focus of the analysis) remain relatively stable as

the highlighted cells of Table 3 are similar when compared with Table 2 (*Expected values for each cluster, by indicator (average values for the 2014-16 period)*).

Figure 7 shows the radar graph containing standardized data for the 2010-16 period. When compared with Figure 2, the similarities are notorious which reinforces our conclusions that, in fact, the clusters distinctive features maintain throughout this extended time span.

**Figure 7 • Radar graph with standardized data for the 2010-16 period**



Source: own elaboration.

### 3.2 Stability in terms of municipalities' allocation

Concerning the municipalities' allocation to each cluster<sup>5</sup>, it was found that about 60% of the municipalities remained in the same cluster over the considered time span and 19% change its allocation only once (Table 4)<sup>6</sup>.

**Table 4 • Number of changes in allocation**

Nb of changes	0	1	2	3	4	5	6
Nb of municipalities	188	57	31	21	8	2	1
in % total municipalities	61%	19%	10%	7%	3%	1%	0%

Source: own elaboration.

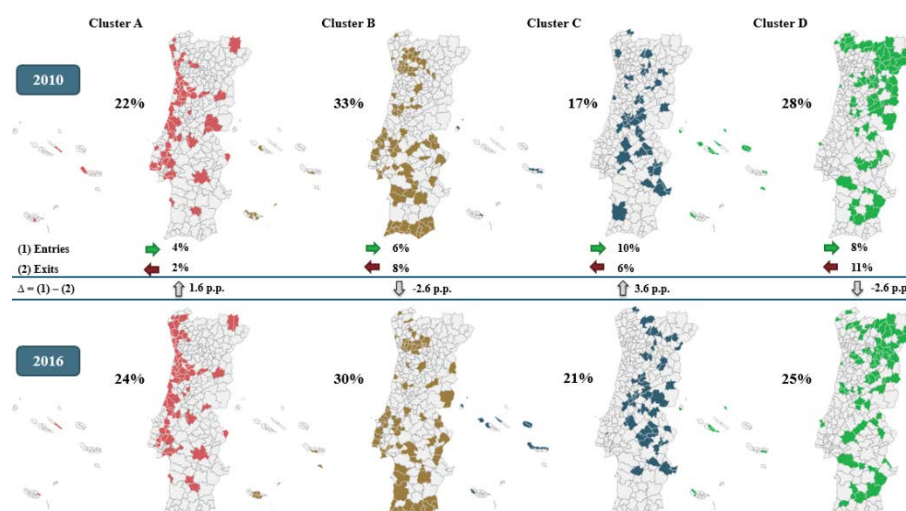
In spite of having almost 40% of the municipalities changing its cluster's allocation at least once, Figure 8 demonstrates that the share of each cluster is relatively stable when comparing the outlook of 2010 with 2016.

<sup>5</sup> It should be kept in mind that this perspective of stability disregards other dimensions besides the entrepreneurial one, i.e., we are not really capturing the municipalities' dynamics as a whole but rather the business dynamics of the companies operating in those locations.

<sup>6</sup> Note that allocations to the same cluster attributed in previous years still count as a change. For instance, if municipality X presented the allocation {B,C,B,B,B,B} for the years between 2010-16, it is counted as two changes (the first one from 2010 to 2011 and the second one from 2011 to 2012).



**Figure 8 • Outlook of the maps in 2010 and 2016\***



Legend: \* relative values (entries and exists in percentage of total municipalities).

Source: own elaboration.

Nevertheless, clusters A and C were able to increase its weight by 1.6 and 3.6 percentage points, respectively. On the other hand, clusters B and D decreased its weight by 2.6 percentage points each.

This means that, from 2010 to 2016, we have observed an increase in the share of municipalities with high levels of profitability and productivity as well as high share of high/medium-high technology industries in the overall turnover of the manufacturing sector (cluster A). There was also an increase in the number of municipalities whose companies are characterized by its high exposure to bank loans but with high return on assets (cluster C). On the contrary, there was a decline in municipalities with high shares of non-performing enterprises and of enterprises with negative equity (cluster B), as well as municipalities with high share of proximity services in the region's overall turnover (cluster B and D) – see Table 3 and Figure 7.

Table 5 exhibits additional information by revealing the transitions from one cluster to another between 2010 and 2016.

**Table 5 • Transition matrix with relative frequencies (2010 vs 2016, in percentage of total Portuguese municipalities)**

		2016				
2010		Cluster A	Cluster B	Cluster C	Cluster D	Total
	Cluster A	20%	1%	1%	0%	22%
	Cluster B	1%	24%	3%	5%	33%
	Cluster C	1%	2%	11%	3%	17%
	Cluster D	2%	3%	7%	17%	28%
	Total	24%	30%	21%	25%	
(1) Entries		4%	6%	10%	8%	
(2) Exits		2%	8%	6%	11%	
$\Delta = (1) - (2)$		1.6 p.p.	-2.6 p.p.	3.6 p.p.	-2.6 p.p.	

Source: own elaboration.

The row-profile gives us the weight of each cluster in 2010<sup>7</sup> whereas the column-profile presents the final position in 2016<sup>8</sup>. The entries (1) and exits (2) correspond to the sum of the elements outside the main diagonal rounded to the nearest unit.

Summing the elements of the main diagonal, it is possible to conclude that in 2016 approximately 72% of the municipalities were in the same cluster as in 2010<sup>9</sup>. Considering the remaining municipalities (i.e., elements outside the main diagonal which correspond to entries/exits) one can verify that cluster C, which revealed the highest increase in its weight by almost 4 percentage points, received municipalities mainly from clusters D and B (7% and 3% of total municipalities, respectively). These were also the main destinations of the municipalities that exited cluster C since 2010.

Additionally, cluster D recorded the highest share of exits, having 7%, 3% and 2% of total municipalities moving from cluster D to clusters C, B and A, respectively. On the contrary, cluster A registered the lowest percentage of exits.

## 4 Final remarks

This paper presents a categorization of the Portuguese economy into regional clusters using a set of 13 indicators that are intended to fully capture the business dynamics of the 308 municipalities of the country. The extension of the analysis for a longer time span revealed that this classification was relatively stable across the 2010-16 period, leading to the conclusion that the results capture some of the municipalities' structural differences. Nonetheless, this does not mean that changes did not occur. In fact, almost 40% of the municipalities have changed its cluster allocation at least once over this period.

Future developments of this paper might involve considering the NACE classification of economic activities as a clustering variable. By including this feature, it becomes possible to explore the regional specialization of the Portuguese municipalities. The analysis of the intensive and extensive margins regarding each cluster evolution might also bring added value to this work.

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<sup>7</sup> Also presented in the upper side of Figure 8.

<sup>8</sup> Also presented in the bottom part of Figure 8.

<sup>9</sup> Please remind that the results of Table 4 consider all allocations' changes in the period of 2010-16, whereas Table 5 only presents the initial and the final position.

# Keeping track of MNEs through business group databases: The experience of Banco de Portugal

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## Abstract

The world has gone global and statistics developed at national level will miss the global picture if we do not react accordingly. Our national economies are impacted not only by local firms but also by multinational enterprises (MNEs) which operate around the globe and organize themselves in various complex and interconnected ways hardly captured by the current statistical standards and definitions. Several statistical domains are therefore likely affected by this phenomenon, namely in the field of balance of payments and related statistics such as foreign affiliates statistics. There are already a number of ongoing initiatives lead by international organizations such as the OECD and the Eurostat and in this paper we present the contribution of Banco de Portugal in this respect. The presence of MNEs in Portugal, as well as Portuguese groups across the world, has several implications in our economy through the interlinkages they establish with the domestic agents. To address this issue, Banco de Portugal developed its own business groups' database that clearly depicts the group structure of Portuguese non-financial corporations (NFCs), showing all the relationships within the group, covering both the resident and non-resident members of the group. This paper presents the architecture and the methodology underlying the design of the database and provides some highlights about its geographical dispersion. Namely, it shows the countries of the ultimate controlling institutional units (UCIs) of multinational groups in Portugal and the host countries of Portuguese groups.

**Keywords:** Business statistics; database design; multinational enterprises (MNEs).

**JEL classification:** C80; F23; F60

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# 1 Introduction

The mission of central banks is not confined to the financial world. Understanding the interlinkages between financial intermediaries and the other agents of the economy is key to decide on the adequate monetary policy, macroprudential framework and credit risk assessment. Banking supervision also benefits from a better knowledge of those dynamics.

There is then a case for central banks to have good quality data on non-financial corporations (NFCs). Sector financial accounts, Balance of Payments, International Investment Position and Foreign Affiliates' Statistics are powerful analytical tools that the Statistics Department of Banco de Portugal provides to the other Departments of the Bank so that the different dimensions of Portuguese NFCs can be assessed.

Complementarily, there is a need to move beyond the aggregates and the use of micro data is fundamental. Banco de Portugal manages the Central Balance Sheet data Office (CBSO) since 1983, with full coverage of all companies operating in Portugal since 2006. Internal and external researchers by BPLim – Microdata Research Laboratory of Banco de Portugal also benefit from this micro database.

In an increasingly global world, understanding NFCs requires also a business groups' database to keep track of Portuguese and foreign MNEs and their impact in the Portuguese economy. To get a complete picture of NFCs sector, consolidated data is also needed to complement individual accounts and business groups' structures.

Banco de Portugal participation's in the European Committee of Central Balance-Sheet Data Office (ECCBSO) promoted the exchange of experiences and encouraged the creation of a consolidated accounts database at Portuguese Central Balance Sheet data Office (CBSO). Starting with listed companies compliant with International Accounting Reporting Standards (IFRS), nowadays, consolidated accounts database has information from 2013 onwards for all companies publishing consolidated annual reports according with IFRS (listed and non-listed) and National Generally Accepted Accounting Practices (National GAAP).

This paper provides a complete overview of the business groups' database and its remainder is as follows: Section 2 shows the data source of the business groups' database, while Section 3 presents the database, namely its architecture, the functioning of the algorithm that loads the database, the visualization tool and some summary statistics that characterize the database. All Names and Tax payer identification numbers used in Sections 2 and 3 are fictional. Section 4 presents the relevance of MNEs in Portugal by comparing some of their economic and financial indicators with those of all-resident enterprise groups and non-groups. Section 5 concludes with some final remarks. Definitions are presented in the Annex.

## 2 Data source

The business groups' database developed by Banco de Portugal contains information on the group structure of Portuguese Non-Financial Corporations (NFCs). The main data source is the *Simplified Corporate Information* (IES, in the Portuguese acronym), a mandatory annual report through which NFCs submit their annual accounts (balance-sheet, income statement, statement of changes in equity, cash flow statement and the annex to the financial statements) simultaneously to the Tax Authority, Ministry of Justice, Banco de Portugal and Statistics Portugal. IES is reported within six and a half months after the end of the economic year, which, for most enterprises resident in

Portugal, corresponds to 15th July of the year following the reference year. After the submission of IES, information is subject to quality control at the Central Balance Sheet Data Office (CBSO) of Banco de Portugal until the end of September. The results presented in this paper refer to the year 2016, the last year available at the time of writing.

The following items are required to ramp up the business groups' database:

- Tax payer identification number (Tax ID)
- Legal entity identifier (LEI) (optional)
- Name
- Country
- NACE (Statistical Classification of Economic Activities in the European Community)
- Direct participation in share capital (percentage)
- Direct participation in voting rights (percentage)
- Date of beginning and end of the participation

Tax payer identification number is mandatory for all entities (resident and non-resident). In Portugal, the Tax ID is unique and mandatory for all entities and is used as the key number in all micro data databases managed by Banco de Portugal.

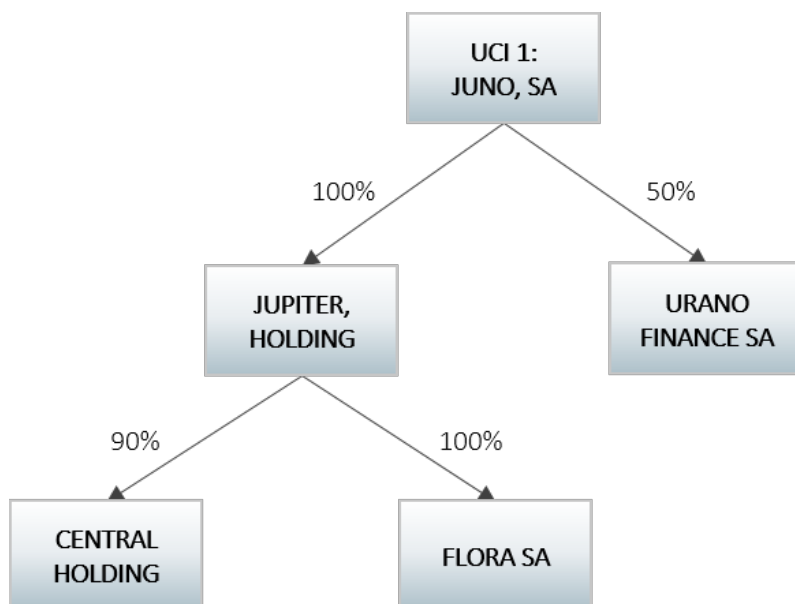
The information about group structure is collected through five distinct tables. One table collects the identification of ultimate controlling institutional unit (UCI) and the ultimate controlling entity in Portugal if the UCI is non-resident. In this table only the first four above items are required. In the remaining four tables all the above items are collected according to the type of participation:

- 1 Direct upward;
- 2 Direct downward;
- 3 Indirect upward;
- 4 Indirect downward.

Direct upward participations exist when one or more companies have a participation in the share capital of the reporting entity. If there are other companies participating in the share capital of the direct upward participants then indirect upward participations occur. The same rationale applies to downward participations.

All indirect participations are reported in pairs of companies, i.e., link by link of the control chain in the group structure. For example: JUNO, SA reports a direct downward participation in JUPITER, HOLDING and an indirect downward participation of JUPITER, HOLDING in FLORA SA and other indirect downward participation of JUPITER, HOLDING in CENTRAL HOLDING (Figure 1).

**Figure 1 • Report of an indirect downward equity participation**



Direct participations are mandatory for all reporting entities with no minimum threshold, implying that the reporting entity has to declare all direct upward and downward participations. Instead of asking for the complete group structure to the Portuguese UCI or the ultimate controlling entity in Portugal if the UCI is non-resident, the option was to require all direct participations for all NFCs in order to reach better quality on group structure data. The assumption was that reporting companies have a better knowledge of their direct participations. This option also allowed to avoid missing data from reported companies on the top of the control chain in Portugal. The report of all direct participations will generate repeated participations in the database, which will later be deleted by the algorithm in order to build a complete and non-redundant business groups' database.

Indirect participations are mandatory only for Portuguese UCIs or for the ultimate controlling entity in Portugal if the UCI is non-resident. In the case of indirect upward participations only those from non-resident companies in the field of Balance of Payments statistics are required. The solution applied to indirect participations reduces the reporting burden on NFCs.

The structure of the tables mentioned above was adopted in 2014 when data for Balance of Payments and International Investment Position (BoP/IIP) statistics was also included in IES, namely equity, dividends and retained earnings of non-resident entities in the scope of foreign direct investment statistics, and variables for outward Foreign Affiliates Statistics (FATS) for all non-resident entities controlled by a Portuguese UCI. This change in the structure of the tables and the incorporation of information for BoP/IIP and FATS statistics was of utmost importance to improve data quality. Data collection became more user friendly and facilitated the reporting of the group structure. At the same time, the inclusion of information from BoP/IIP statistics promoted a better report of the group structure, with a complete coverage of foreign direct investment and FATS entities.

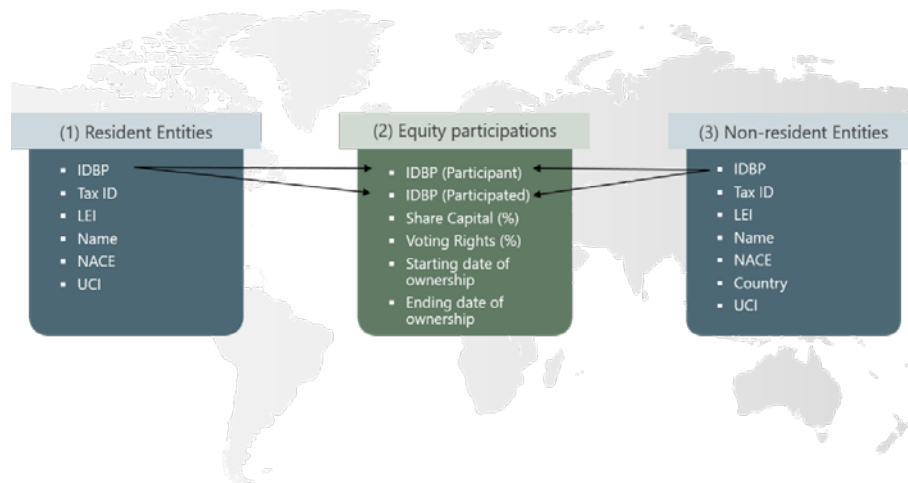
### 3 The business groups' database

CBSO developed an algorithm to analyse and conciliate all the information reported by companies. The algorithm eliminates repeated information, chooses the best option when the information is similar but not equal and tries to identify the correct UCI. When it is not possible to detect automatically the most accurate information, manual quality control will apply.

#### 3.1 Architecture

The business groups' database comprises 3 tables: (1) the business register of resident entities, (2) all the equity participations between entities characterized by the percentages of participation in share capital and voting rights and (3) the business register of non-resident entities (Figure 2).

**Figure 2 • Architecture of the business groups' database**



#### 3.2 Algorithm

The algorithm deals with the identification of: (1) non-resident entities; (2) equity participations and (3) UCIs. At the end, the algorithm result is uploaded in the business groups' database.

##### 3.2.1 Non-resident entities

Non-resident entities are reported by resident NFCs and are identified by Tax ID, Name and Country.

Although the Tax ID is mandatory for all entities, a check digit validation only applies for national tax payer numbers. For non-resident entities some checks are also done, like eliminating dots and spaces and even removing the entire Tax ID if it is presumably wrong.

Also, the Name of the same non-resident entity could be reported in slightly different ways by different reporting entities. This situation requires a procedure to find out similarities on Tax IDs and Names and decide whether the entity is the same or not.

The similarity procedure on Tax IDs and Names uses the fuzzy lookup add-in for Excel which executes a matching of textual data in Excel to identify fuzzy duplicate data. Fuzzy lookup ignores dots, commas, question marks and other punctuation marks and special characters.

The algorithm compares the attributes of all non-resident entities according to the following rules:

- 1 If Tax ID, Name and Country are equal the entity is considered the same;
- 2 If Country is the same and:
  - a) **Tax ID is equal:** Fuzzy lookup compares the Name and considers that it is the same entity when the similarity of the Name is higher than 55%;  
Example: "FLORA SA France" with Tax ID "96720542239" and "Flora SA" with the same Tax ID "96720542239" are compared as "FLORASAFRANCE" and "FLORASA" and considered the same company;
  - b) **Tax ID is different:** Fuzzy lookup compares the binomial (Tax ID, Name) and decides that the entity is the same if the similarity (Tax ID, Name) is higher than 70%;  
Example: "Ares Corp. SA" with Tax ID "70253621" and "Ares SA" with a slightly different Tax ID "AB7025321" are compared as "70253621AresCorpSA" and "AB7025321AresSA" and considered the same company;
- 3 If Country is different and:
  - c) The similarity of the binomial (Tax ID, Name) is higher than 70%, then those entities are selected for manual check;  
Example: "Local Company Ltd Corp" from Brazil is compared with "Local Company Ltd" from USA with the same Tax ID "850401763" and delivered for manual check;
  - d) The similarity of (Tax ID, Name) is lower or equal than 70%, then those entities are considered different.  
Example: "Central Holding" from Austria without Tax ID and "Central Investments Ltd" from Italy with Tax ID "456292930" are considered different companies.

At the end of this procedure the table with all non-resident entities is uploaded with an internal ID called IDBP which will be used in the following steps.

Finally, for the same non-resident entity, the algorithm compares the classification of economic activity (NACE) and LEI and if one or both are different, those cases are selected for manual quality control.

### 3.2.2 Equity participations

As all direct equity participations are requested, there is some overlap between information reported by different entities. Moreover the same equity participation could be reported as indirect by different entities or even reported as direct by one company and as indirect by another company.

The algorithm uses the IDBP of the entity generated in the previous step to compare the percentages of equity participation and voting rights and decide if the equity participation is the same or not. The algorithm follows the following hierarchy:

- Entries reported more than once by different firms (duplications) are eliminated;
- Entries where the reporting firm reports itself as part of an indirect participation (it should only be part of direct participations) are eliminated
- Direct participations prevail over indirect participations (it is assumed that each reporting firm is more knowledgeable for its direct participations);

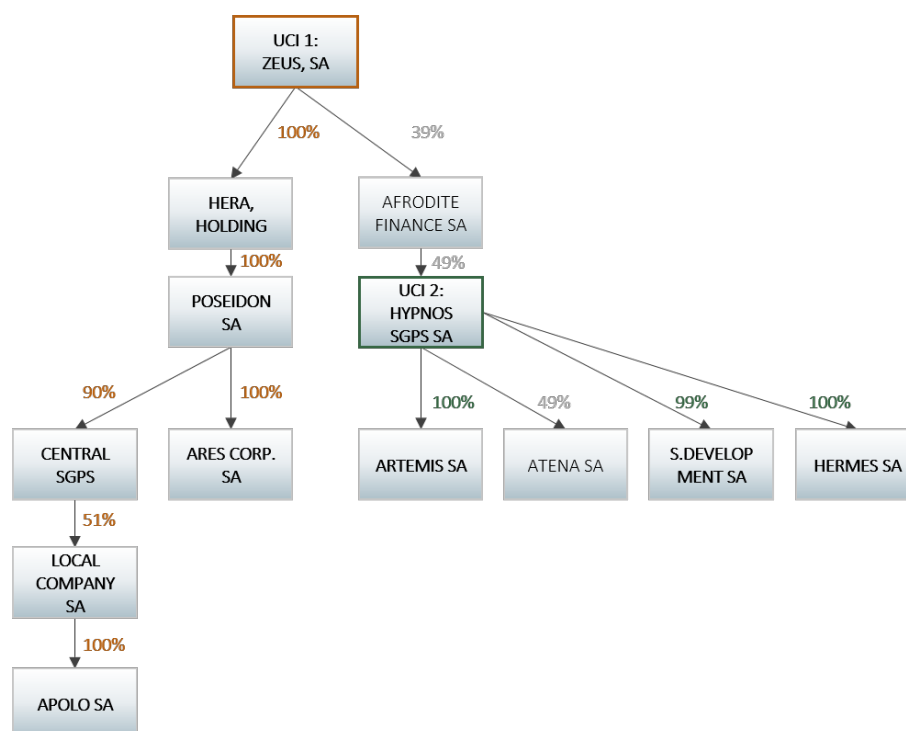


- Direct downward participations (firm A participates in firm B) prevail over direct upward participations (firm B is participated by firm A) (it is assumed that each reporting firm is more knowledgeable for its assets than for its liabilities).
- Mismatches between direct participations reported by different entities are selected for manual quality control.

### 3.2.3 Ultimate Controlling Institutional Unit (UCI)

Empirical evidence shows that companies tend to wrongly identify themselves as UCI. To attribute the correct UCI to a group of companies, the algorithm analyses the chain of voting rights higher than 50% (generally more than 50% implies control) and goes up into the group structure to find out the correct UCI. The UCI of the group will be the company on the top of the control chain. In the example of Figure 3, two different UCIs will be detected by the algorithm: UCI 1 – ZEUS, SA and UCI 2 – HYPNOS SGPS SA. Manual quality control will apply to treat unsolved situations by the algorithm.

**Figure 3 • UCI detection by the algorithm**



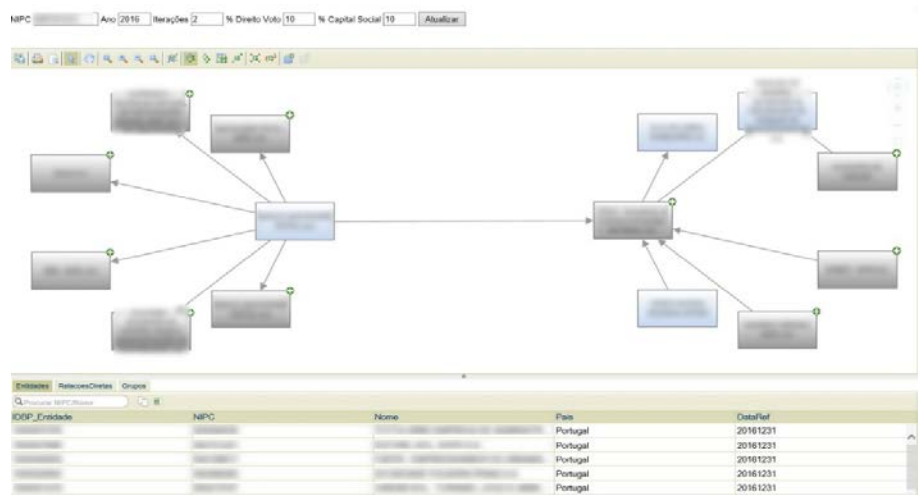
### 3.3 Visualization

Tom Sawyer software is used to visualize and analyse business group structures. This software allows us to use filters to visualize different perspectives of the same group: all equity participations with the same UCI or outside the scope of the group, changing the percentages of share capital or voting rights.

A company can be found by name or tax number and the group structure appears in the main screen or below in a table (Figure 4). All the information could be exported to Excel.

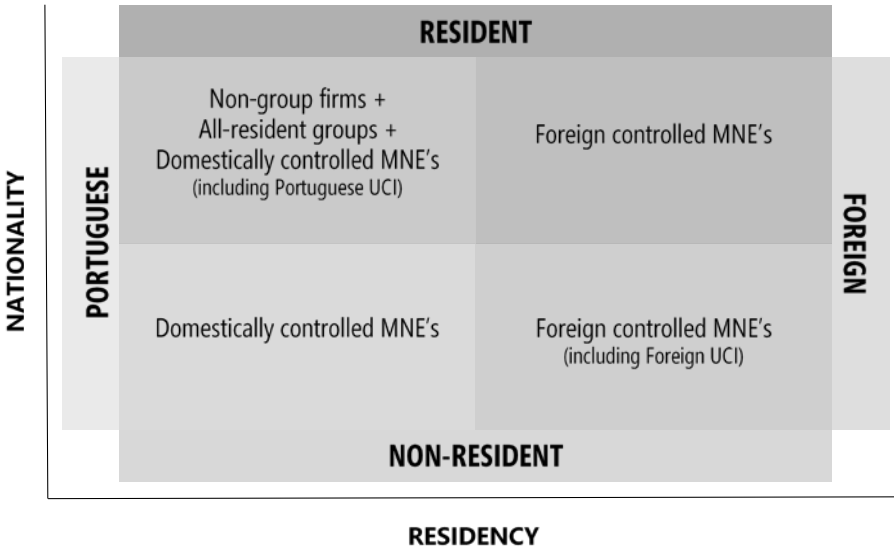
Tom Sawyer also shows different views besides the hierarchical layout: circular layout, orthogonal layout and symmetric layout.

**Figure 4 • Group structure visualization with Tom Sawyer software**



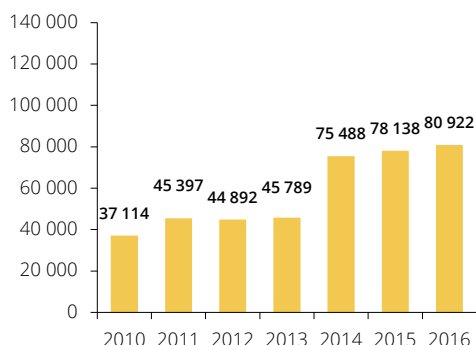
### 3.4 Brief characterization of the database

**Figure 5 • Nationality vs. residency**

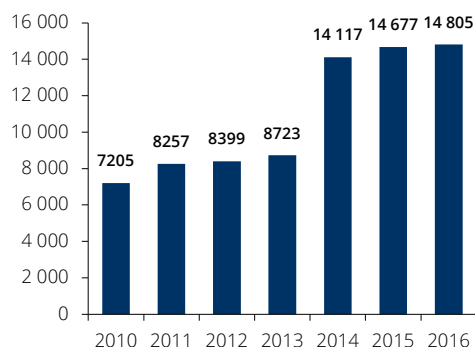


The business groups' database has information from 2010 onwards. In 2010, with the adoption of a new accounting framework in Portugal - in line with the IFRS - information about UCI and indirect equity participations became also available, in addition to the information on direct equity participations already available in the previous National GAAP. As mentioned in section 2, in 2014 the framework changed, which resulted in an overall improvement in data quality. The impact of these changes can be seen in Charts 1 to 3.

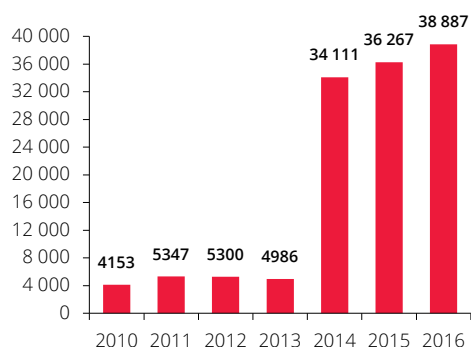
**Chart 1 • Number of equity participations**



**Chart 2 • Number of non-resident entities**



**Chart 3 • Number of UCIs**

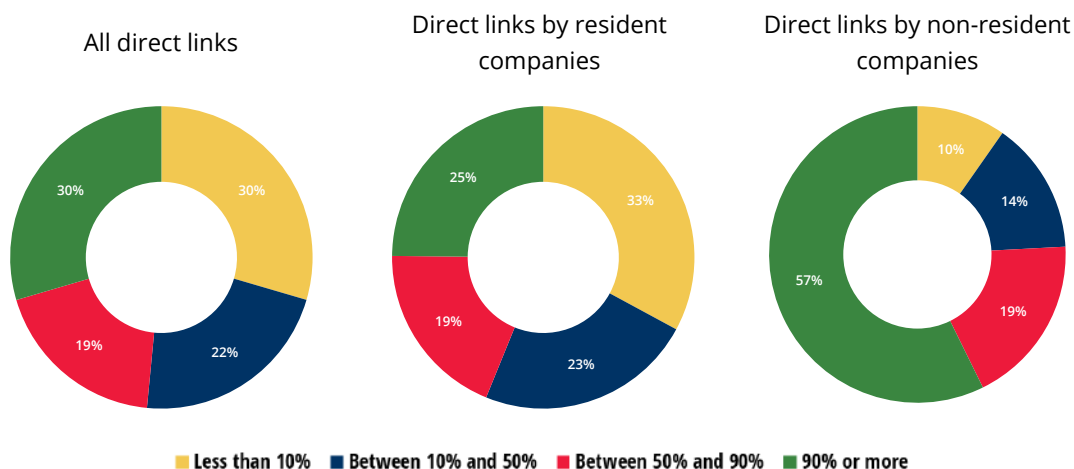


The number of equity participations and non-resident entities increased 65% and 62% in 2014, respectively. The huge increase in the number of UCIs is related to the rules applied in the new framework (Chart 3). All the reporting entities who declare the existence of, at least, one participation are obliged to identify the UCI.

Regarding the intensity of the direct shareholding link<sup>1</sup>, 30% of the participations are below 10% (Chart 4), whereas majority equity capital stakes (more than 50%) represent 49% of the total number of equity participations. The fraction of participations in share capital above 50% are higher for non-resident rather than for resident entities (76% vs 44%). The equity participations higher than 90% represent 57% of the total equity participations held by non-resident entities, hence suggesting that non-resident entities investing in Portugal have the clear goal of controlling the management of companies.

<sup>1</sup> A similar analysis was performed by Heuse and Vivet (2017).

**Chart 4 • Intensity of the direct shareholding link (in %, 2016)**



**Box 1 • The impact of the algorithm and the manual quality control**

**The impact of the algorithm**

The reported equity participations, non-resident entities and UCIs are submitted to an algorithm developed at CBSO to build a complete and non-redundant business group database. The algorithm detects repeated equity participations and similar non-resident entities, eliminates duplicates and attributes the correct UCI.

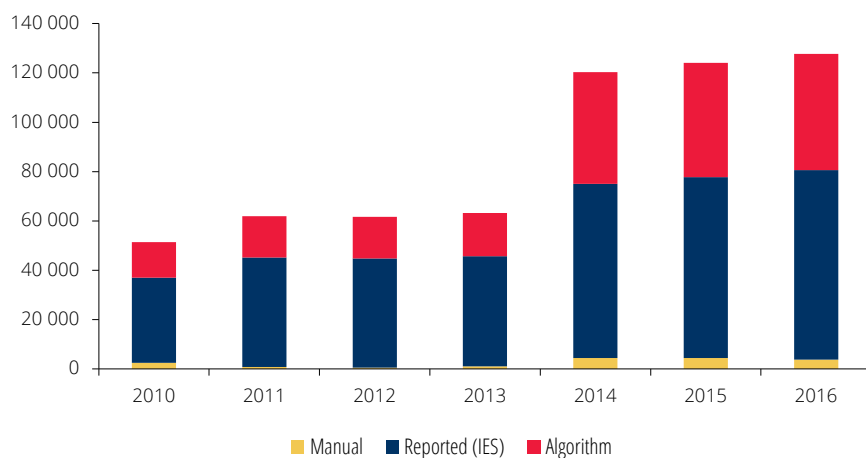
The impact of the algorithm corresponds to deleted information shown on Charts 5 to 7. In 2016, 37% of reported equity participations, 11% of reported non-resident entities and 17% of reported UCIs were deleted.

**The impact of manual quality control**

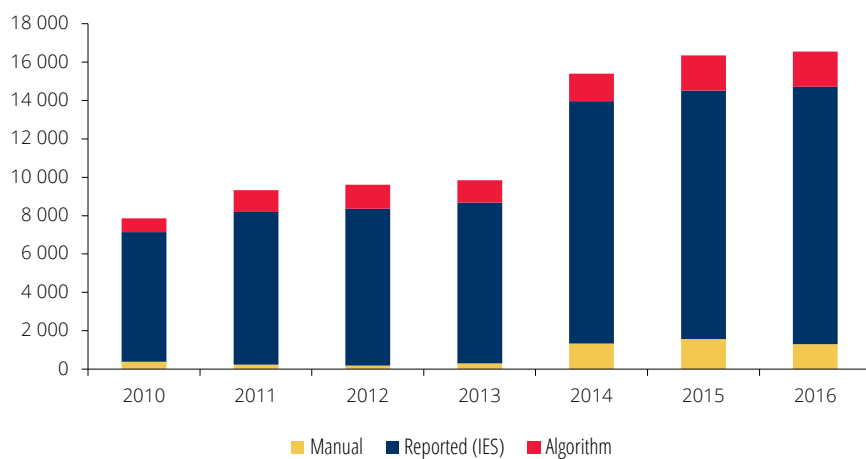
Manual quality control will apply to treat situations not solved by the algorithm and also to complete missing information which are mainly detected through the analyses of foreign direct investment companies and consolidated annual reports. This validation procedure is based on information available in annual reports, companies' websites and through direct contacts to companies, by email or telephone and is done during the summer by 35 trainees selected from 5 universities of economics, management and accounting.

The impact of manual quality control is marginal when compared to the total reported information. Manual validation added new equity participations in an amount equivalent to 3% of the reported participations from 2014 to 2016 and changed only 0.3%. About non-resident entities, 9% of the total were added and 1% were changed. In the case of UCIs, manual quality control is residual, corresponding to 0.3% of the total.

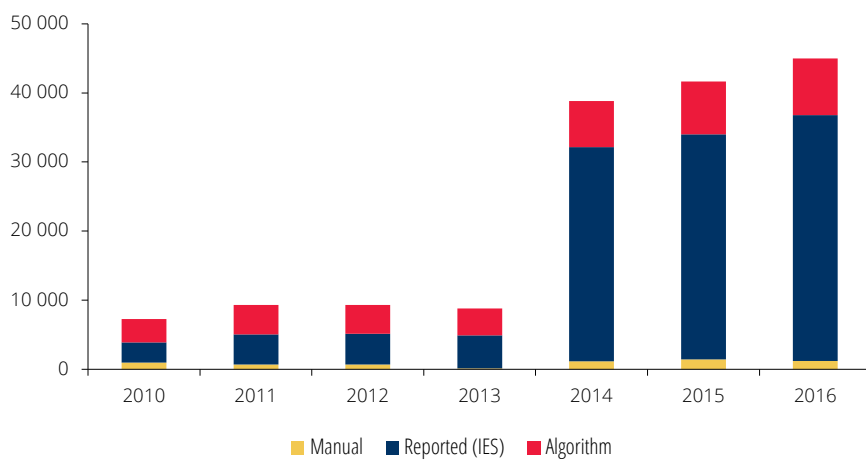
**Chart 5 • Number of equity participations in IES**



**Chart 6 • Number of non-resident entities in IES**



**Chart 7 • Number of UCIs in IES**



## 4 Relevance of MNEs

Using the information available in the business groups' database and matching it with the information from individual accounts annual reports available at the CBSO allows us to understand the impact of MNEs in the NFCs sector (Banco de Portugal, 2018).

In this analysis, a business group is defined as a set of companies controlled, directly or indirectly, by the same UCI. The concept of control requires holding more than 50% of voting rights in another company or the existence of control due to shareholders agreements. Hence, taking the control into account, 15.182 business groups were identified in the business groups' database in 2016.

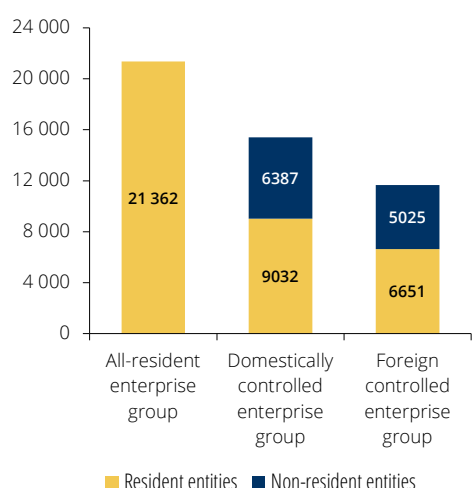
We split the business groups into three types<sup>2</sup>:

- 1 All-resident enterprise groups: groups with resident entities only;
- 2 Domestically controlled enterprise groups: groups with resident and non-resident entities, but with domestic control; and
- 3 Foreign controlled enterprise groups: groups with resident and non-resident entities, but with foreign control.

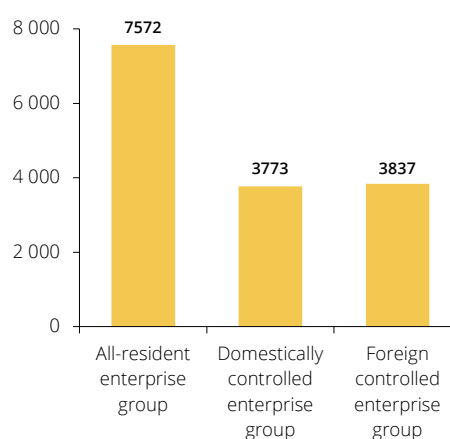
Chart 8 shows the business groups entities split into resident and non-resident, by type of group. All-resident enterprise groups are, by definition, only composed by resident entities. In the MNEs, the proportion of non-resident entities is around 40%.

The number of groups by type is shown in Chart 9. In relative terms, around 50% of business groups in the database are all-resident and the other half is equally divided (25%) between domestically and foreign controlled groups.

**Chart 8 • Business group entities by type of group (2016)**



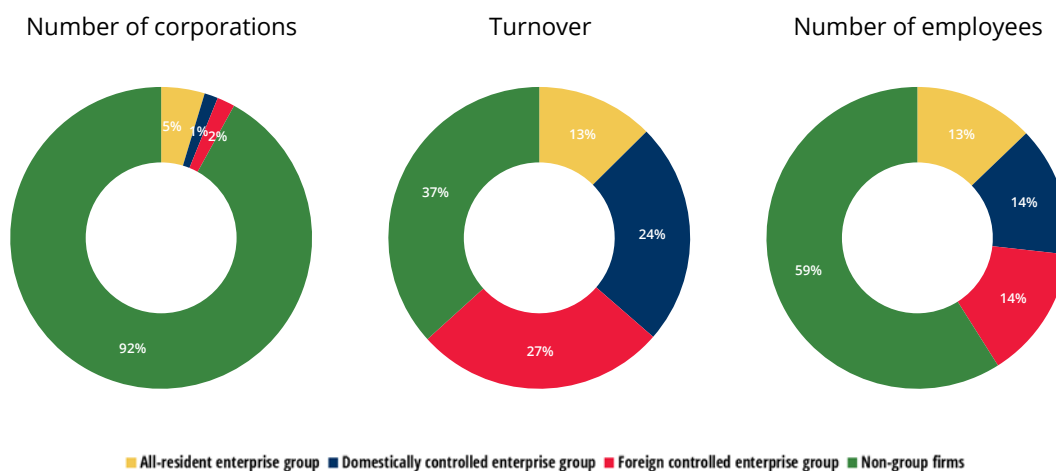
**Chart 9 • Number of groups by type of group (2016)**



The impact of MNEs in the Portuguese economy is evaluated in Chart 10 in terms of number of corporations, turnover and number of employees.

<sup>2</sup> These definitions and other related with MNEs are in the Annex.

**Chart 10 • Resident NFCs by type of group (2016)**

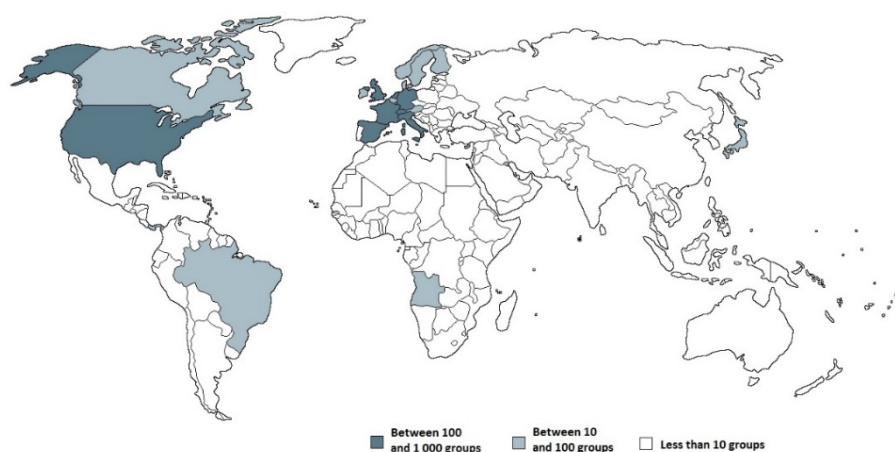


In 2016, although only 3% percent of the total NFCs are MNEs (both Portuguese or foreign controlled), they represent 51% of the turnover and 28% of the number of employees of this institutional sector, of which MNEs under foreign control respectively weighted 27 and 14 percentage points.

#### 4.1 Foreign controlled MNEs

Geographical distribution of UCIs from foreign controlled MNEs shows a clear preponderance of European countries, large world economies like USA, Canada and Japan and some Portuguese speaking countries, namely Brazil and Angola (Figure 6).

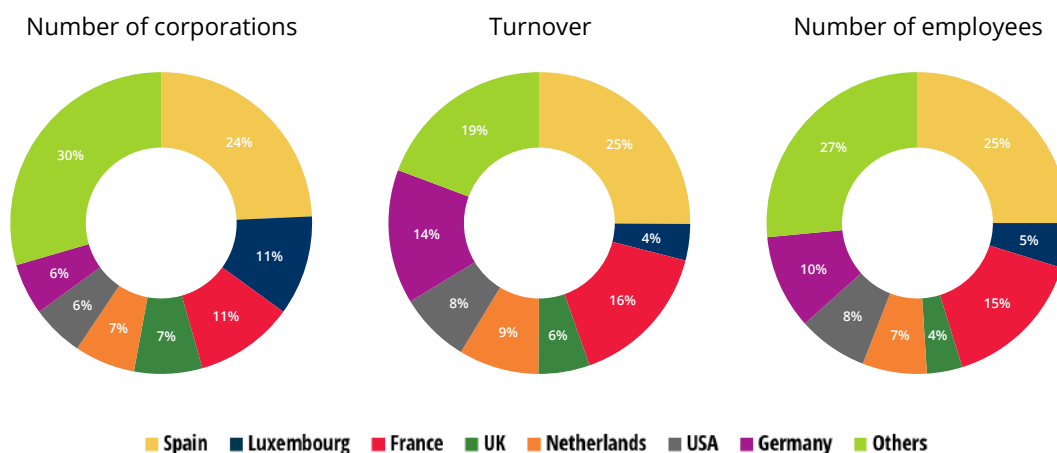
**Figure 6 • Geographical distribution of UCIs with affiliates in Portugal**



Spain appears as the most important ultimate investor in Portugal, controlling almost one quarter of resident NFCs, as well as one quarter of their turnover and employees (Chart 11). Entities from Luxembourg control 11% of companies in Portugal, but their importance in terms of the turnover and number of employees is not that significant, contrarily to what happens to entities from France

and Germany, which are the ultimate investors of 17% of resident NFCs, representing 30% of the turnover and 25% of the number of employees of the NFCs sector.

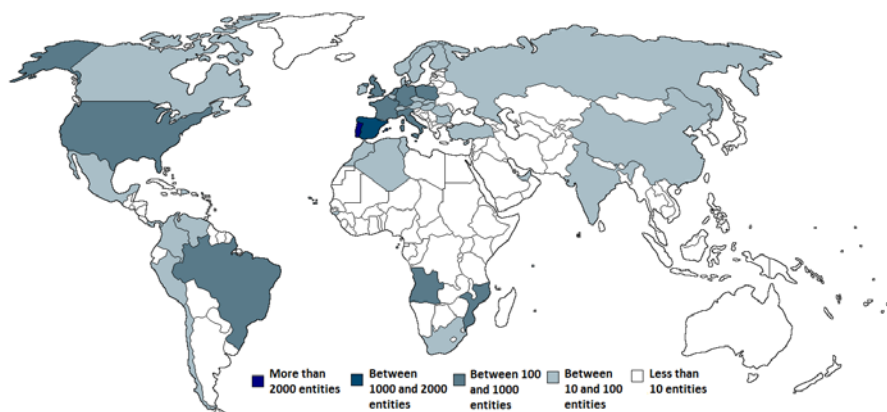
**Chart 11 • Foreign controlled MNEs by country of UCI (2016)**



## 4.2 Portuguese controlled MNEs

Geographical distribution of Portuguese controlled MNEs overlap, to a certain extent, the geographical distribution of UCIs, exhibiting a strong relationship between the locations of domestically controlled MNEs and the country of the UCIs of foreign controlled groups (Figure 7).

**Figure 7 • Geographical distribution of Portuguese controlled MNEs**



Spain is the most frequent destination of Portuguese controlled MNEs as is geographically closer for companies to start investing abroad and “benefit from corporate support functions at headquarters” (OECD, 2018). Spain is followed by other European large economies, such as France, UK and Germany. The presence of Netherlands and Luxembourg likely reflects the importance of Special Purpose Entities (SPEs) (OECD, 2018). Other large economies appear, like Russia, China, India, Latin America, North Africa regions and some Portuguese speaking countries, namely Brazil, Angola and Mozambique, with the common language leveraging foreign investment.

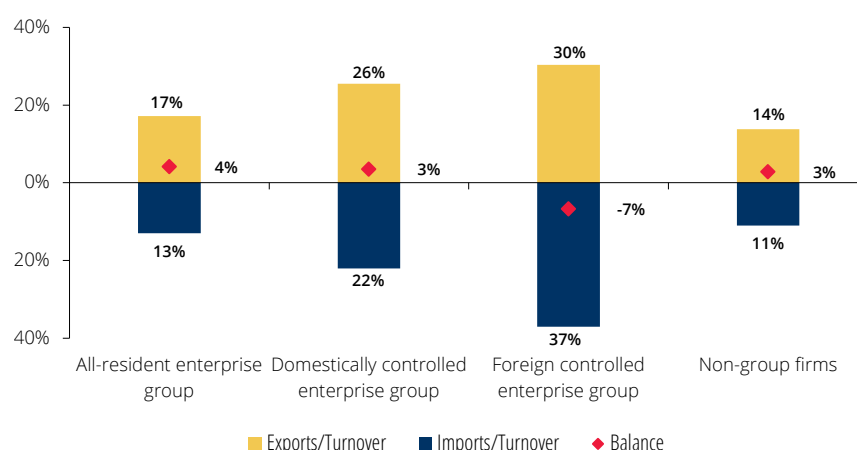


### 4.3 Economic and financial indicators

Some economic and financial indicators are presented, based on the sum of individual accounting data (non-consolidated), in order to better assess the influence of MNEs in the operating and financing activity of NFCs in Portugal (Banco de Portugal, 2018). Results for MNEs are exhibited alongside with the results for all-resident enterprise groups and non-group firms to stress the importance of MNEs.

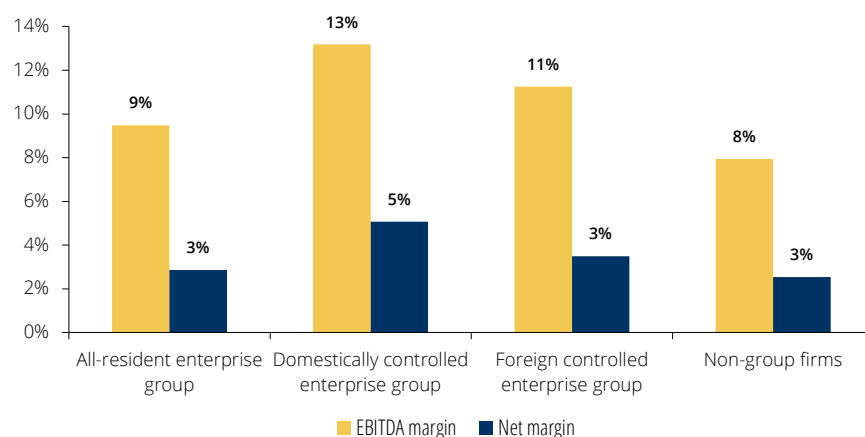
With respect to the operating activity, being part of a MNE usually implies a higher share of exports and imports in turnover. Chart 12 shows that more than 25% of the turnover generated by NFCs integrated in MNEs is exported. However, these firms also import relatively more, which leads to a negative balance (equivalent to 7% of the turnover) in the case of foreign controlled enterprises. Standalone NFCs (non-group firms) and NFCs from all-resident enterprise groups have similar structures. They export a smaller fraction of the turnover, but have positive balances.

**Chart 12 • Share of exports and imports in turnover (2016)**



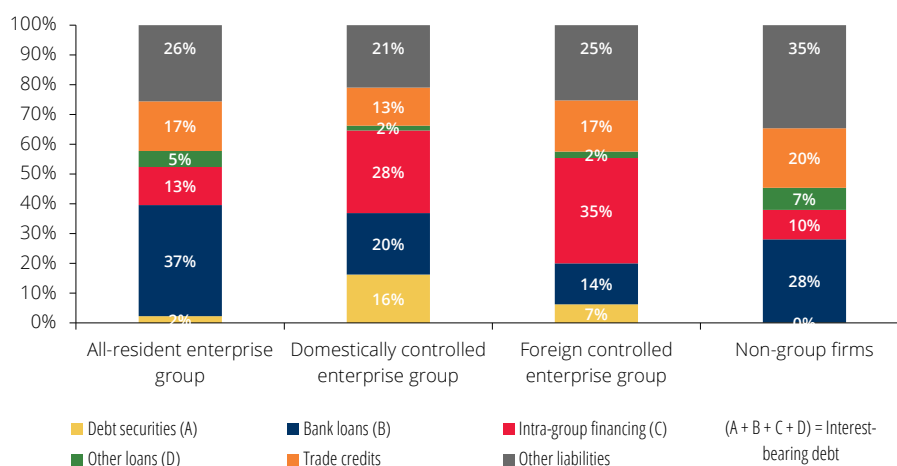
The analysis of EBITDA/Total revenues shows that MNEs are, on average, more efficient transforming revenues into operational results (Chart 13). However, there is no such a difference in the net margin, as depreciations and amortizations account for a greater percentage in total revenues of MNEs, given that they usually hold a larger amount of assets.

**Chart 13 • EBITDA and net margins (2016)**



Another interesting distinctive feature between MNEs and all-resident and non-group firms regards the liabilities structure (Chart 14). On one hand, MNEs present a more diversified pattern of financing, in spite of the predominance of intra-group financing<sup>3</sup>. On the other hand, financing from debt securities is almost exclusive from MNEs. In all-resident enterprise groups and non-group firms, bank loans and other liabilities<sup>4</sup> prevail.

**Chart 14 • Liabilities structure**



## 5 Conclusion

This paper presents the work developed by Banco de Portugal to build a business groups' database in order to better evaluate business group relationships and understand how MNEs impact the NFCs sector and the external statistics.

The first step to successfully achieve that task was to use an administrative data source, electronic and mandatory for all NFCs. Afterwards, it was fundamental to develop an algorithm to read massive amounts of numeric and text information and implement a fuzzy matching procedure to check similarities and clearly identify and distinguish non-resident entities, equity participations and UCIs. Complementary to the automatic procedures, manual quality control is of great importance to fill in unsolved situations by the algorithm and some data gaps.

A business groups' database could be explored to perform useful analyses and studies. At the individual level, it is possible to visualize the group structure and get quick information about its entities through Tom Sawyer Software. At the aggregate level, it is also attainable to know in more detail the economic activity sectors and the world dispersion of non-resident entities belonging to Portuguese MNEs, as well as how MNEs contribute to the number of companies, turnover, employees and the results of NFCs sector. In 2016, despite accounting for only 3% of Portuguese firms, MNEs represented 51% of the turnover and 28% of the employees, thus confirming its importance in our economy.

<sup>3</sup> In the context of the present analysis, group definition implies control (more than 50% of the voting rights or shareholders agreement). However, for lower voting power, intra-group financing could exist, which explains the existence of intra-group financing in non-group firms.

<sup>4</sup> "Other liabilities" includes income tax payable and other payables to public administrations, non-interest bearing shareholder loans, other accounts payable and other current liabilities.

In an increasingly globalised world MNEs will continue to expand their activities which poses a permanent challenge to high quality official statistics. Close cooperation between the statistical authorities, both domestically and internationally, is key to efficiently overcome the difficulties. It is also needed an adequate framework for the sharing of data, where the whole is greater than the sum of its parts. Complementarily, initiatives to promote the use of the Legal Entity Identifier (LEI) or even to make it mandatory should also be pursued.

The CMFB workshop on globalisation (July 2018) showed that there is already a significant number of initiatives going on but there is still work to be done. The use of blockchain for data protection, web scrapping and artificial intelligence for MNEs' profiling, the creation of a common Large Case Unit or "*an AnaCredit for MNEs*" were some of the boldest ideas that, in our opinion, could pave the way to MNE accounts.

## Annex – Definitions

### **All-resident enterprise group**

An enterprise group composed only of enterprises that are all resident in the same country (Business Registers Recommendation Manual).

### **Global decision centre**

Institutional unit where the decisions on the global strategy of the group are taken (Business Registers Recommendation Manual).

### **Domestically controlled enterprise group**

A multinational group where the global decision-centre is in the country compiling the business register (Business Registers Recommendation Manual).

### **Enterprise group**

Council Regulation (EEC) No. 696/93 on Statistical Units defines the Enterprise Group as "an association of enterprises bound together by legal and/or financial links. A group of enterprises can have more than one decision-making centre, especially for policy on production, sales and profit. It may centralize certain aspects of financial management and taxation. It constitutes an economic entity which is empowered to make choices, particularly concerning the unit it comprises".

### **Foreign controlled enterprise group**

A multinational group where the global decision-centre is outside the country compiling the business register (Business Registers Recommendation Manual).

### **Multinational enterprise group**

The Business Register Regulation states in article 2(d) "Multinational enterprise group shall mean an enterprise group which has at least two enterprises or legal units located in different countries".

### **Multinational enterprise (MNE)**

Multinationals usually comprise companies or other entities established in more than one country and so linked that they may co-ordinate their operations in various ways. While one or more of these entities may be able to exercise a significant influence over the activities of others, their

degree of autonomy within the enterprise may vary widely from one multinational enterprise to another (OECD, 2011).

A note in the Business Registers Recommendation Manual (p. 309) refers that, although the definition is ambiguous, 'Multinational enterprise' is used in the same meaning as 'Multinational enterprise group'.

#### **Ultimate controlling institutional unit (UCI)**

The institutional unit, proceeding up in the affiliate's chain of control, which is not controlled by another institutional unit (Regulation (EC) No 716/2007). Foreign Affiliates Statistics (FATS) use the resident country of the ultimate controlling institutional unit (UCI) as global decision-centre.

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OECD Glossary of Tax Terms. Retrieved from <https://www.oecd.org/ctp/glossaryoftaxterms.htm>

Regulation (EC) No 716/2007 of the European Parliament and of the Council of 20 June 2007 on Community statistics on the structure and activity of foreign affiliates

Regulation (EC) No 177/2008 of the European Parliament and of the Council of 20 February 2008 establishing a common framework for business registers for statistical purposes and repealing Council Regulation (EEC) No 2186/93

# INEXDA – the Granular Data Network<sup>1</sup>

Prepared by members of the INEXDA network<sup>2</sup>

## Abstract

The financial crisis of 2007-08 has highlighted the need for using granular data on financial institutions and markets to detect risks and imbalances in the financial sector. Data producers such as central banks and national statistical institutes are witnessing a growing need to improve granular-data access and sharing. When making granular data available, data producers face significant legal and technical challenges related to, among others, safeguarding statistical confidentiality. This paper introduces the INEXDA international network, which provides a platform for data producers to exchange practical experiences on the accessibility of granular data, metadata as well as techniques for statistical analysis and data protection.

**Keywords:** Microdata, International Network, Data Access.

## 1 The motivation for INEXDA

In 2009, the finance ministers and central bank governors of the G20 endorsed the first phase of the Data Gaps Initiative (DGI-1) to promote actions to close data gaps that had come to light in the wake of the global financial crisis that emerged in 2008. During the process of DGI-1, data users and data compilers increasingly expressed the need for improving data sharing, particularly of granular<sup>3</sup> data, in order to foster the understanding of global developments, for example with regard to risks and imbalances. Consequently, the second phase of this initiative (DGI-2) contains a new recommendation (II.20) promoting the exchange of (granular) data as well as metadata.<sup>4</sup>

To help meet data users' and data compilers' demand for (granular) data sharing within the legal framework of the individual jurisdictions and to facilitate the implementation of Recommendation II.20 of DGI-2, a group of central banks established the International Network for Exchanging Experience on Statistical Handling of Granular Data (INEXDA). In accordance with the objectives of INEXDA outlined below, participation is open to other central banks, national statistical institutes, and international organisations. Other examples of exchanging experiences in the context of data

<sup>1</sup> The views expressed here are those of the contributors and do not necessarily reflect those of the Banco de España, Banca d'Italia, Banco de Portugal, Banque de France, Bank of England, Deutsche Bundesbank, or European Central Bank.

<sup>2</sup> Stefan Bender, Christian Hirsch, Robert Kirchner (Deutsche Bundesbank); Olympia Bover, Manuel Ortega (Banco de España); Giovanni D'Alessio (Banca d'Italia); Luís Teles Dias, Paulo Guimarães (Banco de Portugal); Renaud Lacroix (Banque de France); Michael Lyon (Bank of England); Emily Witt (European Central Bank).

<sup>3</sup> In this paper, granular data are defined as less aggregated data than traditional statistics (eg finer breakdowns of aggregates in traditional statistics) or microdata. Microdata are data at the level of individual reporters or at a low level of aggregation that may lead to the identification of individual reporting units.

<sup>4</sup> More information on DGI-1 and DGI-2 can be found at <http://www.imf.org/external/np/g20/pdf/2015/6thprogressrep.pdf>

sharing include the Conference of European Statisticians Task Force on the Exchange of Economic Data, which focuses particularly on the activities of multinational enterprises (MNEs), as well as the work on data sharing by the Bank for International Settlements (BIS) Irving Fisher Committee (IFC).

INEXDA was explicitly mentioned in the report of the Inter-Agency Group on Economic and Financial Statistics: “Update on the Data Gaps Initiative and the Outcome of the Workshop on Data Sharing”, March 2017. The paper was welcomed by the G20 Finance Ministers and Central Bank Governors in March 2017 and by the G20 leaders: “We welcome the recommendations of the Inter Agency Group on Economic and Financial Statistics (IAG) for sharing and accessibility of granular data.” (p. 5, Communiqué of the G-20 FMCBG Meeting (2017)).

## 2 A brief history of INEXDA

On 6 January 2017, the Banca d'Italia, Banco de Portugal, Bank of England, Banque de France and Deutsche Bundesbank (see also figure 1) founded INEXDA during a meeting at the Banco de Portugal. In this meeting, the BIS – which participated as a guest – offered to support the work of INEXDA by providing access to the eBIS<sup>5</sup> platform. All INEXDA information is therefore stored and shared via the eBIS system.

The second INEXDA meeting took place at the Bank of England on 7 July 2017, where the Banco de España and European Central Bank (ECB) joined INEXDA as first-time guests. During this meeting, particular emphasis was placed on developing a metadata schema for the INEXDA network. In this regard, a presentation by the GESIS Leibniz Institute for the Social Sciences on “The da|ra Data Referencing System and its potential for the INEXDA Project” was considered very useful by INEXDA members (see Bender, Hausstein and Hirsch (2018) for a more detailed description of the INEXDA metadata schema).

At the third INEXDA meeting on 11 January 2018 at the Banque de France, the INEXDA network welcomed the Banco de España and ECB as new INEXDA members, increasing the number of INEXDA members from five to seven. Furthermore, the Banco Central de Chile, Banco de México, Oesterreichische Nationalbank, Central Bank of the Republic of Turkey and – for the first time, a national statistical institute – Office for National Statistics UK attended the meeting as guests. One notable outcome of the meeting was the consideration of establishing working groups on different topics within the framework of INEXDA (see section 4).

The fourth INEXDA meeting will be held on 27 August 2018 at the BIS in Basel. Alongside the guests in attendance at the third meeting, the Bank of Russia, Federal Statistical Office of Germany, Eurostat, and the Swiss National Bank will, at the time of writing, be attending the meeting as first-time guests.

## 3 INEXDA's objectives

INEXDA was established with the overall aim of facilitating the international use of granular data for analytical, research and policy purposes within the limits set by the applicable confidentiality regimes.<sup>6</sup> This overall aim can be further broken down into the following two, more specific objectives.

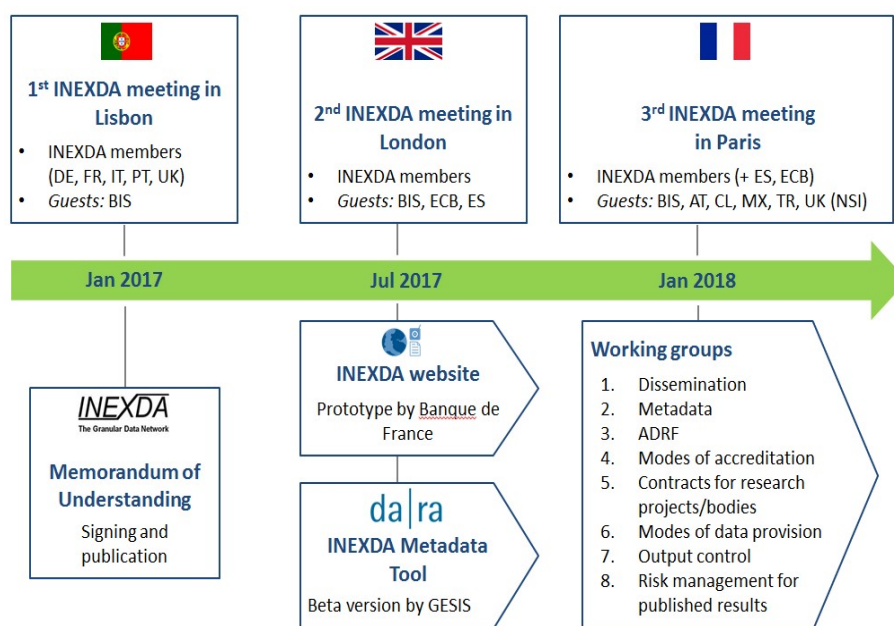
<sup>5</sup> <https://www.ebis.org/auth/login>

<sup>6</sup> INEXDA's objectives are outlined in the Memorandum of Understanding (MoU), which must be signed by each member and is available on the websites of each member institution.

First, INEXDA will provide a basis for exchanging experiences on the statistical handling of granular data that are accessible to external users. Examples of “statistical handling” include the processes, methods, and tools for data and metadata access, techniques for the statistical analysis of granular data, procedures for data confidentiality and data security, and procedures for output control. Second, INEXDA will provide a framework for investigating possibilities to harmonise access procedures and metadata structures, to develop comparable structures for existing data, and to further foster the efficiency of statistical work with granular data.

The higher level of data disaggregation in the case of granular data is also associated with an increased need for data protection. European and national legal provisions regulate both the user group and the access channels to microdata and oblige data providers and data recipients to maintain data confidentiality at all times. Therefore, the overriding principle of the work of INEXDA is compliant with the respective statutory secrecy and data protection requirements, and thus maintaining the confidentiality of the information submitted by the reporting agent.

**Figure 1 • Overview of participants and important outcomes of the first three INEXDA meetings**



## 4 The current INEXDA work programme

For the current work programme, INEXDA members have decided to find a balance between keeping the momentum and not being overly ambitious. Therefore, INEXDA has identified eight potential topics for the work programme:

- 1 Dissemination (of granular data)
- 2 Metadata (see section 4.1 for a brief overview)
- 3 Tools for supporting the work of INEXDA members (ADRF, see section 4.2 for a brief overview)

- 4 Modes of accreditation (see section 4.3 for a brief overview of items 4, 5, and 6)
- 5 Contracts for research projects/bodies
- 6 Modes of data provision
- 7 Output control
- 8 Risk management for published results

INEXDA aims to have an agile structure, so the topics of the working programme should produce tangible results after six months as a minimum. Besides these activities and the contribution of INEXDA to the 9th biennial IFC Conference, INEXDA will also make contributions to the 2018 Conference of European Statistics Stakeholders (CESS) in Bamberg, and the 62nd ISI World Statistical Congress in Kuala Lumpur in 2019.

#### 4.1 Comprehensive inventory of data in member institutions

From the start, the INEXDA network has collaborated to harmonise metadata structures by conducting extensive stock-taking of available data sets in member institutions. The goals are:

- 1 to provide an overview of available and potentially comparable granular data sets from participating institutions;
- 2 to enable data users to discover and use appropriate data sets for their own research and analyses, which the participating institutions agree to share;
- 3 and to prepare a framework to facilitate a possible harmonisation of data sets in the (near) future.

Because the descriptions of the data should be comparable, an agreement on a metadata schema for the granular data was established between all members. To this end, the INEXDA metadata schema closely follows the da|ra metadata schema (version 4.0), which was jointly developed by the GESIS – Leibniz Institute for the Social Sciences and the ZBW – Leibniz Information Centre for Economics. The INEXDA metadata schema is designed to provide metadata for microdata at the data set level.

Adapting an existing metadata schema to fit the purpose of INEXDA provides a level of standardisation for microdata produced in different countries, institutions, and with different aims. Furthermore, the interoperability of the INEXDA metadata schema with the da|ra metadata schema allows for seamless transition between the INEXDA and da|ra databases, which makes it easier to obtain digital object identifier (DOI) for datasets in the future.

All INEXDA members agreed on a metadata schema, which, first, describes the data sets in a comprehensive way for the purposes mentioned above. Second, the schema is easy to use for potential users and data producers. It should be noted, that the metadata schema revolves around a “standardised data set”, which is a snapshot of data produced in an institution (eg credit register) taken at a certain point in time (e. g. 1999-2017). To this end, INEXDA devised 21 items for its metadata schema (see table 1).



**Table 1 • The INEXDA metadata scheme**

<b>1</b>	Resource Type
<b>2</b>	Resource Identifier
<b>3</b>	Name of Dataset
<b>4</b>	Creator
<b>5</b>	DOI Proposal
<b>6</b>	URL
<b>7</b>	Language of Resource
<b>8</b>	Publication Date
<b>9</b>	Availability
<b>10</b>	Sampled Universe
<b>11</b>	Sampling
<b>12</b>	Temporal Coverage
<b>13</b>	Time Dimension
<b>14</b>	Collection Mode
<b>15</b>	Unit Descriptions
<b>16</b>	Descriptions
<b>17</b>	Geographical Coverage
<b>18</b>	Keywords
<b>19</b>	Alternative Identifiers
<b>20</b>	Relations
<b>21</b>	Publications

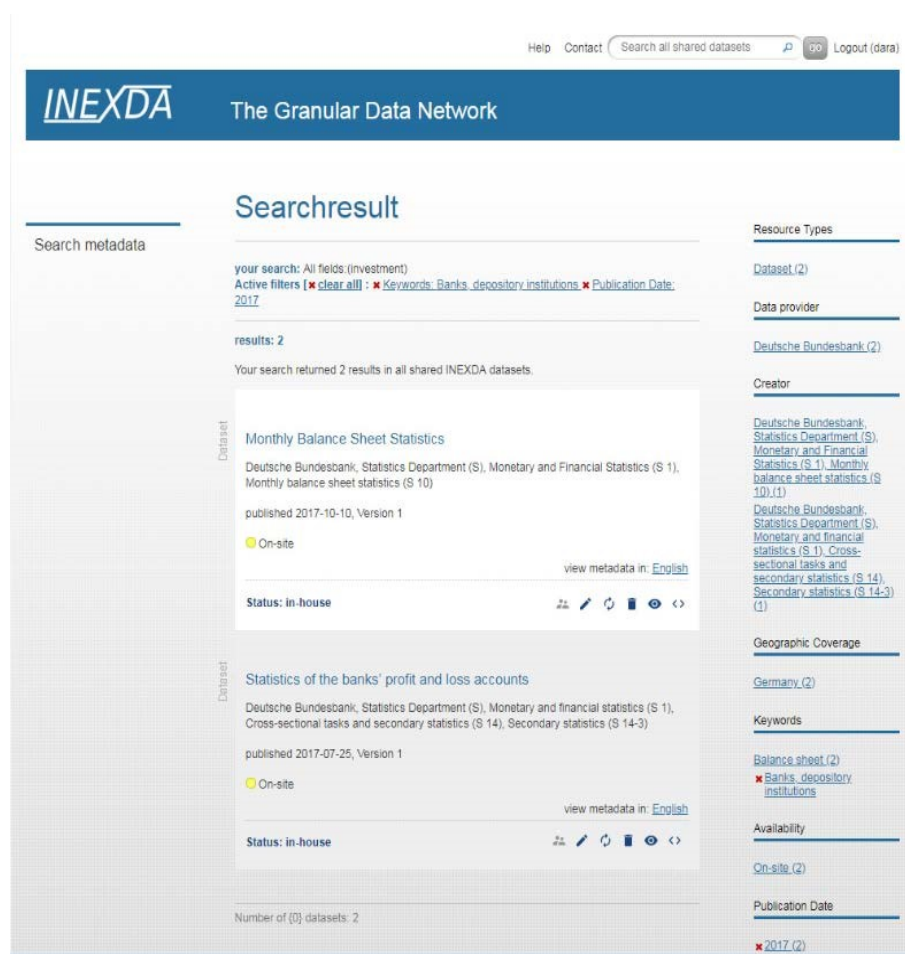
Furthermore, INEXDA has created a platform (see figure 2) for collecting and exchanging the metadata information produced during the inventory. This platform is available to all INEXDA member institutions. The platform is being developed jointly with GESIS.

Because of its sensitive nature, microdata are always subject to protection of confidentiality of individual observations. Metadata about microdata also have to adhere to the same high standards when it comes to protecting confidentiality. INEXDA's metadata system is designed to address these issues.

#### **4.2 Evaluating tools to support INEXDA's harmonisation process**

While the highest priority is given to completing the inventory of available data described in 4.1, the investigation of harmonisation possibilities at other levels of the data lifecycle (eg access procedures and registration processes) remains an important task in the current INEXDA work programme. Standardised software applications could be a way forward, as these would not only facilitate communication between the INEXDA partners but also help to maintain common standards.

Figure 2 • Hypothetical example of the INEXDA Metadata Platform



The New York University (NYU) has established, under the assignment of the Bureau of the Census, the Administrative Data Research Facility (ADRF), which provides a set of analytical tools, data storage and discovery services, and general computing resources based on cloud solutions for a diverse set of users, including government analysts and researchers. As the ADRF framework is considered to be potentially very useful for the harmonisation process, INEXDA will consider cooperation with NYU.

### 4.3 Taking stock of the access procedures and registration processes for researchers

One overarching goal of INEXDA is to provide a basis for exchanging experiences on the accessibility of data, procedures for data confidentiality, and security of data. Since access to microdata is in the scope of official statistics, INEXDA will benefit from national and international experiences to shape the outcome of this work stream. In the context of INEXDA, and following up on a survey of the Working Group of Statistical information Management (WGSIM) of the European System of Central Banks (ESCB) on national central banks' (NCBs) approaches to granting external researchers access to confidential data for research purposes, Emily Witt and Jannick Blaschke (ECB) conducted interviews with several central banks (Oesterreichische Nationalbank, Deutsche Bundesbank, Banco de España, Banque de France, Banca d'Italia, De Nederlandsche Bank, Banco

de Portugal, Central Bank of the Republic of Turkey, Bank of England, European Central Bank, and Eurostat. The result is an overview<sup>7</sup> of selected NCBs' and Eurostat's approaches to providing access to non-published granular data for research purposes that complements other work in this area.<sup>8</sup>

Besides international experiences, national experiences are helpful in identifying the best practices with regard to access to microdata. For example, the Deutsche Bundesbank recently provided an overview of the microdata access procedures used, where three different user groups of microdata have been identified (internal analysts, internal researchers, and external researchers). The paper (Schönberg (2018)) described different access modes for each user group in detail. A unit called Internal Service for Micro Data Analysis handles internal analysts' data access requests following a multilevel approach (modelled after the European System of Central Banks (ESCB) standard approach).

At the end of August 2018, INEXDA will likely start a working group focusing on best practices how data users could be allowed to access granular data once they have completed the accreditation process and have signed all relevant contracts. The task of this working group is to take stock of existing models of data provision used by INEXDA members. Possible topics may include:

- data access via secure access facility and/or remote access (eg technical design and specifications of limitations);
- anonymisation of methodologies and tools;
- provision of services to external researchers (eg provision of standard or ad hoc data sets, linkage of various data sets, upload of external data sets, access to licensed data sets);
- provision of analytical tools and allowing/facilitating code sharing.

#### 4.4 INEXDA web page

A web page for the network will be launched by the end of 2018. The website is intended to be independent of the signing parties' websites and, to this aim, the following domains were reserved: [www.inexda.org](http://www.inexda.org); [www.inexda.com](http://www.inexda.com).

## 5 INEXDA working arrangements

The members of INEXDA have implemented the following working arrangements.

- All decisions are made on a consensual basis;
- The work within INEXDA will be performed at the operational levels of the member institutions;
- INEXDA members convene at least once per year. Guests may be admitted to meetings. A pre-meeting will be organised prior to each INEXDA meeting for the purpose of inviting INEXDA guests to discuss the progress INEXDA has made so far;
- The chair of INEXDA is elected for a two-year term on a consensual basis. Responsibilities of the chair include co-organising the meetings in close collaboration with the local organiser, coordinating activities, and drafting a report at the end of the chairmanship, which has to be agreed on a consensual basis;
- The eBIS facility operated by the BIS provides the centralised location for exchanging documents and fostering collaborative activities among INEXDA members.

<sup>7</sup> The participating interviewees agreed to share the results with INEXDA members and guests.

<sup>8</sup> For example, the "Guidelines for the assessment of research entities, research proposals and access facilities" (Luxembourg, November 2016) from the European Commission, Eurostat, Directorate B: Methodology; Corporate statistical and IT services, Unit B-1: Methodology and corporate architecture, or the results from the FP7 project "Data without Boundaries" (DwB, see <https://www.facebook.com/dwbproject>).

## 6 The INEXDA application process

The following procedure has been established for admitting new members. It is mandatory for institutions that want to join INEXDA to have a representative attending at least one INEXDA meeting in person before submitting a formal application. The application letter should be signed by the head of the statistical department of the respective institution (or, in the case of national statistical institutes or international organisations, by the head of the responsible department) and sent to the chair of INEXDA. Any application to join INEXDA from a new institution and the signing of the MoU must be agreed by all members.

Furthermore, the applicant institution is invited to attend an INEXDA meeting to give a presentation on the current state of its granular data sharing and its motivation for becoming a member of INEXDA.

## 7 Conclusion

The International Network for Exchanging Experience on Statistical Handling of Granular Data (INEXDA) was founded to facilitate active dialogue on practical experiences – in particular on the accessibility of granular data – metadata, and techniques for statistical analysis and data protection. Until recently, the network was predominantly focused on establishing a metadata schema and conducting a comprehensive inventory of data in member institutions. In the next phase of the work programme, access procedures and registration processes for researchers will come to the forefront of INEXDA's activities.

The overall aim is to facilitate the international use of granular data for analytical, research, and comparative purposes without jeopardising and always subject to the respective applicable confidentiality regimes.

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## Appendix A: List of INEXDA members and INEXDA guests (as of 31 July 2018)

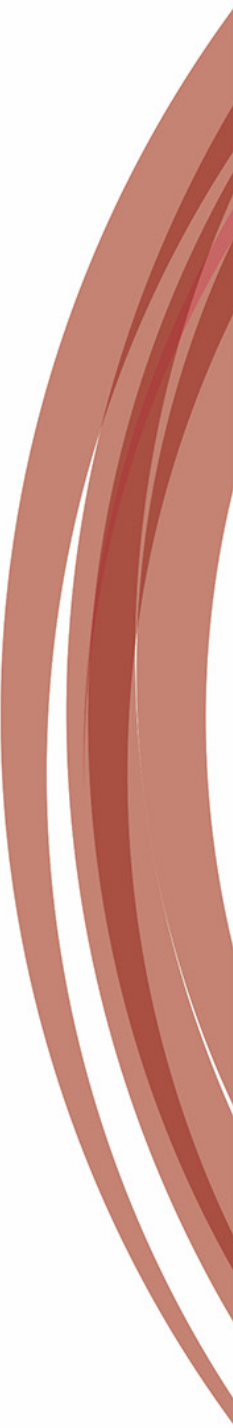
INEXDA members are institutions that have signed the MoU. INEXDA guests are institutions that have participated or have confirmed participation in at least one INEXDA meeting but have yet to sign the MoU.

INEXDA members:

- Banca d'Italia
- Banco de España
- Banco de Portugal
- Bank of England
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## II Commitment to quality

How to turn quality into a habit  
in the statistical production?

Boomerang effect of quality control  
on the compilation of Financial Accounts  
and flow of funds:  
The experience of Banco de Portugal





# How to turn quality into a habit in the statistical production?<sup>1</sup>

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## **Abstract**

One of the main purposes of the Statistics Department of Banco de Portugal is to ensure a statistical production with high quality standards aiming at fully meeting users' needs, aligned with the best practices and procedures recommended by the international organizations. Following its commitment to quality, one of the Bank's priorities is to develop a wide set of quality control procedures that ensure high levels of regular and thorough review of the key statistical outputs.

Statistical quality control is based on different procedures and working arrangements that make sure that processes are effective and efficient and the risks are mitigated. In order to achieve higher quality statistics, there are several quality indicators performed by the primary statistics' compilers.

This paper will present the main quality indicators used and the ongoing process to improve the model of regular and systematic quality controls.

**Keywords:** statistical quality control, quality assessment, quality indicators.

<sup>1</sup> The opinions expressed in the article are those of the author(s) and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the author(s).

# 1 Introduction

The statistical data published by Banco de Portugal complies with the quality management guidelines and best practices laid down in national and international documents like ESCB Public Commitment, European Statistics Code of Practice, ECB Statistics Quality Framework, and IMF Data Quality Assessment Framework (DQAF). DQAF includes a set of prerequisites, and five dimensions of data quality: (i) assurances of integrity, (ii) methodological soundness, (iii) accuracy and reliability, (iv) serviceability and (v) accessibility.

With these dimensions in mind, Banco de Portugal statisticians have implemented effective and efficient statistical procedures throughout the statistical production chain, in line with principle 8 of ESCB Public Commitment - *“Appropriate statistical procedures”*. Moreover, their routines are driven by *“High output quality”* principles (towards relevant, accurate, reliable, timeliness, consistent and accessible statistics).

Nevertheless, it is difficult to assess to what extent they are daily engaged to principle 4 of the same document - *“Commitment to quality”* (it systematically and regularly identifies strengths and weaknesses to continuously improve process and product quality). For that purpose, Banco de Portugal is currently defining a model of quality indicators to systematically measure the quality of its statistical systems and outputs.

Turning the performance of **quality indicators into a habit** will allow to: (i) document quality control procedures, (ii) make comparisons amongst different statistical domains and along time series, (iii) reveal the weaknesses of the systems, and (iv) set priorities when planning the statistical activities for the coming years.

In *“The Power of Habit”* by Charles Duhigg, the award-winning business reporter for *The New York Times* explains why habits exist and how they can be changed. *“The process within our brains is a three-step loop. First, there is a **cue**, a trigger that tells your brain to go into automatic mode and which habit to use. Then there is the **routine** (...). Finally, there is a **reward** (...).”* When figuring out how to spark a craving, the author argues that it is easier to convince someone to adopt a new behaviour, if the same cue and reward is kept.

To foster new habits, the new routine that comes with the proposed model of quality indicators must be easy to implement, and it must be accepted by all stakeholders as an added value process.

## 2 The Cue

Whenever a new production cycle begins, the cue for statisticians in the Statistics Department of Banco de Portugal is to produce high quality statistics, following the motto of Banco de Portugal's Strategic Plan for 2017-2020: *“Always do better”*.

## 3 The Routine

To pursue this objective (high quality statistics), the Statistics Department of Banco de Portugal created the Statistics Audit Unit (SA Unit) in 2004, with a specialized team responsible for regularly assessing data quality and legal provisions' full compliance. One of the ways to address statistical quality control is carrying out **statistics audit operations**, with the purpose of evaluating the efficiency of procedures in place, and promoting the sharing of good practices.

Once a year this Unit also produces **statistics quality reports** (compiler oriented) for the main statistics to assess the quality of the current statistical compilation and, ultimately, to identify opportunities for improvement and future developments towards statistical efficiency.

**After all that is being done, what is missing?** Quality reports shed light on systems' constraints and include suggestions/recommendations to change and improve current practices. But since they are annually produced, during most part of the year, statistical producers stay focused on presenting results for a specific domain, and a specific time period, following the same specific quality controls. One might think *"if a thing ain't broken, don't fix it"* but this should not prevent statisticians to dedicate time to re-think routines and pursue new best practices.

That is why consideration is being given to changing the actual routine and turn these annual quality reports into a regular model of indicators, ready to be quickly and systematically updated by statistics compilers.

## 4 Examples of regular quality indicators

First and foremost, it must be stressed that this model is a preliminary and non-exhaustive proposal of the SA Unit, still to be thoroughly discussed with the production units prior to its implementation.

In this exploratory study, the ongoing model of regular quality indicators consists of:

- Indicators already produced in annual quality reports (or during the production cycle) and new indicators queued for further implementation;
- Indicators computed with a quarterly frequency, but respecting the periodicity of the underlying statistic/phenomenon (i.e. monthly statistics should have monthly indicators, produced with a quarterly frequency);

**Comparable indicators across domains as well as domain specific indicators.**

The model should be divided into seven categories:

- Pre-requisites of quality (PR);
- Accuracy and completeness (AC);
- Plausibility and outlier analysis (PO);
- Reliability and revision studies (RR);
- Consistency (C);
- Timeliness and punctuality (TP); and,
- Accessibility (A).

These categories were inspired by DQAF but adjusted to better fit the statistical domains' idiosyncrasies, and produce more intuitive and measurable results. For each category, a brief explanation and a preliminary, non-exhaustive, sample of indicators is therefore presented (symbols classify the actual status of indicator's performance: • – already exists; ○ – to be implemented; ●/○ – exists but not in a systematic way).

**Pre-requisites of quality:** (i) indicators are in place to evaluate the degree to which legal and institutional environment is supportive of statistics and resources are commensurate with statistical programs and used efficiently; (ii) existing statistics are regularly checked to ascertain whether they can be produced in a more cost-effective way or the burden on reporting agents can be reduced).

PR1. Number of aborted or failed job runs in IT systems (per month)	o
PR2. Percentage of confidential statistical information series flagged (as at the last reviewing date)	o
PR3. Number of days assigned to data exploration stage (per month)	o
PR4. Number of accesses to databases	•

Regarding PR6, a comprehensive list of granted accesses to statistical databases is validated and updated on a yearly basis, as a control activity within the rules on data confidentiality and to ensure the integrity of information.

**Accuracy and completeness:** (i) source data and statistical techniques are sound and statistical outputs sufficiently portray reality; (ii) the largest and most material subset of the required information is available).

AC1. Percentage of estimated non-response
AC2. Percentage of adjustments/imputation to stocks at the end of period (breakdown by reporting entity, by country <sup>2</sup> , by institutional sector <sup>3</sup> , by unit records)
AC3. Percentage of failed 1 <sup>st</sup> level data checks until the version used in the production stage (breakdown by reporting entity)

Data checks referred in indicator AC3. are only applicable to statistics with direct report (i.e. monthly MFI<sup>4</sup> and BOP<sup>5</sup> data) and include, for instance, tests on basic logical identities.

**Plausibility and outlier analysis:** (i) the absence of unjustified outliers in data; (ii) values that markedly deviate from the usual pattern of the series are detected, isolated and further analysed).

PO1. Monthly rate of change in stocks/transactions/OCVP <sup>6</sup> greater than X% (breakdown by instrument type, by institutional sector debtor and/or creditor, by reporting entity)	•/o
PO2. Year-on-year rate of change in stocks/transactions/OCVP greater than X% (breakdown by instrument type, by institutional sector debtor and/or creditor, by reporting entity)	•/o

<sup>2</sup> As defined by ISO 3166-1 country code.

<sup>3</sup> As defined in ESA 2010.

<sup>4</sup> Monetary and financial statistics.

<sup>5</sup> Balance of payments statistics.

<sup>6</sup> Other changes of volume and prices.

Monthly and year-on-year rates are generally computed during the production cycle, when statisticians validate their first estimates. But the systematic documentation, respecting comparable standards, as well as the calibration of thresholds (X%) by phenomenon, and statistical domain, is still to be defined.

**Reliability and revision studies:** (i) revised values of statistic are close to the initial value released; (ii) revisions are tracked and mined for the information they may provide)

RR1. MAPE - Mean Absolute Percentage Error	•
RR2. MARE - Mean Absolute Relative Error	•
RR3. Q - Directional Reliability Indicator	•
RR4. RMSRE - Root Mean Square Relative Error	•
RR5. Bias component	•
RR6. Regression component	•
RR7. Disturbance component	•

These indicators are currently computed by SA Unit for annual quality reports purposes and for Key Risk Indicators' (KRI) monitoring. According to this new paradigm, their inclusion in the model of quality indicators represent an opportunity for statistical compilers to regularly, and almost automatically, compute them, anticipating deviations and mitigating risks at source.

The choice of additional items/balance sheet aggregates to be tested is yet to be discussed with each statistical domain.

**Consistency** (logical and numerical coherence, including consistency over time, within datasets, across datasets, and comparisons with external data)

C1: First difference of the series between growth rates of change in stocks/transactions/other changes in volume and price (breakdown by instruments, balance sheet items – MFI, or functional categories - BOP)	o
C2: Difference between EO <sup>7</sup> series and lower and upper threshold of 3% of current account turnover (only applicable to BOP)	•/o
C3: Cross-checks between main balance sheet items in statistical MFI balance sheet information (BSI) and supervisory data in FINREP <sup>8</sup> (only applicable to MFI)	o
C4: First difference of the series between goods credits and debits in BOP statistics, and exports and imports in international trade statistics, or between their growth rates (only applicable to BOP)	•/o

<sup>7</sup> Net errors and omissions.

<sup>8</sup> Prudential reporting requirement of financial information enshrined in Implementing Regulation (EU) No 680/2014, published by the European Banking Authority (EBA).

In fact, a set of other consistency indicators can be generally defined as “Cn: First difference of the series between prime source (S1) and secondary source (S2)”. Whenever this kind of indicator is computed by one statistical domain where S2 becomes S1, the results must be compatible with its “mirror” indicator.

**Timeliness and punctuality** (the length of time between its availability and the event it describes; the time lag between the release of data and the target date announced in official release calendar)

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TP1. Punctuality of time schedule of effective publication (in days)	•
TP2. Time lag between the end of reference period and the date of the first/final results (in days)	•

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Combining indicator TP2. for timeliness with the number of BPstat<sup>9</sup> consultations by statistical domain highlights the relevance of their statistics for users, given the time lag for publication.

**Accessibility** (the availability of statistical information to the user, including data and metadata accessibility, and assistance to users)

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A1. Number of series disseminated (in BPstat)	•
A2. Number of statistical press releases disseminated	•
A3. Number of media content related with statistics published on website (videos, infographics, explainers)	o
A4. Total BPstat consultations by statistical domain	•
A5. Number of published news by statistical domain	•
A6. Number of requests for information or clarifications answered, by statistical domain	•
A7. Quality assessment punctuation from data users satisfaction surveys	o

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BPstat will soon be substituted by a dedicated website (a statistics portal) that will allow for greater user-friendliness and interactivity with the users. At that time, indicator A7. should be implemented with a reasonable periodicity.

**What are the next steps?** Indicators should be exhaustively characterised, tolerance intervals should be defined and main sources must be selected and prepared for regular computation. Comparable indicators, across statistical domains, should be distinguished from those which are specifically related to one domain. In addition, data owners, responsible for updating indicators, must be assigned.

<sup>9</sup> The “BPstat” is a dissemination service of Banco de Portugal that provides statistical information (data and metadata) organised in domains and allowing for both time series and multidimensional exploration.

Further possible developments may include the definition of harmonized rules to generically compare the overall quality of each statistical system. The quality assessment exercise should complement automatic results with casuistic analysis.

Finally, the Statistics Department Board, the SA Unit and the staff of statistical domains should reflect together over the evolution of indicators, and contribute to improve the model.

## 5 The Reward

Like a carrot and stick method, a good quality indicators' model offers several rewards to data users and providers, to the Statistics Department Board, to intermediate managers and staff.

To **data users and providers**, this model shows that:

- A robust set of indicators can quickly assess users' changing demand for information and help to deliver tailor-made statistics;
- Successful tests to external consistency might reveal new opportunities to integrate and merge information from different sources, hence **reducing the reporting burden** to data providers.

To the **Statistics Department Board**, quality indicators represent:

- A valuable management tool to **keep track of key performance indicators** (KPI) and key risk indicators (KRI);
- A way to raise awareness to their need to intervene and implement new tools and procedures;
- A key management **information when prioritising the investment** in IT solutions (software, hardware) and in specialised human resources (training).

From the perspective of statistical domains, a new routine will only be embraced if **managers and staff** believe in the reward. Their benefits can be listed as follows:

- Intermediate managers will have tools to evaluate the quality of their statistical system and the effort put by their teams;
- Statistical domains are encouraged to continuously monitor the quality of their outputs, rather than answering to quality reports' results on an annual basis;
- The staff becomes able to compare their work with their peers;
- In order to **anticipate opportunities for improvement**, staff might feel encouraged to reroute the calculation of indicators from published data to acquisition/production databases;
- It ultimately makes processes more efficient, leaving the staff with **more time to focus on their core business, data analysis and research**.

High quality statistical systems provide for more focused and motivated statisticians craving for high quality statistics.

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# Boomerang effect of quality control on the compilation of Financial Accounts and flow of funds: The experience of Banco de Portugal

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## **Abstract**

Financial Accounts are fundamental to monitor financial stability by quantifying the impact of financial decisions of a host of economic agents. In Portugal, the compilation of these statistics is a responsibility of Banco de Portugal. One of the main purposes of the Statistics Department of Banco de Portugal is to ensure this statistical production with high quality standards, aiming at fully meeting user's needs, by developing a wide set of quality control procedures.

Financial accounts are derived statistics stemmed from a vast array of other primary statistics, including balance of payments and monetary and financial statistics. In this context, Banco de Portugal developed a multidisciplinary team with experts from financial accounts and from the different underlying primary statistics. Within this format, all team members are co-responsible for producing national financial accounts, on a bottom-up approach, thus improving both the quality of these statistics, as well as the quality of primary statistics. This is the result of a systematic iterative process of data cross-check and reconciliation which may represent an opportunity to validate the soundness of microdata, on a top-down approach. To better understanding economic sectors' interlinkages and to assess how intersectoral financial linkages have changed, flow of funds is a powerful analytical tool.

**Keywords:** quality control, financial accounts, matrix management, data cross-check, flow of funds.

# 1 Introduction

In a context of an increasingly complex economic and financial reality, the National Financial Accounts (hereinafter referred as “financial accounts”) are fundamental to monitor financial stability by quantifying the impact of financial decisions of the economic agents. National financial accounts provide an overall view of the financial interlinkages between institutional sectors helping in the identification of sector vulnerabilities, imbalances and potential over-exposures to certain financial instruments.

The statistical function of central banks is changing and it is important to develop solutions that contribute to enhance the effectiveness and efficiency of its statistical system. In this context, the quality of the financial accounts statistics is a priority for Banco de Portugal, which is the competent statistical authority in this domain. To follow this purpose, the Statistics Department developed a multidisciplinary team with experts from financial accounts and from the different underlying primary statistics. This new approach established a cooperative work, with a positive impact on the quality and consistency among the various statistics produced in Banco de Portugal.

## 2 Methodological framework

Financial accounts are one of the components of the national accounts that records two kinds of information, flows and stocks, between the different institutional sectors of the economy and between these sectors and the “rest of the world”.

These statistics are prepared in accordance with the guidelines set out in the European System of National and Regional Accounts (ESA 2010) – Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013.

Accordingly to ESA 2010, “flows refer to actions and effects of events that take place within a given period of time, while stocks refer to positions at a point of time”. Stocks (also referred as positions or outstanding amounts) are the holdings of assets and/or liabilities at a given point of time, recorded at the end of each accounting period.

Institutional sectors are economic agents, or “institutional units”, with the same economic role, grouped according to the sectorial classification rules of ESA 2010, based on the type of producer, function and main activity: non-financial corporations, financial corporations, general government, households and non-profit institutions serving households and, rest of the world.

Financial accounts are broken down by financial instruments, such as: monetary gold and special drawing rights; currency and deposits; debt securities; loans; equity and investment fund shares or units; insurance, pensions and standardised guarantee schemes; financial derivatives and employee stock options; and other accounts receivable and payable.

The accounting principle underlying the national accounts is a quadruple-entry principle, i.e. each operation must be entered twice by the two parties involved.

The financial accounts are considered derived statistics as they are based on a vast array of other primary statistics, including, in the case of Portugal, balance of payments and international investment position statistics, monetary and financial statistics, central balance sheet statistics, securities statistics and central credit register statistics.

Although the main data sources are internal to Banco de Portugal, external data sources are also used, such as the information provided by the Portuguese Insurance and Pension Funds Supervisory

Authority, the Portuguese Treasury and Debt Management Agency and, the Portuguese National Statistical Institute (Instituto Nacional de Estatística - INE). Actually, INE is responsible for compiling the national non-financial account, while Banco de Portugal takes the responsibility for the compilation of the national financial account (Banco de Portugal already produced a cluster of statistics that is necessary for compiling financial accounts), following a protocol signed in 1998 between Banco de Portugal and INE. This protocol provides for the establishment of mechanisms of cooperation, mutual consultation and methodological discussion on the compilation of national accounts, in particular regarding the harmonised implementation of the European System of National and Regional Accounts. This interaction leads to better quality in the two types of accounts.

Due to this aggregation of multiple sources of information, financial accounts provide a picture of the impact of financial decisions among the different economic agents. These statistics provide an overall view of the financial interlinkages between institutional sectors, helping in the identification of sector vulnerabilities, imbalances and potential over-exposures to certain financial instruments. In Portugal, this kind of analysis turned out to be very useful in a context of the global financial crisis, because it enables an overview of the degree of intermediation of the financial sector and of the structure of private sector wealth. With these statistics it is possible to measure the relationships and interconnections between the different institutional sectors of the economy and to monitor their exposure to different risks.

To better understand economic sectors' interlinkages and to assess how intersectoral financial linkages have changed, flow of funds is a powerful analytical tool. This type of analysis allows to detail the data by counterpart sector and type of financial instrument, identifying specific economic behaviours. It enables to analyse intersectoral relationships among the resident sectors of an economy and between these and the rest of the world.

At this point, flow of funds are a subset of the financial accounts, as it allows to establish the net transactions between the different institutional sectors. This data gives the user an overall picture of the whole economy, since financial accounts, by being at the end of the cycle, is the only system where all sectors of the economy are put together in an integrated system.

### 3 A multidisciplinary team

One of the main purposes of the Statistics Department of Banco de Portugal is to ensure the production of high quality statistics and to provide a more efficient data quality management in statistical systems, developing a wide set of quality control procedures.

Following this purpose of high quality standards, the Portuguese solution to compile national financial accounts was to develop a multidisciplinary team, with experts from financial accounts and from the different underlying primary statistics.

This multidisciplinary team, that involves the different statistical domains, was created by the end of 2009, with national financial accounts experts, permanently allocated to financial accounts' tasks, and two experts of each underlying primary statistics (one effective and one substitute). It is chaired by the National Financial Accounts Head of Division of Statistics Department.

This new organizational model of compiling financial accounts can be easily transposed to any kind of organization where the final goal is to improve quality and consistency. This can be seen as a project organisation where management structures coexist in the form of a matrix management structure, instead of a traditionally hierarchy management organisation. Despite all its advantages, this kind of organisational model is nevertheless more demanding in terms of coordination.

This multidisciplinary team turns out to be very efficient as all members are actively engaged in collectively contributing to the end-product, producing a high quality output. It is a collective effort that benefits from the expertise of the technicians of each primary statistics in analysing the specific data of their domain. For instance, experts from the Central Balance Sheet Statistics Unit provide not only primary data but are also specifically responsible for the compilation of the non-financial corporations sector account, and are more generally co-responsible for national financial accounts (Matos, 2016).

The responsibility of the compilation of financial accounts is shared by all team members and distributed as follows:

- The compilation of each institutional sector is provided by the statistical area that is responsible for the majority of primary data. For instance, the compilation of financial accounts of general government is allocated to the General Government Statistics Unit; and the compilation regarding the financial sector is a responsibility of the Monetary and Financial Statistics Division;
- The securities statistics data is provided by the Securities Statistics Unit;
- Methodological definitions and procedures are a responsibility of the Methodological Statistics Unit in cooperation with the Financial Accounts Unit;
- The final management of financial accounts, namely the aggregation of all statistical institutional sectors data and the disclosure of national financial accounts outputs to final users, is a responsibility of the Financial Account Statistics Unit.

Since managing such a multidisciplinary team is not an easy task, Banco de Portugal has been adopting a stepwise approach, since 2009. It has been a “work in progress” system, as it turned out to be very useful in developing new ways of improving quality, not only for the final statistics output of financial accounts, but also for primary statistics.

For instance, when ESA 2010 was implemented, financial accounts faced the need of implementing a new information system compliant with the new recommendations. This was also the opportunity for improving the financial accounts compilation system. Instead of developing a new system within the Unit, all the members of this multidisciplinary team were involved. The benefits were clear: the system was defined with a minuteness detail because each team member developed their procedures in the new system attending the needs of the new guidelines. On another hand, the consistency between primary statistics and this ones, as well as with the previous and the final output of financial accounts was preserved and guaranteed.

This multidisciplinary team has faced, during the later years, several improvements, not only concerning the system underlying the compilation procedures, but also in the management of resources. The final goal is always to improve quality and increase process efficiency.

Besides the quality improvements, there are also several costs due to the complexity involved with the coordination and management of such a team. First of all, this kind of work organisation must have a very good planning calendar, and hierarchic managers and multidisciplinary team managers must agree over the allocation of resources. One of the main problems that this kind of organisation structure may face is the risk that the team members receive conflicting tasks. To avoid this kind of conflicts, priorities must be agreed and all team members must be aware of their roles. Their activities must be settled in each team member annual planning, for both matrix management and hierarchy management, and should be captured and reflected in their performance evaluation. Managing people with more than one reporting line is a big challenge and it is very important to clarify who has the responsibility to evaluate the performance of each team member for which task.

## 4 Boomerang effect

This new method of compiling financial accounts, which can be easily described as a bottom-up and top-down approach, can generate many benefits, ensuring a high quality of the financial accounts outputs, as well as a better quality of primary statistics. Thus, experts gain a global insight of how their data affect other statistics and are able to take interrelated and synergic combined final decisions.

The main result of this boomerang effect is to take advantage of the interaction and cooperation between the different statistical areas, to ensure the quality and establish different levels of responsibility in the compilation of financial accounts. This is achieved by separating the data processing activities from the activities of analysing and exploring the information. However, this multidisciplinary team shares the responsibility for the entire production cycle of the compilation of financial accounts.

This approach encourages the cooperative work between the different areas of the statistics department, and promotes a more efficient contribution of the primary data to the financial accounts compilation. It also avoids duplicating the tasks of compiling data for the primary statistics in one moment, and after that compiling the same information for the compilation of financial accounts purpose. On another hand, the primary statistics benefit from the concerted data produced by the compilation process of financial accounts. This boomerang effect is an opportunity to implement not only internal quality control procedures, but also to ensure consistency between statistics produced.

This results on a systematic iterative process of data cross-check and reconciliation which may represent an opportunity to validate the soundness of micro data, on a top-down approach. It promotes the consistency of the financial accounts between the institutional sectors, because, for all instruments, the assets of one sector must be equal to the liabilities of the counterpart sector. Thus, the validation of the final output of financial accounts must fulfil horizontal and vertical consistency.

Horizontal consistency is an internal validation that ensures inter-sector consistency for the different types of information, while vertical consistency certifies that financial accounts outputs are consistent with final data of the primary statistics, despite the discrepancies that may exist due to different methodological processes.

The multidisciplinary team can serve the purpose of different statistical domains. First of all, primary statistics feed the system with data that is an output of their own compilation process, which have already met the first level of quality control tests within their respective production cycle.

It is important to refer that primary statistics are the owners of granular information concerning the institutional sector that they are responsible for. This granular data is often stored into different micro databases, which are a powerful tool with a high statistical potential. For instance, Monetary and Financial Statistics comprise the Balance Sheet Information on Financial Corporations that has granular information on assets and liabilities of the sector; the Balance of Payments and International Investments Position system has micro data on the assets and liabilities of the rest of the world sector; the Central Credit Register contains granular information on credit exposure and loans to all sectors of the economy; the Securities Statistics Integrated System is a security-by-security and investor-by-investor database of securities holdings and issues; the Central Balance Sheet Database contains accounting and financial information of non-financial corporations.

On the other hand, the Financial Account Unit can input into the system the information they need with a high quality standard, as the information is already confirmed and validated by the respective primary statistic's owners. This process provides more complete and detailed statistics, aiming at fully meeting user's needs, with high quality standards of the final output.

Additionally, the potential problems and inconsistencies among primary statistics are analysed before the final compilation of the financial accounts and all the institutional sectors take combined decisions aiming at the internal and external consistency of the final results.

Ultimately, this joint coordination effort requires also an alignment of the revisions policy for statistical domains involved.

## 5 Concluding remarks

"Good statistics are a precondition to good policy-making" (Matos and Nunes, 2017), and the way Banco de Portugal achieved this goal in National Financial Accounts was through the creation of a multidisciplinary team that has been a success in the compilation of these statistics.

Although demanding in terms of management, this new method has proved to improve the consistency between statistics as well as the quality of primary and final financial accounts statistics disseminated. Users' needs are thus more easily met, allowing for greater integration and consistency between the different statistical products.

The success of this multidisciplinary team work is confirmed by a more efficient production process and a higher quality output.

It can be viewed as a boomerang effect, as the final output of financial accounts is also likely to provoke a number of second-order consequences, namely the better quality and coherence of primary statistics, and raise awareness of primary statistics compilers (also part of the financial accounts compilation team) to what needs to be done as preparatory work for producing consistent statistics.

The other side of the coin of this matrix organisational structure relates to the challenges in terms of planning and management. However, the Portuguese experience provides evidence that such costs are clearly outweighed by the benefits.

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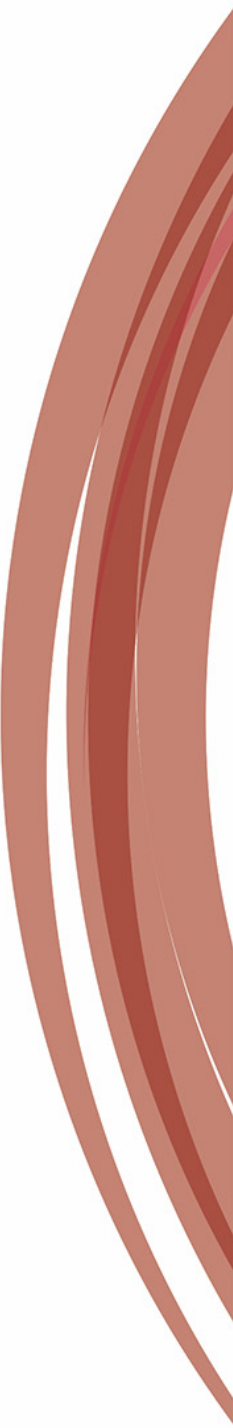
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How does innovation lead to growth? Available at <http://www.ecb.europa.eu/explainers/tell-me-more/html/growth.en.html> (Accessed April 2018)







## III Commitment to Communication

Storytelling: adding value to numbers



# Storytelling: adding value to numbers

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## **Abstract**

One of the biggest challenges of statisticians working with official statistics is to develop the ability to translate collections of information into guidance for citizens, so they can make informed decisions. In this paper we present storytelling and data visualization as powerful tools to make data meaningful, using Balance of Payments as an example.

**Keywords:** Storytelling, Visual communication.

One of the main challenges of statistical authorities is to sensitize common citizens that statistics are relevant because they contribute to improve their quality of life by allowing people to be more informed and, consequently, to make better decisions. Advances in technology are enabling statistical producers to collect larger amounts of data. However, having all these numbers adds difficulty to the task of communicate them, since it makes harder to filter which information is relevant for whom. According to Knaflic (2015) people take about 3 to 8 seconds to decide whether they continue to look or they leave what they have in front of them. Because of that, being able to tell stories and to create effective data visualizations is instrumental to succeed in communicating with data. Accessible statistics must be easy to interpret and understand: when our visuals seem complicated or uninteresting we run the risk of losing our audience. Introducing exaggerated complexity could make people uncomfortable, since they feel that they are not able to follow our message. A good graph and a good story must, above all, consider the needs of the user rather than those of the statistician finds. Creating legible and clean visualizations, using simple language or removing unnecessary complexity, is not oversimplifying, but rather not making things more complicated than they need to be.

## **From the technical language on Balance of Payments ...**

Official statistical manuals and guidelines define the Balance of Payments (BoP) as a statistical output where all the transactions between residents and non-residents are recorded. The BoP is composed by three main categories. The first one, the current account, provides information on international trade in goods (traditionally the largest category); international transactions in services; primary income (such as compensation of employees or investment income) and secondary income (where general government current transfers are recorded). The capital account, the second main category, provides information on the acquisition, by residents in other countries or by non-residents in the compiling economy, of non-financial assets, such as real estate. For all these transactions, the BoP registers the value of credits and debits and the difference between them is called balance. While the balance of the current and capital accounts determine the exposure of the compiling economy to the rest of the world (RoW), the financial

account, the third main component of the BoP, explains how this exposure is financed. It covers all transactions associated with changes of ownership in foreign financial assets and liabilities of an economy and is broken down into five main components: direct investment, portfolio investment, financial derivatives, other investment, and reserve assets. Ideally, the balance of the current and capital accounts should equal the total net of the financial account, otherwise net errors and omissions need to be recorded.

### ... to common vocabulary

The importance of the BoP statistics is undeniable, since they allow to understand a country's economic performance vis-à-vis other countries. However, the overuse of technical and unfamiliar concepts can lead to a misperception of its utility, the reason why we need to make efforts to remove unnecessary complexity.

BoP statistics are essential because they reflect all the transactions that are made among people or companies that do not live in the same country, directly or indirectly. Families go to supermarket and buy goods that were produced abroad. Some companies sell their products to other countries while others prefer to invest directly there. Some people get jobs abroad and send part of their salaries to their families that remained in their own countries who can, in turn, invest that money in foreign assets, such as shares issued by a company located in a different part of the world. Streets are full of tourists who spend money in hotels, restaurants or even in tickets for a football match between two national teams with foreign players. For all these transactions, the BoP registers the value of exports, the value of imports and the difference between – the balance. When a country exports more than imports, it is earning more from its international transactions than spending abroad – it is a net exporter towards the RoW, and its surplus can be invested in other economies. On the contrary, when a country's imports exceed its exports, it is incurring in a deficit which needs to be funded. Persistent deficits, particularly in the goods and services transactions, can reflect lack of competitiveness. When a country has not enough competitive advantages, it may start accumulating large deficits and gradually increases its debt in relation to other countries which can start feeling discouraged to invest in it, which can lead the country, in extreme situations, to be forced to ask for financial assistance.

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Eustat – Explained Statistics: Balance of payment statistics

([http://ec.europa.eu/eurostat/statistics-explained/index.php/Balance\\_of\\_payment\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Balance_of_payment_statistics))



## IV Compiling Statistics – Special case studies

Developments in public debt in euro area  
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Uses of mirror data: examples from the BIS  
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# Developments in public debt in euro area countries before, during and after the last financial crisis

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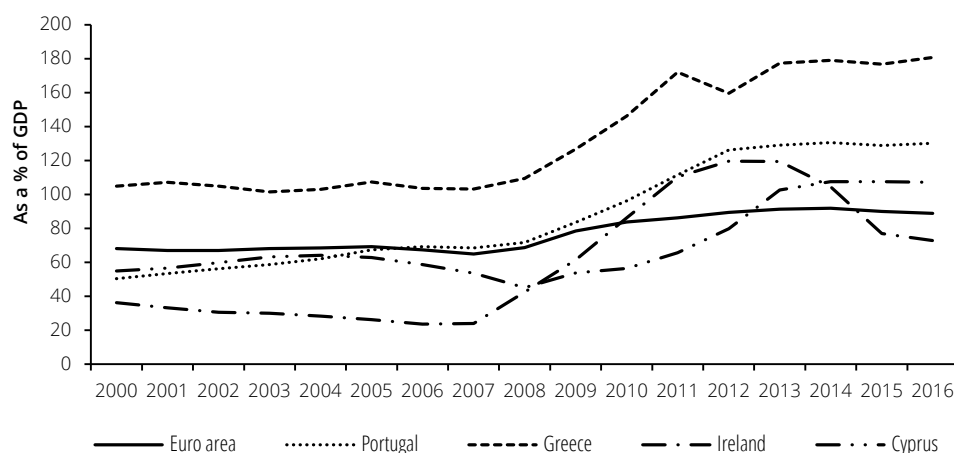
## Abstract

In 2000, around half euro area countries met the limits imposed by the Maastricht Treaty for public debt and deficit. However, in the aftermath of the 2008 financial crisis and the sovereign debt crisis in Europe, some countries struggled to obtain funding in the markets and/or had to implement measures to support financial institutions, which eventually forced them to call for international assistance programs. This new reality led to some changes, not only in terms of the levels of deficit and debt, but also in terms of debt's structure both for financial instruments and creditors.

**Keywords:** Public debt, deficit, stock-flow adjustment.

From 2000 to 2016, the public finances of the euro area countries have undergone profound changes. The pressure on euro area countries' public debt was mainly due to budgetary constraints and the implementation of measures to support their financial systems. In sixteen years, the public debt of the euro area increased from 68% of GDP in 2000 to 89% of GDP in 2016 (Chart 1).

**Chart 1 • Public debt in the euro area**

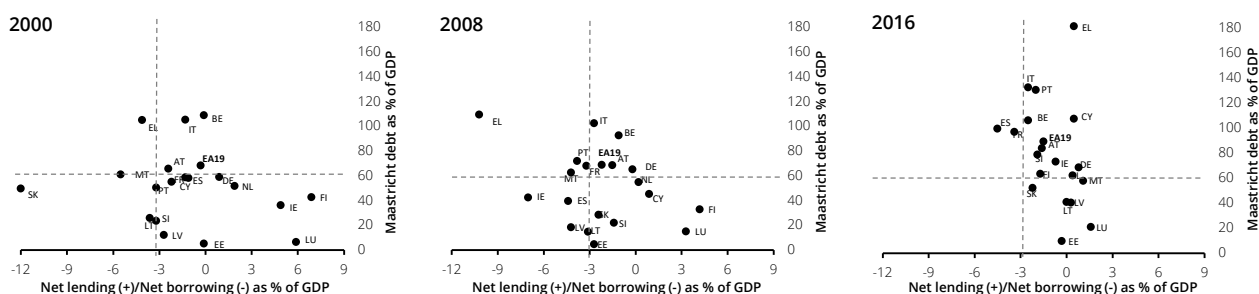


Source: Eurostat

During this period, Germany, Spain, France and Italy were responsible for 80% of the total increase of the euro area public debt. In 2000, Belgium, Greece, Malta, Austria and Italy recorded a public debt above 60% of GDP while, at the end of 2016, the majority of the euro area countries faced the same reality (Chart 2).

Between 2000 and 2008, eight countries registered deficits above 3% of GDP, but it was between 2008 and 2013 that significant deficits were recorded, namely, above 10% of GDP for Greece, Ireland, Spain and Portugal, in different years. In 2016, only France and Spain showed a deficit above 3% of GDP (Chart 2).

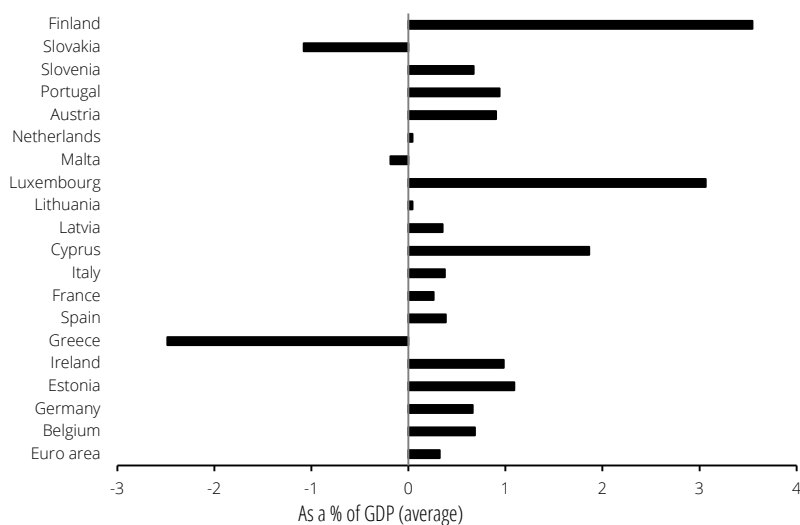
**Chart 2 • Public debt and deficit in the euro area countries: 2000, 2008 and 2016**



Source: Eurostat

Usually, the public debt varies according to the deficit, i.e. increasing when deficits are recorded. However, the change in debt can be affected by other factors as transactions in financial assets, in liabilities not included in debt and valuation differences. The difference between the change in debt and the deficit is called stock-flow adjustment and, between 2000 and 2016, due to countries' support for their financial systems, through loans, debt securities or capital injections and due to the accumulation of deposits, some countries accounted for large amounts (Chart 3). The negative stock-flow adjustment in Greece was mainly related to government debt alleviation.

**Chart 3 • Stock-flow adjustment in the Euro Area countries: 2000-2016**



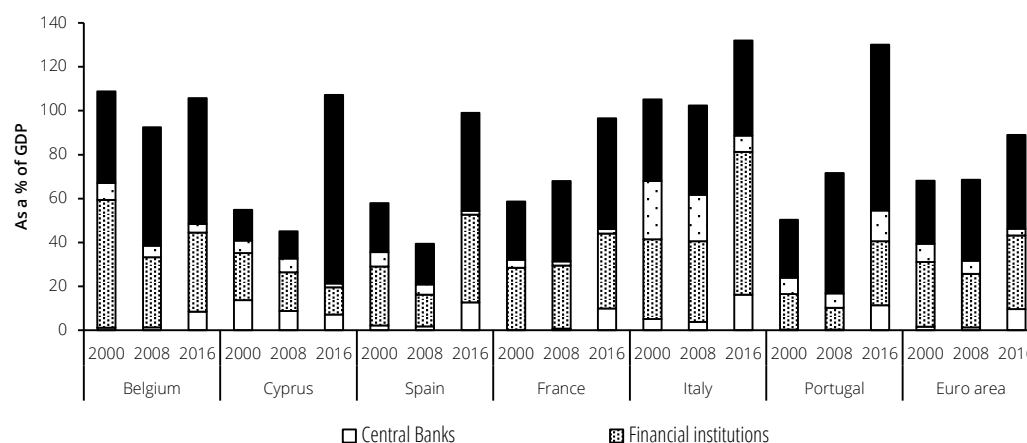
Source: Eurostat



It is also noteworthy that, particularly for countries such as Greece, Ireland, Spain, Cyprus and Portugal that were under international financial assistance, it was observed a change in the public debt structure by type of instrument with public bonds placed in the financial markets being replaced with loans granted by the international organisations. From this group of countries, Greece stands out, showing an increase in loans from 50% of GDP in 2011 to 110% in 2012; on the contrary, debt securities more than halved from 122% of GDP in 2011 to 49% of GDP in 2012, keeping this ratio until 2016: this was due also to the restructuring of part of its debt.

Finally we analyse the evolution of public debt from the perspective of the creditors and assess to what extent the creditors' structure has changed over time. Chart 4 shows a greater financing by the central banks from 2% of GDP in 2000 to 10% of GDP in 2016 in the euro area, as a result of the European Central Bank's quantitative easing programme. The increase of external financing in the euro area, from 29% of GDP in 2000 to 43% of GDP in 2016, is partly explained by the loans granted by the International Monetary Fund to the euro area countries under financial assistance. This is the case of Portugal and Cyprus that, from 2000 to 2016, recorded an increase in loans from 26% to 76% of GDP and from 14% of GDP to 86%, respectively. In the euro area, the weight of the financial institutions remained constant from 30% of GDP in 2000 to 34% in 2016.

**Chart 4 • Public debt held by counterpart sectors**



Source: European Central Bank and Eurostat

# Analysis of international services in Portugal

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## Abstract

In the last decade, the value of services transacted between Portugal and the rest of the world increased considerably, following the phenomenon of globalization. The "Travel" item represents the largest weight on the services account in those years but the country, for example, did not recover the volume of exports of financial services reached before the crisis. Nevertheless, Portugal has been improving, on a sustained basis, the balance on technological services and diversifying its export markets.

**Keywords:** Balance of Services, Globalization, International Trade.

## 1 Introduction

As a result of technological developments and global trade liberalization that have occurred since the second World War, the global exports of services has increased considerably, from a weight of 9% in the total exports of goods and services in 1970 to a weight of more than 20% in 2014, according to Loungani, Mishra, Papageorgiou and Wang (2017). This study proposes a set of stylized facts about world trade in services between 1970 and 2014, based on information from 192 countries for 62 categories of services. They are the following: the increase of the share of world services' exports between 1970 and 2014; the increase of the importance of the "Transport" item in the global amount of services transacted internationally; the "Telecommunications, computer, and Information services" category is the fastest growing category between 1995 and 2014; the recovery of the level of financial services' exports to levels reached before the financial crisis. This analysis intends to verify if those facts have also occurred during the last ten years in Portugal, describing at the same time the major changes that occurred in the balance of services in this period, particularly marked by the international financial crisis.

## 2 Results and Conclusions

In Portugal, the balance of services more than doubled, in the last decade, from 4.0% of GDP in 2008 to 8.1% of GDP in 2017. In absolute terms, exports of services almost doubled (growth of 71%). Imports also increased, but at a slower rate (40% growth). The share of exports of services on total exports of goods and services increase 4.5 pp from 31.4% in 2008 to 35.9% in 2017, in line with the first stylized fact for international trade in services, presented by the article quoted previously.

The increase in the weight of the balance of services in GDP is largely explained by the increase in the “Travel” surplus (accounting for 3/4 of this increase). “Travel” exports more than doubled between 2008 and 2017, representing 7.8% of GDP in 2017. It is worth to note that “Travel” exports account for half of total services’ exports, growing continuously since 2008. Great-Britain has been the main destination, representing 17.1% of “Travel” exports in 2017, followed by France (16.4%). The growth of “Travel” imports was also considerable (46% in last decade), but represented only 2.2% of GDP in 2017 – Spain stands out as the main destination on the import side. The diversification of export markets is noted in the “Travel” item: the weight of the top-5 destination countries decreased from 67% in 2008 to 63% in 2017, in line with large market share gains of exports of goods and services, mainly recorded in 2016 and 2017 (see Boletim Económico, outubro 2017, Banco de Portugal).

The expansion of “Travel” exports may have contributed to the increase in absolute terms in exports of “Transport” services (mainly due to the component of air transport services), although the weight of these in the total exports of services has fallen 3.6 pp (to 21.6% in 2017), not following the trend evidenced in the second stylized fact.

In “Other services except Travel and Transport”, the exports grew 49% comparing to the values recorded in 2008. This was mainly due to an improvement in the balance of the “Telecommunications, IT and Information” services component, which in 2017 recorded a surplus (with the exports growing at an average rate of 7% per year), compared to a deficit in 2008. The third stylized fact presented by the article quoted above, refers this component as the fastest growing export component, although in the case of Portugal for the decade under analysis the “Charges for the use of intellectual property n.i.e.” component recorded a higher average export growth: 29% per year.

The article argues that the expansion of this type of “modern services”, which includes these last two components and “Financial” services, is the way to increase labor productivity in “middle-income” countries. The trend for Portugal, although in a non-continuous way, has been to reduce the deficit registered for this type of technological services. In the case of “Financial” services, the levels of exports have not yet reverted to those prior to the international financial crisis, not following the global trend explained in the latest stylized fact.

In terms of geographic distribution, France was the main destination of exports of “services except Travel” in 2017 (with a weight of 13.6%). The composition of the top exporting countries of these services has changed since 2008. In that year, Spain and Great Britain led this ranking. On the side of imports, Spain is the one that heads the top (with a weight of 15.3%) in 2017, having supplanted Great-Britain that led in 2011. Another country that stands out is USA, whose exports of Travel grew on average 15% a year, and in other services the average annual growth was 5%. The increase in the importance of the USA in the balance of services is one of the factors explaining the widening of the extra-UE market share in the total volume of service transactions.

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# From Balance of Payments and International Investment Position to the Rest of the World account: Roadmap to Banco de Portugal's experience

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## **Abstract**

In Portugal, external statistics (Balance of Payments/International Investment Position – BoP/IIP) and financial accounts are a responsibility of Banco de Portugal. The non-financial accounts are compiled by INE-Portugal.

The methodological manuals suggest a high degree of consistency and harmonization between the BoP/IIP statistics and the Rest of the World (RoW) account. Banco de Portugal's compilation process of BoP/IIP and RoW account statistics was improved in 2014 to reinforce its consistency, achieving higher statistical quality standards, increasing the comparability between the two domains and obtaining a more efficient compilation process. One example is the internalization of quarterly analysis of the RoW financial account into a monthly BoP/IIP process, implying changes in procedures and IT developments.

There is also a strong link between the BoP and the national sector accounts given that net lending/borrowing of the economy is obtained through the balancing item of the current and capital accounts.

**Keywords:** Balance of payments, International investment position, Financial Accounts, Rest of the world sectoral account.

**JEL classification:** C80

# 1 Balance of Payments and International Investment Position compilation

## 1.1 Basic concepts and methodological framework

The methodological standards that guide the compilation of BoP/IIP are set out in the sixth edition of the Balance of Payments and International Investment Position Manual (BPM6).

BoP/IIP statistics aim to grasp the economic relationships between residents and non-residents of a given economy. The full set of external accounts comprise both the operations related to financial assets and liabilities, known as the financial account and also those operations involving the non-financial assets, portraying the so-called real economy, recorded in the current and capital account.

BoP/IIP high quality statistics are a crucial set of information for determining the net lending/borrowing of a given national economy. The principles and methodology underlying the BoP/IIP are consistent with those of national accounts, compiled accordingly to SNA2008<sup>1</sup> or ESA2010<sup>2</sup>. The variety and dimensions that are reflected in BoP/IIP are enormous aggregating flows/stocks that are reflected in the different institutional sectors of a given economy. Moreover, BoP/IIP are based on several data sources and similarly to national accounts, the non-financial and financial part should be balanced. This task is, in practice, rather demanding taking into account that BoP/IIP statistics, in the case of Portugal, are compiled on a monthly basis.

### 1.1.1 The current and capital account

The structure of the current and capital account shows links with the sequence of accounts of national accounts. The current account has flows of goods, services, primary income, and secondary income between residents and nonresidents (BPM6, §2.14). The capital account shows credit and debit entries for nonproduced nonfinancial assets and capital transfers between residents and nonresidents (BPM6, §2.16). BoP is compiled from the perspective of the resident sectors. As an example, if the sector of non-financial corporations is exporting goods and services, the corresponding amount will be recorded as a credit in BoP (an example is shown below).

Goods and services are recorded when there is a change of economic ownership from a unit in one economy to a unit in another country (ESA2010, §18.26). In BoP the current and capital account reflect the export and imports of goods and services, regardless of its final use, whereas in national accounts this information is recorded either as intermediate consumption or gross fixed capital formation. Therefore, the entries in the capital account only cover acquisitions and disposals of non-produced non-financial assets and capital transfers. Land acquisitions and disposals are not included (ESA2010, §18.55). On the other hand, in relation to current and capital transfers the links are more straightforward.

BoP statistics provide a useful insight to some items regarding households. As an example, remittances, which are recorded in the current account as current transfers can have, in countries like Portugal, a significant weight. Current transfers encompass also the lottery prizes which are received by households whenever those are organized at the European level. BoP is also a useful instrument for analysing the impact in the economy of a given phenomenon. This is the case of the European Union Funds, which are recorded via BoP. The related amounts are recorded in the

<sup>1</sup> System of National Accounts 2008

<sup>2</sup> European System of National and Regional Accounts 2010

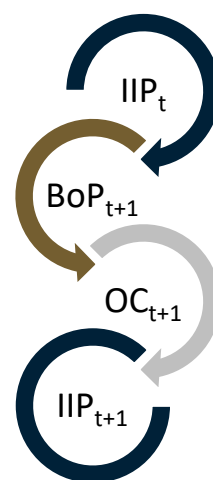
current account if they are received as subsidies by the national producers, which are mostly on the non-financial corporations sector. The most common example are the agricultural subsidies. The European Funds can also be recorded in the capital account whenever those funds are devoted to finance gross fixed capital formation. The balance of the current and capital account will imply an increase/decrease in net foreign assets, e.g. the financial account balance. As an example, a deficit on the current and capital accounts implies that it is financed by either the disposal of foreign assets or the increase of liabilities to nonresidents.

### 1.1.2 The financial account

The financial account has two key pieces: BoP and IIP. According to its definition in BPM6 (§ 2.8), the IIP is a “a statistical statement that shows at a point in time the value of: financial assets of residents of an economy that are claims on nonresidents or are gold bullion held as reserve assets; and the liabilities of residents of an economy to nonresidents”. Its net position, obtained from the difference between assets and liabilities, can either represent a net claim (if positive) or a net liability (if negative) from an economy to the rest of the world. This net position is a balancing item known as net worth.

In figure 1, there is an illustration of the schema for the compilation of the international financial accounts between two consecutive periods,  $t$  and  $t+1$ .

**Figure 1 • Compilation schema of BOP/IIP**



$BoP_{t+1}$  represents the flows that reflect only economic transactions, while  $OC_{t+1}$  comprises other changes in financial assets and liabilities not related to transactions, such as holding gains and losses, arising from changes in their prices and/or the exchange rates and other changes in the volume of assets and liabilities (BPM6, §3.20). Together  $BoP_{t+1}$  and  $OC_{t+1}$  summarize the flows between residents and non-residents that explain the changes in the IIP from  $t$  to  $t+1$ . These flows are recorded in net terms, separately for financial assets and liabilities.

The balancing item which results from netting BoP's net acquisition of financial assets and net incurrence of liabilities is called net lending (if positive) or net borrowing (if negative), representing either a surplus or a deficit of the economy regarding the rest of the world.

Conceptually, in BoP the balancing item of the non-financial account's side, the sum of the current and capital accounts, and of the financial account should be equal, but imbalances between these two items do exist, usually due to discrepancies in source data. This imbalance is known as 'errors and omissions'. The following equality can be expressed:

$$\text{Sum of the current and capital account} = \text{Net financial external accounts} + \text{Errors \& Omissions}$$

In the financial account, BOP/IIP items are primarily grouped by functional categories, which aim to reflect the economic motivation of cross border transactions and positions. These functional categories are: direct investment, portfolio investment, reserve assets, other investment and financial derivatives and employee stock options. At a second level of classification, BPM6 uses three broad categories for financial assets and liabilities: Equity and investment fund shares; debt instruments other financial assets and liabilities.

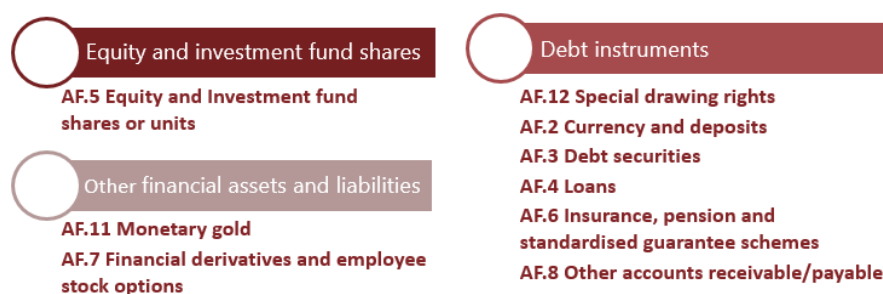
## 2 From BOP/IIP to the Rest of the World account

### 2.1 Methodological framework of National Accounts

In the latest publication of these manuals and also of BPM6, there was a clear effort of convergence, enabling more consistency between both statistical domains.

Although convergent, complementary approaches still remain. For example in the financial account, while BOP/IIP operations are primarily recorded by functional categories as already mentioned, in NA the record is done by type of instrument, giving priority to the classification based upon the legal characteristics of the relationship between the parties involved in a certain operation rather than its economic motivation. Through the bridging between BPM6's financial assets and liabilities broad categories and SNA2008/ESA2010 financial instrument type, a correspondence between the two statistical outputs can be achieved, as can be observed in figure 2.

**Figure 2 • Bridging financial instrument classification between BPM6 and SNA2008/ESA2010**



In addition, these two statistical domains allow for a complementary analysis. While BoP/IIP is compiled from the standpoint of the resident sectors, in the RoW account in NA the external operations are recorded from the perspective of non-residents and portrayed like an institutional sector: Rest of the World (RoW). According to the definition in ESA2010 (§2.131) the RoW sector “is a grouping of units without any characteristic functions and resources; it consists of non-resident units insofar as they are engaged in transactions with resident institutional units, or have other economic links with resident units”.

The recording perspective in NA results in the following dynamics: a resource or a claim for RoW is a use or a liability for total economy and vice versa. Consequently, balancing items are symmetric. The recording of monetary gold (gold held monetary authorities as reserve asset) is an exception since it is registered as a financial asset for the holding sector but has no counterpart liability, which conveys into a methodological difference between BoP and RoW account.

In Portugal, the compilation of National Accounts is a responsibility shared between Banco de Portugal and INE - Portugal. The first is responsible for the compilation of the financial account and the latter for the non-financial account.

From this point on, the focus will be on the compilation of the financial account of BoP/IIP and NA, showing some of the procedures currently in practice.

## 2.2 Compilation procedures of the National Financial Accounts in Portugal

National Financial Accounts (NFA) have a dedicated unit within the statistics department, but for the compilation Banco de Portugal developed a multidisciplinary team with experts from financial accounts and from the different underlying primary statistics. All team members are co-responsible for producing NFA, for example, the input for the RoW account is a responsibility of the BoP/IIP experts.

In terms of the compilation procedures, the several units give the inputs for their sector account. Then, through a pre-established hierarchy of sources, inputs from some sectors have a prevalence over the others. RoW has hierarchy of source upon most of its counterparts, with the following exceptions: the sectors investment funds other than monetary market funds; pension funds and for the insurance corporations data on the instruments within AF.6 category (SNA2008/ESA2010) related with insurance and standardised guarantee schemes, since the information from these specific sectors/instruments was regarded as having better quality/coverage. For example, much of the information provided to BoP/IIP for pension funds is made by the entities managing the funds, which sometimes makes it difficult to distinguish between operations of the manager itself or of the funds.

The balancing item net lending/borrowing used by NFA for the total economy is given by the current and capital accounts' balancing item. As already mentioned, the different perspective in the compilation of BOP and NFA leads to this symmetry. Therefore the following equalities can be expressed:

$$\begin{aligned}\text{Net lending/net borrowing of RoW} &= - ( \text{Net lending/net borrowing of total economy} ) \\ &= - ( \text{Sum of the current and capital account} ) \\ &= - ( \text{Net financial external accounts} + \text{Errors \& Omissions} )\end{aligned}$$

Another balancing item also used in NFA is net worth, for which the following expression is used:

$$\text{Net worth of RoW} = - ( \text{International Investment Position} - \text{Monetary gold position} )$$

The monetary gold position is subtracted from IIP, given that it is not a liability for RoW in the NFA compilation.

Another methodological difference regards the instrument 'Financial derivatives' (AF.7 in SNA2008/ESA2010) which is recorded on gross basis in the IIP and on net basis in the NFA. When considering the net output, this does not originate any discrepancy between both statistics.

### 2.2.1 From BoP/IIP to RoW – an example

To illustrate some of the correspondences mentioned along the paper, let's consider an NFC resident in Portugal and the recording of its external operations.

Figure 3 shows the NFC current and capital account for t+1. This NFC imports its goods to manufacture the final product and exports part of its production. A property income is paid related to securities issued and held by foreign investors. The sum of the current and capital account flows result in a net borrowing balance of -3 monetary units (m.u.).



Figure 3 • Current and capital account flows for t+1

	Flows t+1
<b>Credit</b>	<b>2.7</b>
Exports of goods	2.7
<b>Debit</b>	<b>5.7</b>
Imports of goods	5.4
Property income	0.3
<b>Net (C-D)</b>	<b>-3</b>

This NFC is controlled by a non-resident entity and the operations between them are recorded in the direct investment functional category. During t+1, the NFC issued securities that were also of the interest of portfolio investors, reflected on the liabilities side. On the assets side, the investment in securities issued outside the monetary union is recorded on the assets side on the portfolio investment category. Also on the assets side the NFC's deposits on banks outside Portugal are recorded under the other investment category. Figure 4 displays the NFC's IIP for t and t+1 and also the summarized flows that occurred during period t+1. The IIP is represented by the stock columns in t and t+1. The financial transactions, other price changes, exchange rates changes and other volume changes are respectively recorded in the columns 'Trans t+1', 'OPC t+1', 'ERC t+1' and 'OC t+1'.

Figure 4 • IIP and financial flows between t and t+1

	Stock t	Trans t+1	OPC t+1	ERC t+1	OC t+1	Stock t+1
<b>Assets</b>	<b>195</b>	<b>10</b>	<b>5</b>	<b>-2</b>	<b>0</b>	<b>208</b>
<b>Direct investment</b>	<b>35</b>	<b>-10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>
Debt instruments	35	-10	0	0	0	25
<b>Portfolio investment</b>	<b>150</b>	<b>20</b>	<b>5</b>	<b>-2</b>	<b>0</b>	<b>173</b>
Debt instruments	150	20	5	-2	0	173
<b>Other investment</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>
Debt instruments	10	0	0	0	0	10
<b>Liabilities</b>	<b>77</b>	<b>13</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>92</b>
<b>Direct investment</b>	<b>77</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>82</b>
Equity	70	0	2	0	0	72
Debt instruments	7	3	0	0	0	10
<b>Portfolio investment</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>
Debt instruments	0	10	0	0	0	10
<b>Net (A-L)</b>	<b>118</b>	<b>-3</b>	<b>3</b>	<b>-2</b>	<b>0</b>	<b>116</b>

During the period t+1, the balance of payments' financial net transactions is of -3 m.u., presenting the same net borrowing result as of the current and capital account as desired.

Figure 5 shows the same information as figure 4, but with SNA 2008/ESA2010's instrument classification. Functional categories are dismissed and items grouped by financial instrument type.

**Figure 5 • IIP and financial flows: bridging from BPM6 to SNA2008/ESA2010 instrument classification**

	Stock t	Trans t+1	OPC t+1	ERC t+1	OC t+1	Stock t+1
<b>Assets</b>	<b>195</b>	<b>10</b>	<b>5</b>	<b>-2</b>	<b>0</b>	<b>208</b>
F22	10	0	0	0	0	10
F32	185	10	5	-2	0	198
<b>Liabilities</b>	<b>77</b>	<b>13</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>92</b>
F32	0	10	0	0	0	10
F41	7	3	0	0	0	10
F512	70	0	2	0	0	72
<b>Net (A-L)</b>	<b>118</b>	<b>-3</b>	<b>3</b>	<b>-2</b>	<b>0</b>	<b>116</b>

Figure 6 shows the transition from BoP/IIP's perspective to RoW's perspective.

**Figure 6 • From BoP/IIP do RoW**

	Stock t	Trans t+1	PC t+1	OC t+1	Stock t+1
<b>Assets</b>	<b>77</b>	<b>13</b>	<b>2</b>	<b>0</b>	<b>92</b>
F32	0	10	0	0	10
F41	7	3	0	0	10
F512	70	0	2	0	72
<b>Liabilities</b>	<b>195</b>	<b>10</b>	<b>3</b>	<b>0</b>	<b>208</b>
F22	10	0	0	0	10
F32	185	10	3	0	198
<b>Net worth/Net lending</b>	<b>-118</b>	<b>3</b>	<b>-1</b>	<b>0</b>	<b>-116</b>

Assets and liabilities change their places and balancing items have now symmetrical values. The columns of OPCt+1 and ERCt+1 in figure 5 are now merged in the PCt+1 column in figure 6, summarizing the prices changes.

### 3 Mitigating differences between BOP/IIP and RoW

Given the described compilation procedure, differences between BOP/IIP and RoW, other than methodological, can emerge for one of two reasons: either by discrepant counterpart information with hierarchy of source or by different vintages of information.

As mentioned earlier, BoP/IIP data through RoW's sectoral account has hierarchy of source over most of its counterparts in the compilation of the NFA, which only adds increased responsibility to the quality of information. The compilation timeliness of BoP/IIP stressed the need of enhancement of the quality procedures to avoid corrections introduced to RoW's account data, which ultimately lead to vintage differences.

To better understand the quality procedures implemented, we shall look at the compilation process of BoP/IIP in *Banco de Portugal*.

### 3.1 BOP/IIP's compilation system

Figure 7 • Compilation system schema



The process begins with data acquisition and its validation. For the compilation of BOP/IIP several sources of information are used, but they can be condensed in five types:

- direct report of external operations - entities which conduct cross border operations, from a defined threshold, must classify and report such operations to *Banco de Portugal*;
- settlements data from banks – a very valuable piece of information to help validate the direct report and to detect new entities involved in operations with non-resident entities. This information is reported on an entity by entity basis and by type of flow (inward or outward) or position by the end of the period
- external data from other entities and organizations - emphasis to information from *INE-Portugal* and on a supra-national level Centralised Securities Database<sup>3</sup> and Coordinated Portfolio Investment Survey<sup>4</sup>;
- internal data from Banco de Portugal- statistical outputs such as SSIS, the securities statistics integrated system with information on residents' holdings investor by investor, security by security (s-b-s) and residents' issuances s-b-s, and monetary financial statistics and investment funds. As a curiosity, this latter source of information was integrated after realizing through NA hierarchy of sources that for RoW's holdings of investment fund shares/units, this was a more accurate source than SSIS. Internal but non-statistical, such as accounting data for the central bank sector and Target settlements;
- specific surveys of BoP/IIP division – to fill as in the case of financial derivatives.

All these different data sources are analyzed and then incorporated, initiating the compilation process. The statistical information is processed using SAS, which insofar has proven to efficiently deliver to the compilers autonomy and flexibility to adapt to new sources/procedures when needed. Later, when the compilation process is finished, we start the data analysis, which is generally done through excel files, with pivot tables connected to SAS tables in the database. If needed, corrections are made and in part the compilation is reprocessed. Afterwards, outputs are disseminated to several users: internal, within Banco de Portugal, external national and supra-national entities and also to the public in general.

<sup>3</sup> Information from the European Central Bank

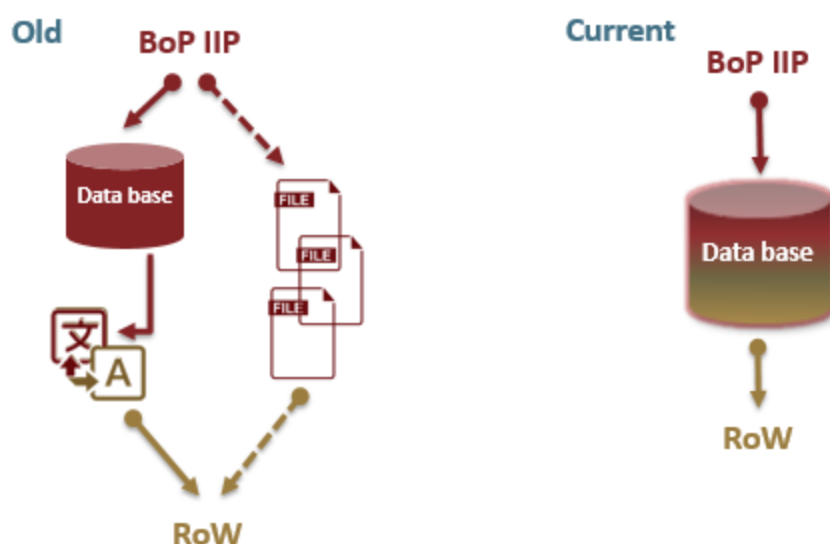
<sup>4</sup> Information from International Monetary Fund

### 3.2 Improvements in the BoP/IIP compilation system envisaging to mitigate differences

The update of the methodological manual to BPM6 presented itself as an opportunity to redesign BOP/IIP's compilation system from its core. One of the changes that had a direct impact on RoW's compilation was the data warehouse framework.

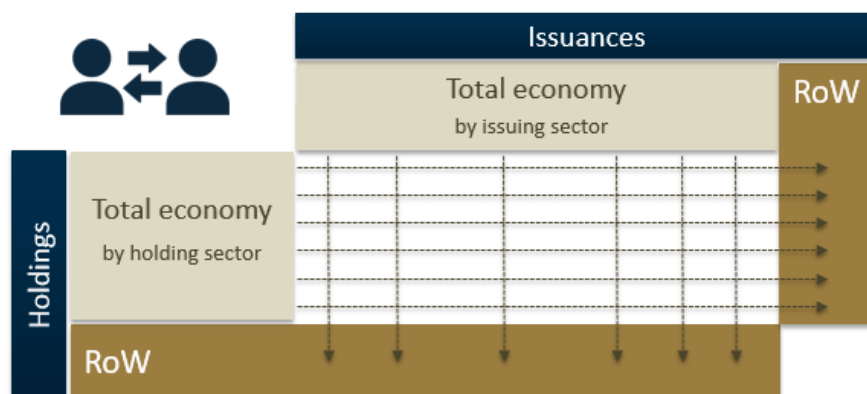
Figure 8 shows both the old and the current structure of the data warehouse. In the old structure, the BOP/IIP data base was only in its own terminology, as so to give the inputs for the RoW account the information had to be 'translated' outside the data base. Additional inputs with information not directly available on the database had to be prepared separately. In the current structure the database supports both terminologies, enabling a direct extraction of data for RoW's account.

**Figure 8 • Data warehouse structure**



The combination of an enriched database with a flexible compilation system, allowed for several additional analysis. One of those analysis, which was even included within the compilation procedure, was the monthly comparison of the securities' whom-to-whom transactions. This comparison is made between BOP and SSIS's statistical outputs: RoW's holdings by resident issuer sector and RoW's issuances by resident investor sector (respectively, blue highlighted row and column in figure 9). In terms of instrument, it is broken down by short and long-term debt securities, listed shares (only for RoW's holdings) and investment fund shares/units. This procedure is also made monthly for transactions.

**Figure 9 • Securities' whom-to-whom**



This allows to detect divergences between both statistical outputs, which trigger an investigation of its origin. If needed, corrections are still included in the course of BoP/IIP's production. As a result of this process, there was a clear quality improvement in both statistical domains.

Another procedure only made possible by the current data base structure is the monthly analysis of the IIP and all the financial flows through the perspective of RoW account. It allows an early identification of possible outliers, for example examining if a price change vis-à-vis resident sector in a certain instrument is plausible given its stock. As mentioned by Mink, R. et al (2012), a "set of accounts that show by sector and type of financial instrument the transactions, other economic flows, and the positions of financial assets and liabilities vis-à-vis the counterpart sector, whether resident or cross-border, reflect more accurately the reality of the interconnected global economy".

All these procedures are tools to mitigate vintage differences between BoP/IIP and RoW. Operations are recorded in BoP/IIP with the best information available, but often additional time and information from other statistical domains brings clairvoyance to its full extent. A check of media news and press releases from official entities is regularly made. When a complex operation is identified, meetings are promoted with colleagues from other statistical domains concerning such operations, aiming to achieve higher consistency and accuracy upon its recording.

## 4 Final considerations

Banco de Portugal improved its BoP/IIP compilation system for the implementation of BPM6. Since then it became possible to analyze data through both BoP/IIP and RoW's account perspective and in doing so compilers became more aware of how their data affect other statistics. When the focus goes beyond the production that each compiler is carrying, there is shift in the mindset that supports a more integrated and cooperative approach to the statistical compilation as a whole.

Even if the navigation is not as straight forward as one may initially predict, the roadmap is definitely clear about the destination, which all in all is the consistency and quality improvement of statistical outputs.

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# Estimating a country's currency circulation within a monetary union

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## **Abstract**

We discuss the non-trivial problem of a country's currency circulation within a monetary union, focusing on an internationally relevant currency with significant intra monetary union cash flows: the euro. We compare the results currently published with a set of alternatives to estimate the Euros in circulation in some Euro area countries, based on different hypothesis, techniques and data. Although using a structural money demand model may be useful for some countries, our conclusions suggest that allocating a proportion of the Euros estimated to circulate in the Euro area to each country is more adoption ready and could offer relatively harmonized estimates.

**Keywords:** Currency union; Euro circulation; Structural money demand models.

**JEL classification:** E41; E50

“The true currency of life is time, not money, and we've all got a limited stock of that.”

## Introduction

Unlike time, money is a dimension of our world that can be controlled and which serves an instrumental role in the way we live. Indeed, the central bank usually has the power to control the supply of cash to the economy, which is used to fulfil different needs of the agents in such economy. Although recent technological advances, affecting especially the financial industry and involving innovative payments solutions, have built the narrative for a growing demise of the use of cash, recent studies for different jurisdictions and currencies have somewhat dispelled this belief and have shown that cash still holds a critical role in the way we make payments and store value.

Esselink & Hernández (2017) concluded, through a survey conducted in 2016, that 79% of the number of payments (and 54% of the value of payments) done in the Euro area were made in cash, whereas only 19% of the number (and 39% of the value) of payments in the same area were settled through cards. On a similar note, using data collected by the Bank of International Settlements' (BIS) Committee on Payments and Market Infrastructures (CPMI), Bech *et al.* (2018)

<sup>1</sup> The paper benefited from valuable contributions and insights by Mr. António Jorge Silva, Mr. Luís D'Aguiar and Ms. Filipa Lima, to whom I would like to express my sincere gratitude.

argue that, although card payments have recorded a consistent increase over the last decade, cash in circulation also increased in CPMI countries<sup>2</sup>, therefore curtailing the theory of a progressive move towards a cashless society<sup>3</sup>. From a different perspective, Judson (2017) also reports that, despite the increasing pressure for the fading out of cash, demand for U.S. Dollars keeps growing.

Against this backdrop, it is reasonable to argue that cash still holds an important role in modern economies and that it warrants the attention and study of its different stakeholders, spearheaded by central banks. In this domain, several topics can be approached with relevant insights for policy making. However, many of them depart from the assumption that the volume of cash in circulation is perfectly known. Yet, this assumption does not always hold for all economies and deserves scrutiny.

In fact, one of the most interesting topics concerning cash is the actual determination of the stock of cash in circulation in a given economy, which ultimately is available to fulfil the resident's needs. While it may appear as a straightforward computation, the international role of the concerned currency and/or the impact of intra-currency union cash flows can significantly affect this stock and, hence, complicate its calculation process. This is particularly the case of the U.S. Dollar and the Euro: since these currencies are typically accepted for international settlements and are used as a means of storage of value in countries outside of the currency's jurisdictions, the circulation of U.S. Dollar and Euro in such countries is not negligible and significantly reduces the amount of cash in circulation in the issuing country/area<sup>4</sup>. Moreover, in the case of currency unions, such as the European Economic and Monetary Union (EMU), the intra-currency union cash migrations, due to, *inter alia*, tourism and the shadow economy, also increase the complexity of the computation of the amount of cash in circulation in each currency union country, given that such movements are typically not recorded directly at the central bank's cash counter and, therefore, need to be estimated.<sup>5</sup>

To this end, we opted to address the issue of the compilation of the stock of cash in circulation. For this endeavour, we opted to focus specifically on the Euro area countries (fixed 2002 composition)<sup>6</sup>, given that they encompass arguably the most complex framing of this problem: the Euro is an internationally relevant currency and there are non-negligible intra-Euro Area cash flows.

In this paper, we present three methods that allow the computation of an estimate for the volume of cash in circulation for the 12 countries: Method 1 consists in a naïve forecast according to legacy currency data; Method 2 departs from the ECB's indirect estimation of the cash in circulation in the Euro area and allocates a proportion of such volume to each country according to *ad hoc* criteria; Method 3 leverages on the derivation of a structural money demand function for each

<sup>2</sup> Australia, Belgium, Brazil, Canada, China, Euro area, France, Germany, Hong Kong SAR, India, Italy, Japan, Korea, Mexico, Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Sweden, Switzerland, Turkey, United Kingdom and United States.

<sup>3</sup> According to the same authors, the only countries where evidence of the substitution of cash for cards was found was in Russia and Sweden.

<sup>4</sup> In fact, recent estimates by the European Central Bank point that 30% of the Euros put in circulation until the end of 2016 were actually circulating outside the Euro area while Judson (2012) estimates that about 50% of U.S. Dollars were held outside the United States. For a deeper discussion of this issue, please consult ECB (2017a), ECB (2017b) or Judson (2012).

<sup>5</sup> For an introduction on the issue of tourism in the compilation of the national currency in circulation, check, for example, box 1 in Politronacci et al. (2017).

<sup>6</sup> In 2002, the Euro Area comprised 12 countries: Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland.



country, taking a non-Euro area European Union country as reference, to determine the cash in circulation in each country. The results are benchmarked against the volume of cash in circulation currently shown in the financial accounts<sup>7</sup>.

The goal of this paper is therefore to provide a further contribution for the discussion on the possible methods to estimate cash in circulation when a country participates in a currency union and/or when its currency has a relevant international role. By the same token, the objective is also to raise awareness to the potential of each of the techniques used in supporting, together with national practices and expertise in this field, the development of a methodology for the explanation of cash holdings in each country.

The paper is organized as follows: section 1 briefly presents the methodological guidelines adopted; sections 2 to 4 introduce and discuss the outcome of the methods used and section 5 concludes.

## 1 Methodological principles

Throughout this study, we opted to resort exclusively to data publicly available, in order to ensure a level playing field between countries and to maximize the replicability of our exercises. The data shown are mostly available through the Eurostat's, the European Central Bank's (ECB) and/or through the National Central Banks' (NCB) websites.

We refer to the concepts of currency union and monetary union as synonyms and in line with the concepts defined in Appendix 3 of the International Monetary Fund's 6<sup>th</sup> edition of the Balance of Payments and International Investment Position Manual (BPM6).<sup>8</sup>

We interpret cash in circulation as the value of the legal tender in circulation in each Euro Area country, in the form of banknotes. Hence, we exclude from the scope of the term 'cash in circulation' the role of coins, due to their relatively low relevance in the Euro Area – as of March 2018, coins represented only 2,35% of the Euros put in circulation.

The estimations that we compute for Euro Area countries concern the period from 2002 to the end of 2017 and, when possible, are shown on a monthly basis. In all other cases, the data presented has a quarterly frequency.

For simplicity, we cover only the countries that first introduced the Euro at its inception in 2002: Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland. Countries who joined the Euro Area later on (Slovenia, Cyprus, Malta, Slovakia, Estonia, Latvia and Lithuania) are excluded, to avoid the impact of different changeover periods.

<sup>7</sup> For this purpose, we considered the stock of instrument F.21 (currency) held in the financial balance sheet of each country, which is reported by each country to Eurostat in the framework of the Quarterly Financial Accounts (according to ESA 2010).

<sup>8</sup> "For statistical purposes, a currency union is defined as a union to which two or more economies belong and that has a regional central decision making body, commonly a currency union central bank (CUCB), endowed with the legal authority to conduct a single monetary policy and issue the single currency of the union." BPM6, Appendix 3.9

## 2 Method 1 – Extrapolating legacy currencies

As referenced previously, the impact of intra Euro Area cash flows and the international role of the Euro prompted Euro Area countries to develop complex estimation methods to determine the volume of cash in circulation after the adoption of the Euro. By contrast, during the legacy era<sup>9</sup>, when no intra currency union flows were to be estimated and not all currencies had a relevant international role, the compilation of the cash in circulation was relatively simpler: in broad terms, it corresponded to the currency put into circulation by the central bank subtracted by the cash in the vaults of resident monetary and financial institutions.<sup>10</sup> Within this framework, the series yielded were generally relatively free of estimation uncertainty, given that the core information necessary was typically known by the central bank with a high degree of accuracy.

Considering this, one method that can be constructed to provide an estimate of the cash in circulation in each Euro area country can be drawn from extrapolating legacy cash in circulation data. This is one of the approaches proposed in Politronacci *et al.* (2017)<sup>11</sup> and referred in Bartzsch *et al.* (2015) as part of the annual banknote production plan in Germany.

To this end, we have surveyed the information published by the NCBs of the countries under analysis and sought to extract historical time-series of cash in circulation, registered in the liabilities of the central bank. To maximize the utility of our analysis, we imposed that such series should be relatively long – over 5 years of legacy era data. We were able to retrieve information for Spain, Portugal, France, Italy and Greece, for the period spanning from 1980 to 2001 (monthly data – 264 observations). For all other countries, the series were either not published or not long enough.<sup>12</sup>

To produce the results of this method, we opted to automatically fit an ARIMA model to the historical cash in circulation series. In this exercise, we opted to estimate such model for the 1980-2000 period, to avoid the pre-cash changeover effect felt in 2001, which could somehow bias our parametric results. The candidate models were chosen according to the Bayesian information criteria presented in Schwarz (1978).<sup>13</sup> The forecasts for the cash in circulation during the Euro area were then obtained by using the parametric estimates yielded by the fitted model and are shown in figure 1 below, with a 95% confidence interval (blue lines).

<sup>9</sup> We refer to the era of currencies that immediately preceded the Euro in each country – *e.g.* the Deutsche Mark in Germany or the French Franc in France.

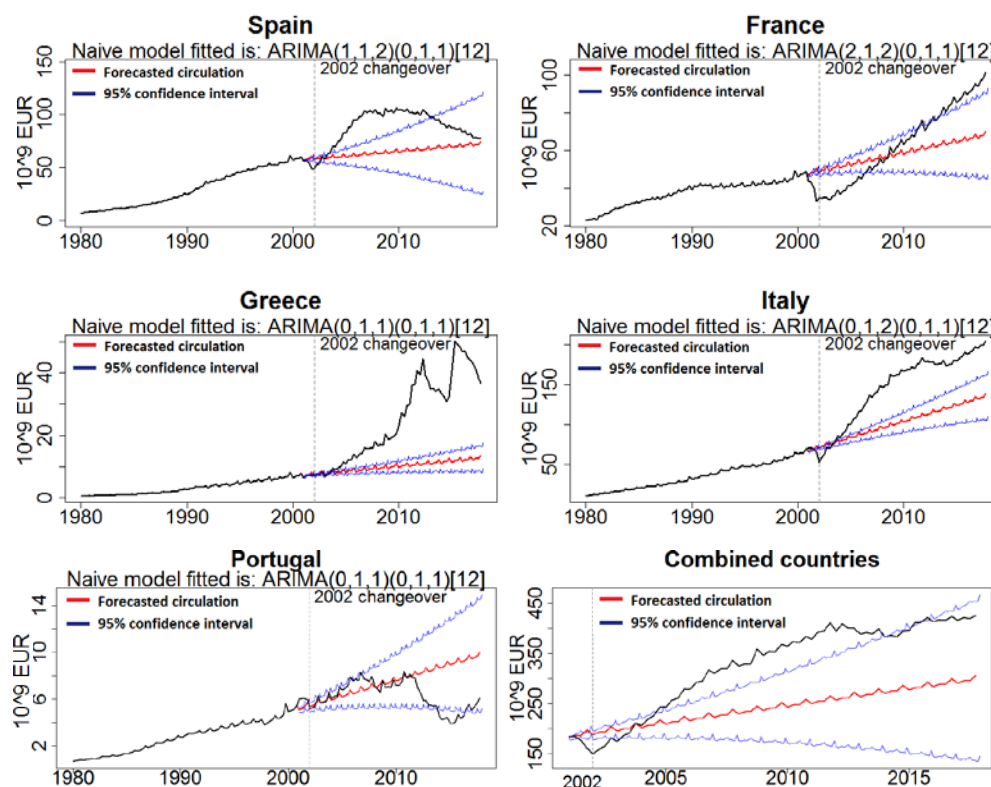
<sup>10</sup> This premise implies that the concerned currency is not internationally relevant. In case it is internationally relevant, a correction for the international circulation (transaction and hoarding motive) is due.

<sup>11</sup> To estimate the Euros in circulation in France for 2002-2017, the authors extrapolate the circulation of French Francs from 1979 to 2000 to the Euro era.

<sup>12</sup> The ECB publishes the series “Currency in circulation” for all Euro area countries. However, this information only dates back to 1999, which does not fit our time-frame requirements.

<sup>13</sup> To prevent that the selected model was over fitted, we restricted the maximum number of  $p$  and  $q$  auto-regressive and moving-average terms, respectively, to 3, the number of  $P$  and  $Q$  seasonal auto-regressive and moving-average terms, respectively, to 1. For further explanations and details on automatic ARIMA modelling, please consult, for example, Hyndman & Khandakar (2008).

**Figure 1 • Method 1 estimation results | Reported circulation (black)<sup>14</sup> vs forecasted circulation (red)**



Source: NCBs and author's calculations

The results shown project the model observed for legacy currencies to the Euro era. When compared to the stocks currently reported by each country, the method is able to produce a 95% confidence interval which includes the values currently reported by Portugal and Spain (and France in several periods). The estimations for Greece and Italy are below the reported stocks. However, when we combine the estimates produced for these 5 countries and compare them with the sum of the reported stocks of cash in circulation, it seems that method 1 underestimates the aggregated cash in circulation in such countries.

The methodology supporting this forecast implies assuming that the time-series structure determining such model holds in both the Euro and the legacy era. However, the changeover to the Euro in 2002 can arguably be interpreted as a structural change, as well as the impact of the developments in payment systems since the introduction of the Euro. Moreover, as Miller (2017) highlights, forecasting on historical data can be useful in the short-term, but if the structural factors underlying such forecast change significantly, then the model will most probably underperform over the long-run. This is the reason why the confidence intervals significantly expand over time and why we have named this estimate as 'naïve'.

Against this background, the estimates rendered through this method, derived through the time-series structures verified for the cash in circulation during the legacy era – which have, most likely,

<sup>14</sup> The series used until December of 2000 for each country correspond to the amount inscribed as cash in circulation in the respective central bank's liabilities. After that period, the values considered are those reported as the stock of instrument F.21 (currency) held in the financial balance sheet of each country.

developed and changed significantly over the years –, should be taken with caution. Concurrently, they can be understood as a smoothened forecast of the Euros in circulation in each country – had the time-series structure of cash in circulation remained constant since the 1980-2000 era – and can be used to support the validation of the methods currently employed by each country to estimate cash in circulation.

### 3 Method 2 – Estimating the Euros held within the Euro area and allocating a proportion to each country

The European Central Bank, as the supranational central bank of the European currency union, is interested in studying and modelling the circulation of Euros within and outside the Euro area. That is why it develops regularly a report on the international role of the Euro and why it has recently been studying the methodological issue of estimating the circulation of Euros outside the Euro area. In ECB (2017a), the ECB published an upgrade to the method it used to estimate the Euros circulating outside the Euro area, which now includes an upper bound, based on a fixed coins to banknotes ratio, and a lower bound for this stock, derived from data on the shipments to non Euro area countries of Euro currency by denominations. These lower and upper bounds are used to calculate the point estimate of the Euros circulating outside the Euro area, which consists in the arithmetic average between such bounds.

Although the end-purpose of the ECB (2017a)'s method is different from ours, it can still be adapted as a tool to estimate the amount of Euros in circulation in each country. Indeed, if the ECB (2017a) defined a method to estimate the Euros circulating outside the Euro area, then, by difference, one can obtain the Euros circulating within the Euro area. Using this stock as a reference, it is possible to allocate a proportion to each country according to specific and harmonized criteria, which will then be used to obtain the point estimate of the circulation that we are seeking. This is the reasoning behind method 2.

To compute the ECB (2017a)'s estimate for the Euros circulating outside the Euro area, we need its two elements: the upper and the lower bounds. The upper bound is obtained by applying the ratio of coins to banknotes used in ECB (2017a)<sup>15</sup> to the Euro coins in circulation in the Euro area in each period. The lower bound is more complex and demands more in-depth data. Indeed, the ECB (2017a)'s lower bound relies on data on official shipments of Euro banknotes to non Euro area countries by denomination since 2013, which is then combined with the data on the issuance of banknotes by the Eurosystem since 2002<sup>16</sup>. However, the data on official shipments by denomination is not currently published and cannot be accessed by the public. For this reason, to proxy the lower bound amount, we opted to use a fixed proportion of the total Euros in circulation in each period, based on the lower bound published for December of 2016 in ECB (2017a). The lower bound was then proxied as follows:

$$\text{Lower bound proxy}_t = \text{Total euros in circulation}_t * \text{fixed proportion}^{17}$$

<sup>15</sup> The ECB (2017a) considers the ratio of coins to banknotes verified in 2002: 4,16%.

<sup>16</sup> For an explanation of how this combination is operated, please consult the ECB (2017a).

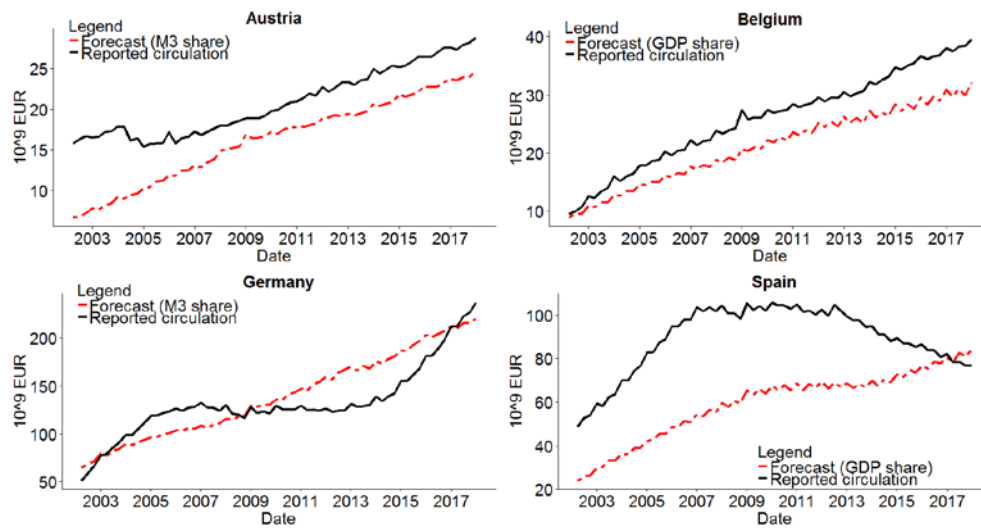
<sup>17</sup>  $\text{Fixed proportion} = \frac{\text{Lower bound in ECB(2017a)}_{\text{Dec.2016}}}{\text{Total euros in circulation}_{\text{Dec.2016}}} = 25\%$

Having calculated the monthly point estimate for the Euros circulating outside the Euro area, in line with the ECB (2017a) methodology, we computed the estimate for the Euros circulating within the Euro area by subtracting the referred point estimate to the stock of Euros in circulation in each period. To complete this estimation method for the amount of Euros circulating in each country, we allocated a proportion of the Euros circulating in the Euro area according to two alternatives: the proportion of each country's GDP in the Euro area (fixed 2002 composition) and the relative weight of the contribution of each country to the collective contribution of the countries under analysis to the Euro Area's M3<sup>18</sup>.

Using each of these keys will naturally reflect the rationale behind each one, and their underlying premises, which will therefore confer to the resulting allocation a harmonized distribution across countries. The reasoning behind the usage of each country's GDP share in the Euro area's GDP is that it allows to allocate the Euros circulating in the Euro area according to an objective, harmonized, measure of wealth, which seeks to portray economic activity, and thereby "linking" our estimate to this phenomenon. Concurrently, the argument for the usage of the relative weight of the contribution of each country to the collective contribution of the countries under analysis to the Euro Area's M3 is that it allows to understand and reflect the relative importance of each country in this important monetary aggregate.

The results generated by each allocation key are summarized as follows:

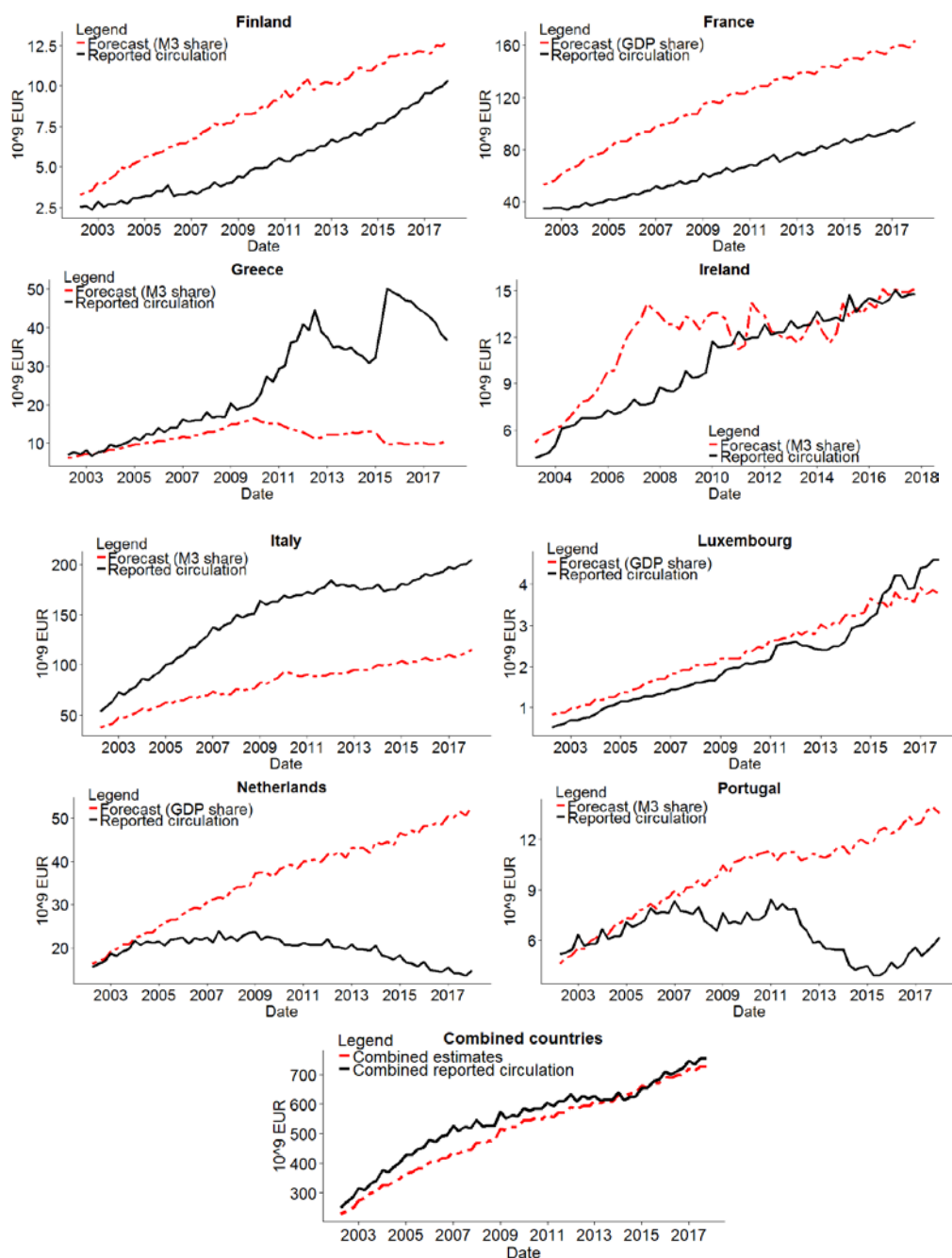
**Figure 2 • Method 2 estimation results (2002-2017)**



<sup>18</sup> This was obtained as follows:

$$M3 \text{ share Country } X = \frac{\text{Contribution to } M3_{\text{Country } X_t}}{\sum_x^N \text{Contribution to } M3_{\text{Country } X_t}}$$

Where X are the countries Euro area countries under analysis (fixed 2002 composition)



Source: ECB, NCBs and author's calculations

The results presented in figure 2 show somewhat mixed results: it appears that in some countries the forecast consistently overestimates (Finland, France, Portugal and Netherlands) or underestimates (Austria, Belgium, Spain, Greece and Italy) the reported circulation, while in others it seems to be following closely the reported stocks (Germany, Ireland and Luxembourg). However, if one compares the combined estimates with the sum of cash in circulation reported by each country, it hints at the idea that, overall, method 2 follows closely the combined reported circulation. Note that, for all countries, we opted to show only the most conservative estimate by retaining the smallest estimates resulting from the M3 and GDP share allocations, to avoid that

the forecasts are inflated by the particularities associated with the compilation of country's GDP or M3 contribution.

In any case, regardless of the allocation measures chosen, there are two key virtues worth highlighting. Firstly, method 2 estimates the Euros circulating in each country based on an ECB approved method to estimate the Euros circulating outside the Euro area. In that sense, the estimate rendered for the Euros circulating within the Euro area is one that stems from a commonly accepted and published method, which reinforces the quality of the end results. Secondly, by using relatively fair and impartial allocation keys, we are also ensuring a clear and objective estimation criterium for all countries, which can further promote the consistency of the different estimation methods currently used by each country.

## 4 Method 3 – Estimating a structural money demand function

To explore additional methods for estimating the Euros in circulation in each country, we have investigated the existing literature, with particular emphasis on structural models of money demand, given that they can incorporate short and long run dynamics between that aggregate and its selected determinants. Two good examples of such models are the Bundesbank (2009)'s model<sup>19</sup> and Bartzsch *et al.* (2015) model for explaining and forecasting the demand for Euro banknotes in Germany<sup>20</sup>.

From this investigation, a possible solution to the estimation of the cash in circulation in each Euro area country was found in the estimation of a banknote demand function, in line with one of the proposals in Bartzsch *et al.* (2011b, section 2.2.4). In this study, the authors estimate foreign demand for Euro banknotes issued in Germany departing from the setup of a demand function for German banknotes without foreign demand, which is then applied to a country whose banknote demand is comparable to Germany, except for foreign demand.<sup>21</sup> The authors used the domestic circulation estimated for Germany via this banknote demand function to obtain, by difference of the total cumulated net issuance of German banknotes, a point estimate of the German banknotes in circulation abroad.

Although we do not intend to use this framework for the same purposes, we can adapt it to estimate the cash in circulation in each Euro area country. To do this, we need to apply the same reasoning as in Bartzsch *et al.* (2011b) and, for each Euro area country, find another country whose structural drivers for cash in circulation are relatively comparable. To avoid that the method becomes endogenous – Euro area countries predicting the cash in circulation in other Euro area

<sup>19</sup> The Bundesbank (2009)'s model seeks to explain, through a vector error correction model, the demand for small, medium and large denominations via cash consumption, the opportunity cost to hold cash (proxied by the interest rate level), the demand from non-Euro area countries (proxied by the real exchange rate of the Euro *vis-à-vis* the Euro area's 22 most important trade partners), house prices (BIS housing price indicator), an estimate of the shadow economy, the unemployment rate and the preference for alternative payment methods (proxied by the number of settled payment cards). The model ends up by concluding that, in the long run, the demand for small denominations is mainly influenced by cash consumption, the demand from non-Euro area countries and the opportunity costs, whereas the demand for large denominations is mainly driven by house prices and the demand from non-Euro area countries.

<sup>20</sup> Bartzsch *et al.* (2015) also approach the issue via an error correction model where the demand for Euro banknotes is regressed against a set of variables depicting the motives to hold cash (transactions motive, store of wealth, availability of alternative means of payment, size of shadow economy and demand by non-residents).

<sup>21</sup> For this purpose, Bartzsch *et al.* (2011b) chose France.

countries –, we opted to consider as possible reference countries all European Union Member-States who currently do not belong to the Euro Area<sup>22</sup>. This guarantees that the time series of the circulation of national currency of such a benchmark country are relatively free of uncertainty (given that they have their own currency), and that all countries involved have strong economic connections and tend to share the economic cycle<sup>23</sup>.

To allocate a reference country to each Euro area country, we decided to cluster European Union countries according to proxies for the level of transactions, wealth, degree of openness of the economy, dimension, importance of tourism, hoarding motive and role of cashless payment instruments. This implies assuming that the possible reference country/ies for each Euro area country will be the set of non-Euro area countries who are classified in the same cluster.

The variables that we used for this exercise are detailed in table 1 below:

**Table 1 • Proxies used in clustering analysis**

<b>Variable</b>	<b>Proxy for</b>	<b>Source</b>
Gross domestic product at market prices (Current prices, 10 <sup>6</sup> €)	Transactions level	Eurostat
Final consumption expenditure of households (Current prices, 10 <sup>6</sup> €)	Transactions level	Eurostat
Population	Dimension	Eurostat
GDP <i>per capita</i>	Wealth	Author's calculations
Consumption <i>per capita</i>	Wealth	Author's calculations
Percentage of exports and imports of goods and services in GDP	Openness of economy	Eurostat and author's calculations
Nights spent at tourist accommodation establishments	Importance of tourism	Eurostat
Nights spent at tourist accommodation establishments <i>per capita</i>	Importance of tourism	Eurostat
Balance of travel account in balance of payments	Importance of tourism	Eurostat
Long term government bond yields – Maastricht definition (average)	Hoarding motive	Eurostat
Unemployment rate	Hoarding motive	Eurostat
Value of ATM cash withdrawals with cards issued by resident PSPs – at terminals provided by resident PSPs – <i>per capita</i>	Importance of cashless payments	ECB, Eurostat, and author's calculations
Human Development Index (HDI)	Wealth	World Bank

To determine the cluster where each country fits, we applied Ward's (1963) agglomerative hierarchical method and MacQueen's (1967) non-hierarchical *k-means* approach. In both cases, we

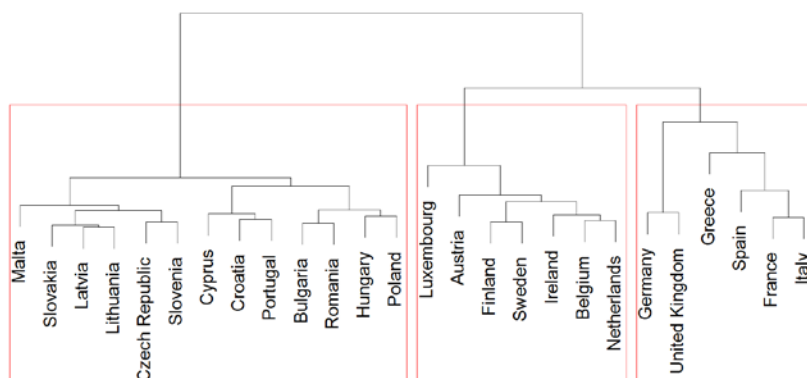
<sup>22</sup> Bulgaria, Czech Republic, Denmark, Croatia, Hungary, Poland, Romania, Sweden and the United Kingdom.

<sup>23</sup> The European Commission's publication "European Business Cycle Indicators" is a good source for an overview of the EU business cycle and for a primary assessment of the business cycle in each EU country.

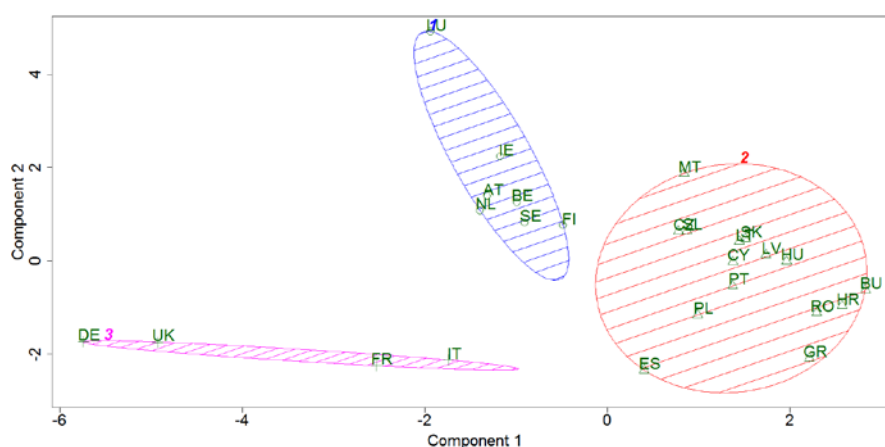


set the number of clusters to three, to maximize the possibility that at least one non-Euro area country fits each cluster. The methods were applied to data from 2015, given that HDI data was not available for later years. Denmark and Estonia were circumstantially excluded from the analysis due to data shortages in different variables.<sup>24</sup> The results that we obtained through this partitioning are as follows:

**Figure 3 • Ward's method results – 3 clusters**



**Figure 4 • K-means results<sup>25</sup> – 3 clusters**



<sup>24</sup> The data sources through which we extracted data for all countries did not include, for 2015, the proxy for the importance of cashless payments for Denmark and the long term government bond yields - Maastricht definition (average) – for Estonia.

<sup>25</sup> We show the cluster representation against the score of each country in the two first principal components of the data used, which represent 66,33% of the variability of the data.

Table 2 • Ward's cluster descriptions

	Cluster 1	Cluster 2	Cluster 3
<b>Population</b>	-0.46	-0.44	1.12
<b>GDP</b>	-0.25	-0.53	0.84
<b>Consumption</b>	-0.31	-0.51	0.87
<b>GDP_capita</b>	1.20	-0.70	-0.12
<b>cons_capita</b>	1.04	-0.83	0.18
<b>Openess</b>	0.53	0.11	-0.89
<b>Travel_exports</b>	-0.18	0.08	1.29
<b>10y_bond</b>	-0.63	0.16	0.79
<b>Unemployment</b>	-0.43	-0.07	1.49
<b>Card payment_capita</b>	0.50	-0.50	0.05
<b>HDI</b>	0.92	-0.78	0.31

Table 3 • Summary of cluster results

	Ward's method	K-means	Non euro-area reference country
Austria	Cluster 1	Cluster 1	Sweden
Belgium	Cluster 1	Cluster 1	Sweden
Finland	Cluster 1	Cluster 1	Sweden
Ireland	Cluster 1	Cluster 1	Sweden
Luxembourg	Cluster 1	Cluster 1	Sweden
Netherlands	Cluster 1	Cluster 1	Sweden
Sweden	Cluster 1	Cluster 1	N/A
Bulgaria	Cluster 2	Cluster 2	N/A
Croatia	Cluster 2	Cluster 2	N/A
Cyprus	Cluster 2	Cluster 2	N/A
Czech Republic	Cluster 2	Cluster 2	N/A
Hungary	Cluster 2	Cluster 2	N/A
Latvia	Cluster 2	Cluster 2	N/A
Lithuania	Cluster 2	Cluster 2	N/A
Malta	Cluster 2	Cluster 2	N/A
Poland	Cluster 2	Cluster 2	N/A
Portugal	Cluster 2	Cluster 2	Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania
Romania	Cluster 2	Cluster 2	N/A
Slovakia	Cluster 2	Cluster 2	N/A
Slovenia	Cluster 2	Cluster 2	N/A
France	Cluster 3	Cluster 3	United Kingdom
Germany	Cluster 3	Cluster 3	United Kingdom
Greece	Cluster 3	Cluster 2	United Kingdom, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania
Italy	Cluster 3	Cluster 3	United Kingdom
Spain	Cluster 3	Cluster 2	United Kingdom, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania
United Kingdom	Cluster 3	Cluster 3	N/A

As table 2 and 3 show, both Ward's method and the *k-means* procedure yielded approximately the same group configuration. Greece and Spain are the only countries that are classified in different clusters. Table 2 shows cluster means for each of the clusters computed through Ward's method. In a nutshell, one can describe cluster 1 as countries where wealth proxies stand out, and cluster 3 as countries where population, transactions and wealth proxies are most prominent.<sup>26</sup> Table 3 shows that cluster 2 is the one with the highest number of candidate reference countries and that Spain and Greece are the countries with the highest number of possible candidate countries, given that they are classified in clusters 2 and 3 in *k-means* and Ward's (1963) methods, respectively.

To apply the reasoning established in Bartzsch *et al.* (2011b) to each Euro area country, we have drawn a banknote demand function according to the following equation, where X is the respective reference country:

$$c_t^X = \beta_0 + \beta_1 P_t^X + \beta_2 Y_t^X + \beta_3 i_t^X + \varepsilon_t \quad (1)$$

Equation 1 seeks to decompose the determinants of banknote demand and encompasses a set of key factors included in similar models.<sup>27</sup> In our model, the cash in circulation in the reference country ( $c_t^X$ ) is regressed by the price level ( $P_t^X$ ) and a transactions variable ( $Y_t^X$ ) in the reference country, as well as the opportunity cost of holding money in ( $i_t^X$ ). If we assume, as the core hypothesis for this estimation method, that the parameters yielded from the reference countries hold in all countries of the same cluster, then the volume of banknotes circulating in each Euro area country (represented by Z below) can be obtained by applying the parameters estimated in equation 1:

$$\hat{c}_t^Z = \hat{\beta}_0 + \hat{\beta}_1 P_t^Z + \hat{\beta}_2 Y_t^Z + \hat{\beta}_3 i_t^Z \quad (2)$$

To proxy each of these regressors, we used as independent variables of our model the all-items harmonized index of consumer prices (to portray the fluctuation of prices in each economy), the final consumption expenditure of households (to mimic the overall behaviour of transactions in each economy) and the long term government bond yields – Maastricht definition (average) – to incorporate the effect of the opportunity cost of holding cash. All of this data is published by Eurostat. For this study, we considered a quarterly sample from 2002 to 2017 (64 observations), where all of the dependent and independent variables were not differenced, not seasonally adjusted and were considered in their logarithmic form, with the exception of bond yields.<sup>28</sup> Therefore, all parameters can be interpreted as a pure elasticities, except for the parameter associated with bond yields.

Using this set of variables, we applied the standard unit root, stationarity (Phillips & Perron (1988), Augmented Dickey-Fuller (1979, 1981) and Kwiatkowski *et al.* (1992)) and cointegration tests, which have shown that the vast majority of variables are I(1) and cointegrated.<sup>29</sup>

<sup>26</sup> In cluster 2, the most comprehensive one, there is no clear-cut proxy deserving highlight in comparison with other clusters.

<sup>27</sup> See, for example, the variables used by the Deutsche Bundesbank (2009), Rua (2017) and Bartzsch *et al.* (2015) in similar models for banknote demand.

<sup>28</sup> This was due to the fact that in the latter end of our sample, bond yields drop to negative values for many countries, which jeopardizes the utilization of natural logarithms.

<sup>29</sup> Results are available upon request to the author.

After concluding that their variables were also I (1) and cointegrated, Bartzsch et al. (2011b) consider 5 different estimation models<sup>30</sup> to compute their parametric estimates and conclude that, given their small sample size, the fully modified least squares (FM-OLS)<sup>31</sup> method with non-seasonally adjusted data would be the most robust method. Given that the characteristics of our data match those of Bartzsch *et al.* (2011b) and that our sample size (64 observations) is also not very large, we have also opted to use this estimation algorithm.

Applying this estimation method to our dataset, we have computed a set of regressions which considered the circulation in each possible reference country in national currency and in Euros and we have also tested the inclusion of seasonal dummies. After taking into account individual and global significance, the adjusted coefficient of determination in each regression and the Bayesian information criteria, we concluded that the best regressions for each cluster are the following:

**Table 4 • Summary of estimation results**

Cluster	Regression	Currency of y var.	Adj. R <sup>2</sup>	σ Reg.
1	$\hat{c}_t^{SE} = 2,70P_t^{SE} - 0,14Y_t^{SE} + 0,24i_t^{SE***}$	SEK	0.574	0.134
2	$\hat{c}_t^{CZ} = 1,88P_t^{CZ***} + 0,44Y_t^{CZ***} - 0,03i_t^{CZ***}$	CZK	0.96	0.054
3	$\hat{c}_t^{UK} = 1,47P_t^{UK***} + 0,35Y_t^{UK***} - 0,04i_t^{UK*}$	GBP	0.978	0.036
*** 0,001 significance level (99,9% confidence)				
** 0,01 significance level (99% confidence)				
* 0,05 significance level (95% confidence)				
. 0,1 significance level (90% confidence)				

Note that in all but cluster 1, the regressions estimated are showing the expected signs, that is, an increase in prices and in transactions leads to an increase in the amount of cash in circulation, while an increase in the opportunity cost of holding money leads to a decrease of cash circulation. However, the regression estimated for Sweden has counterintuitive parameters (hoarding with positive sign, transactions with negative sign). This is mainly due to the fact that Sweden is one of the few countries where cash in circulation has been consistently decreasing, as was reported by Bech *et al.* (2018)<sup>32</sup>. For this reason, we opted to use the reference country of the nearest cluster (cluster 3 – United Kingdom) as a reference for countries belonging to cluster 1.

Hence, the estimates for the Euros in circulation in each Euro area country according to this method are calculated through equation 3 below, where the parameters are those drawn from the regressions in table 4 featuring the respective reference country and Z is the Euro area country.

<sup>30</sup> The estimation methods considered were a static regression Engle and Granger (1987), dynamic ordinary least squares, fully modified ordinary least squares, canonical cointegration and Johansen (1995) system estimator.

<sup>31</sup> In a nutshell, as Phillips (1995) describes, FM-OLS is an estimator developed by Phillips & Hansen (1990) that provides optimal estimates of cointegrating regressions, by modifying the traditional least squares estimation to take into account serial correlation effects and possible endogeneity in the independent variables stemming from the existing cointegration relationships.

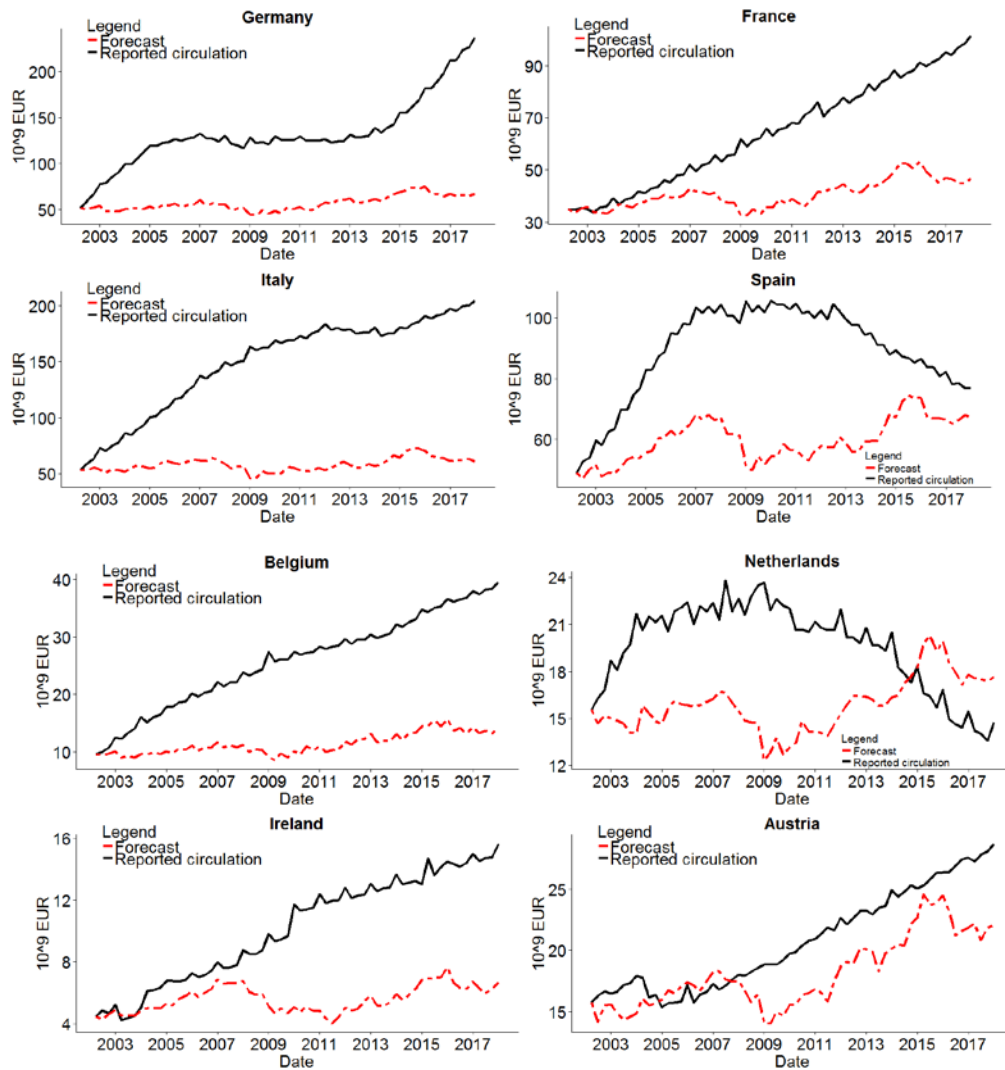
<sup>32</sup> The Central Bank of Sweden (Sveriges Riksbank) reports that in January 2006 the amount of cash in circulation was 105.864 SEK, whereas in January of 2018 the same stock was 55.125 SEK.

$$\hat{c}_t^Z = \hat{\beta}_0 + \hat{\beta}_1 P_t^Z + \hat{\beta}_2 Y_t^Z + \hat{\beta}_3 i_t^Z \quad (3)$$

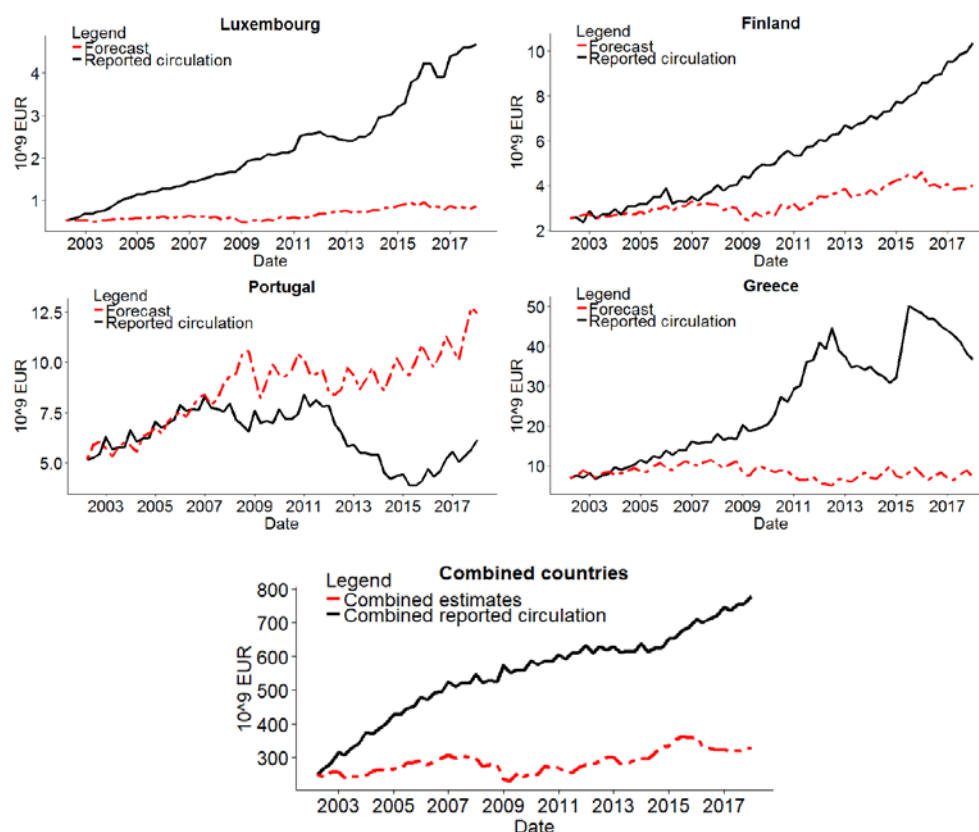
For Spain and Greece, the only countries that were classified in two different clusters, we used the parameters from the reference country whose regression showed the highest adjusted  $R^2$  and lowest Bayesian information criteria: the United Kingdom.

Note that the resulting estimates ( $\hat{c}_t^{XZ}$ ) are converted to Euros at the exchange rate prevailing in each period. Moreover, to ensure that both the forecasted and the reported series start from the same level<sup>33</sup>, we have applied the annual rates of change derived from equation 3 to the level verified in the first quarter of 2002 to obtain the final forecast curve.

**Figure 5 • Method 3 estimation results**



<sup>33</sup> This is critical since, in many cases, there are important level differences between the reference country and the country being estimated (e.g. Luxembourg and United Kingdom).



Source: Eurostat, NCBs and author's calculations

The results of method 3, shown in figure 5, are somewhat mixed, but it appears that, in the majority of cases, it underestimates the stock of cash in circulation, especially when the stocks reported by each country show a strong upward trend (e.g. Germany, France, Italy, Belgium, Ireland, Luxembourg, Finland and Greece). A similar conclusion is also reached if one compares the combined estimates with the sum of the cash in circulation reported by each country. The method only overestimates the cash in circulation for Portugal and the Netherlands.

This can be due to the fact that the assumption of homogeneity of the structural impact of the variables chosen between countries might not hold in all pairs of reference and Euro area countries and that further investigation is needed. In fact, this is the risk one takes in applying a 'one-size fits all' technique such as method 3 and that calls for caution in the interpretation of the results.

Notwithstanding, unlike some of the estimation methods that we have formulated before, this design seems to be able to partially encompass the effect of the economic cycle, via the regressors it includes. Moreover, it also reflects the role of seasonality on the demand for Euro cash – due to the seasonality pattern embedded in the independent variables it includes –, which can be an interesting feature to explore for policy making.

All in all, the main merit of this model is that it departs from an hypothesis that can be reasonable in some specific pairs of reference and Euro area countries – similar structural impact of money demand factors and negligible foreign demand for the currency of the reference country – and incorporates such factors to obtain an estimate for money demand in each Euro area country. However, given that such assumptions might not always hold, these results must be taken carefully and as a further element to support the enhancement of the techniques currently used by each country.

## 5 Conclusions

The news about the demise of the use of cash seem somewhat exaggerated. Despite some punctual evidences of a shy decrease in its usage, cash still widely serves as a means of payment or of storage of value, regardless of the jurisdiction or of the currency concerned. Given its criticality, this paper focused on the issue of estimating the amount of cash in circulation in a given economy, under the special conditions introduced by the participation in a monetary union. For this purpose, all Euro area countries (fixed 2002 composition) were scrutinized.

Our goal was not one of persuading for the superiority of a specific technique, but rather to foster the discussion of this issue, particularly among central bank statisticians, with a view to propose practical solutions that may contribute to enhance current methods. Given the specificities of the estimation of cash in circulation in each economy/monetary union and since we are, in essence, trying to estimate a non-observable cross-border phenomenon, it should be underlined that there is no single method that can guarantee uncertainty-free results. Hence, any result of any estimation method must be duly validated from the theoretical point of view (e.g. the quality of the source data and the feasibility of the assumptions must be accurately factored in) and from the practical point of view (e.g. the results must be compared against the reality and idiosyncrasies of the countries under scrutiny).

In this spirit, this paper presents 3 possible estimation methods for the amount of Euros in circulation in each Euro area country, grounded on different data sources and statistical techniques.

Method 1 consists in the extrapolation, for the post 2002 period, of the time series structure of legacy currencies in the 1980-2000 period. The results of this method, which implies assuming no structural breaks in the cash in circulation series for the post 2002 era, appear to build confidence intervals that encompass the values currently reported by 3 of the 5 countries for which a forecast was possible.

Method 2 takes as starting point the method published by the ECB to estimate the Euros circulating outside the Euro area (published in ECB (2017a)) and takes as reference the estimate for the Euros circulating in the Euro area. A proportion of this stock was then allocated to each Euro area country according to harmonized criteria: (i) the share of each country's GDP in the Euro area's GDP; and (ii) the relative importance of the contribution of each country to the collective contribution of the countries under analysis to the Euro Area's M3. The overall results of this method appear to be more in line with the stocks currently reported, although there are some cases of noticeable under/overestimation. Notwithstanding, this method has the virtue of being based on a publicly available (ESCB approved) estimation method and of producing estimates according to well-defined, harmonized criteria.

Finally, method 3 adapts one of the methods used by Bartzsch et al. (2011b) to estimate the "German euros" in circulation outside the Euro area and consists in estimating a structural money demand model for a country similar to the country for which we seek to estimate the cash in circulation. To determine the reference country for each Euro area country, hierarchical and non-hierarchical clustering was applied to a dataset containing proxies for the level of transactions, wealth, degree of openness of the economy, dimension, importance of tourism, hoarding motive and role of cashless payment instruments in each EU country. Through this technique, the United Kingdom, Czech Republic and Sweden were selected as reference countries for the estimation of a structural money demand model. The structural factors included in this regression were proxies for the evolution of prices, transactions and the opportunity cost of holding money. The results,

which translate with greater emphasis the seasonality associated to each proxy, appear to underestimate the stock of cash in circulation in each Euro area country, especially when the stocks reported by each country show a strong upward trend. Hence, it must be highlighted that using this 'one-size fits-all' estimation approach carries the assumption that all pairs of reference and Euro area countries have similar structural money demand factors, which might not hold in all cases. Therefore, the results must be taken prudently and as a further element to support the development of the methods currently used by each country.

All in all, when the virtues and frailties of all three methods are considered, it is arguable that method 2 is seemingly more "adoption ready", given that it starts is grounded on an already approved and published methodology to estimate the Euros circulating outside the Euro area and employs relatively fair allocation criteria. Notwithstanding, the confidence interval yielded through method 1 can also be a useful reference to frame any future estimation experiments, and the structural model laid in method 3 can provide a basis for future country-specific adaptations that can prove important in supporting the methods currently used by each Euro area country. However, for future studies in this topic, new functional forms, techniques (e.g. country specific coins to banknotes ratio) and panels of variables can be tested to achieve a greater degree of accuracy in all countries. That said, any methodological changes arising from future refinements of the methods currently used must be duly contextualized and tested against the idiosyncrasies of each country.

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# Uses of mirror data: examples from the BIS international banking statistics and other external statistics<sup>1</sup>

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## Abstract

This study examines the data elements that are common to the BIS international financial statistics and other external statistics such as the Balance of Payments, International Investment Position and Coordinated Portfolio Investment Survey. We enlist several conceptual relationships between various data sources and demonstrate the validity of relationships with country data at an aggregate level. In addition, the differences between mirror data items provide deeper insight into relevant data sets.

The paper's approach elucidates the methodological framework and data gaps, helping users to properly use the information. It also addresses quality issues and the statistical links between different domains.

**Keywords:** balance of payments, data collection and data estimation methodology, international banking, international financial data.

**JEL classification:** C82, C800, F42, F300.

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## A Introduction

Mirror data refer to different sources that capture similar concepts. They involve the comparison of different statistical data that can be analysed mainly in two perspectives – within one country between different statistical domains with similar concepts; or between reporting countries aiming to compare the same statistical data under a dual perspective.<sup>4</sup> For example, creditor banks' assets should equal to debtor banks' liabilities when valued using the same method.

The concept of mirror data is an important statistical tool that also allows common data items to be validated across statistical domains, which can help to fill gaps in related data sets. In addition, it promotes consistency and accuracy, helping to raise statistical quality standards. Consistent and high-quality data are crucial for economists, analysts and policymakers who need to explore statistical information.

This paper focuses on external statistics, comparing creditor as well as debtor data sources. In particular, it explores linkages within and between two data sources of the BIS international banking statistics, as well as linkages with the BIS international debt securities statistics, the IMF International Investment Position (IIP) and the IMF Coordinated Portfolio Investment Survey (CPIS).

The paper seeks to identify statistical consistency tests between the BIS's international banking statistics and other external statistics domains. At a first stage, it aims to compare published data between these different domains. Second, it identifies the methodological aspects that may explain some differences. Finally, it offers guidance on the types of discrepancy that should be avoided. The country experiences include the Portuguese case, and also benefit from contributions provided by other reporting countries.

We propose to develop this joint work in several stages. After identifying the consistency tests (in this paper), we will present them at the BIS workshop for compilers in November 2018 and ask for additional suggestions. In order to address different compilation practices among countries, we intend to collect the relevant metadata from all the compilers and list the main methodological differences. Subsequently, consistency tests for individual reporting countries and bilateral comparisons at a granular level could be constructed.

This document consists of five sections. After the introductory Section A, data sources are described in Section B. The methodological framework for linkages between pairs of mirror data sources and results with explanations are provided in Section C for loans and deposits, and in Section D for debt securities. Section E concludes with proposed future work. The annex provides statistics tables by country for each of the mirror concepts; and also the list of names of ISO country codes used in the texts and tables.

## B Description of data sources

This study covers two different dimensions: an internal one comparing the BIS international banking and financial statistics (IBFS) data sources and an external dimension comparing the international banking statistics (IBS) with other external data sources. In regard to the first

<sup>4</sup> Swapan-Kumar Pradhan (BIS) and Jana Sigutova, who was visiting from the Bank of Canada, were the first to jointly explore the mirror relationships between the BIS international banking statistics and other data sets. The topic was presented for discussion in the Biennial Meeting of the Central Bank Experts, 8–9 February 2017, Basel.

dimension, we recognise linkages between the locational banking statistics (LBS), the consolidated banking statistics (CBS) and the international debt securities (IDS).

The LBS and CBS are the two BIS data sets on international banking activities. The LBS measure claims and liabilities including the inter-office positions of banking offices resident in reporting countries. They record the instruments (loans and deposits, debt securities, and other assets and liabilities), currencies, bank nationalities, counterparty sectors (eg intragroup, central banks, unrelated banks and non-banks) and the composition of resident banks' balance sheet by their counterparties' geographical location. Complementing this perspective, the CBS measure the worldwide consolidated claims of banks headquartered in reporting countries, including claims of their foreign affiliates but excluding inter-office positions.

The LBS comprise two data subsets, the LBS by residence (LBS/R) and the LBS by nationality (LBS/N). Broadly speaking, the LBS/R include an instrument breakdown for banks' on-balance sheet claims/liabilities, while the LBS/N provide the same information on the basis of reporting banks' nationality. The CBS are also presented in two different formats – on an immediate counterparty basis (CBS/IC), which aggregates claims based on the contractual obligation of banks' immediate counterparty countries, and on an ultimate risk basis (CBS/UR). The latter are aggregated on the basis of ultimate obligor, after taking into account risk transfers. Common elements (breakdowns) exist within and between the two LBS data sets, and the LBS/N are also comparable with the CBS/IC since both abide by the principle of immediate counterparty on a residence basis and aggregated by the nationality of banks.<sup>5</sup>

The IDS are a security-by-security data set built by the BIS using information from commercial data providers. They describe securities issued outside the local market of the country where the borrower resides and/or securities issued under international law. They capture eurobonds and foreign bonds but exclude negotiable loans. The securities are aggregated, among other criteria, by issuer's sector, currency, nationality and issuer's residence. The residence of the issuer is the country where the issuer is incorporated, whereas the nationality of the issuer is the country where the issuer's parent is headquartered. In principle, the cross-border debt securities liabilities of banks in the LBS/R should be comparable with the IDS issued by the banks' sector in the same location (residence). However, information may be incomplete if the ownership of securities changes through secondary market transactions.

According to the 'Reporting guidelines and practices for BIS international banking statistics', the LBS statistics are consistent with the Balance of Payments (BoP) and International Investment Position (IIP) methodology, as they correspond to claims/liabilities of one country vis-à-vis those of non-resident countries. In addition, the LBS are best suited for macro analysis of economic and financial stability issues. The linkages with these and other statistical domains cannot be disregarded and should be part of the IBS statistical analysis.

To address the second dimension, external statistics are used. Under the IMF, Balance of Payments and International Investment Position Manual (sixth edition) (BPM6), the IIP is a statement that shows, at a given point in time, the value of financial assets (liabilities) of residents in one economy that are claims (debts) on non-residents or are gold bullion held as reserve assets. Our analysis focuses on the linkages between LBS/R and the IIP loans, deposits and debt securities of deposit-taking corporations excluding central banks, among all functional categories.

<sup>5</sup> The latest version of the 'Reporting guidelines and practices for BIS international banking statistics', as well as reporting templates and other documents explaining how to report the *BIS international banking statistics*, are available on the BIS website.

We also compared the debt securities liabilities of banks from the LBS/R with the bank-issued debt securities liabilities that are reported as assets in the IMF CPIS, which is a voluntary data collection exercise conducted by the IMF.

## C Methodological framework and results for loans and deposits: Linkages between LBS and other statistical domains

One of the most important ways to validate data consistency is to analyse interlinkages with other data sources, and help to improve data quality as well as coverage. In addition, such linkages send an important message to data analysts and decision-makers: namely, that statistical information should be used to complement economic analysis from different perspectives. This section presents three broad categories, with subcategories within each, for loans and deposits.

### Loans and deposits (LD)

#### LD1 Comparison of bilateral interbank claims and interbank liabilities from the BIS LBS/R

This mirror exercise corresponds to the comparison between interbank claims and interbank liabilities for loans and deposits, both sourced from the LBS/R (hereafter referred as interbank claims and interbank liabilities). The LBS/R provide instrument breakdown of claims/liabilities of resident banks in a reporting country, with a full country breakdown of counterparties including currencies and counterparty sectors.

The main motivation in this case is that the claims of reporting banks in country “i” on counterparty banks in country “j” should be a good proxy of the liabilities of reporting banks in country “j” to banks in country “i”.<sup>6</sup> Similarly, the liabilities of reporting banks in country “i” to counterparty banks in country “j” should be a good proxy of the claims of reporting banks in country “j” on banks in country “i”.

From the perspective of country “i”, the tests can be described as:

$$\text{Interbank claims}_{i,j}^{LBS/R} \approx \text{Interbank liabilities}_{j,i}^{LBS/R}$$

and

$$\text{Interbank liabilities}_{i,j}^{LBS/R} \approx \text{Interbank claims}_{j,i}^{LBS/R}$$

The above comparison is only possible among LBS reporting countries. We use reported bilateral positions and aggregate to overall positions. The net interbank claims of all countries are defined by:

<sup>6</sup> According to the valuation principles defined in the ‘Reporting guidelines and practices for BIS international banking statistics’, loans (both claims and liabilities) should be valued in accordance with the reporting country’s accounting standards and, in principle, at nominal (or contractual) values. It is recognised, however, that national accounting rules may require different valuation methods for particular positions.

$$Net\ interbank\ claims = \sum_{i=1}^x \left[ \sum_{\substack{j=1 \\ i \neq j}}^x (Claims_i^j - Liabilities_j^i) \right]$$

and

$$Net\ interbank\ liabilities = \sum_{i=1}^x \left[ \sum_{\substack{j=1 \\ i \neq j}}^x (Liabilities_i^j - Claims_j^i) \right]$$

Where the inner sum represents net interbank claims/liabilities for reporting country "i" and x is the number of reporting countries in respective quarter. The value of x could be different depending on count of LBP reporting countries, with inclusion of new ones over the years.<sup>7</sup> Tables 1 and 2 (Annex) illustrate how net interbank claims and liabilities were derived in our exercise from underlying bilateral claims and liabilities for banks in reporting countries.

One crucial aspect which is ignored in most research using interbank claims and liabilities, even at the aggregate level, is that the LBS counterparty bank sector includes central banks (or official monetary authorities) which are not included in the reporting banks.<sup>8</sup> Therefore, a fair comparison between interbank claims and liabilities is valid only if the counterparty bank sector excludes central banks. Until Q3 2013, such an exclusion was possible only at the aggregate cross-border positions level, but hardly any analysis using aggregate level data on interbank claims/liabilities considered this aspect when comparing mirror positions.<sup>9</sup> The importance of positions vis-à-vis central banks in reconciliation of interbank claims/liabilities is demonstrated with actual reported data in Table 3.

**Table 1 • Positions vis-à-vis counterparty bank sector and, of which, central bank**  
Actual reported positions, as of Q4 2017, in USD millions

Position	Reporting country (RC)	Interbank sector including CBs	Interbank sector excluding CBs
Claims	RC1 on RC2	28,393.0	8,155.0
Liabilities	RC2 to RC1	8,720.7	8,600.8
Net interbank claims of RC1 on RC2		19,672.3	-455.8

Position	Reporting country (RC)	Interbank sector including CBs	Interbank sector excluding CBs
Liabilities	RC1 to RC2	31,499.0	9,334.0
Claims	RC2 on RC1	11,736.1	8,020.6
Net interbank liabilities of RC1 to RC2		19,762.9	1,313.4

<sup>7</sup> x =38 in 2004, 39 in 2005/2006, 40 in 2007, 41 in 2008, 42 in 2009, 43 in 2010 to 2014, 45 in 2015 and 47 in 2016/17.

<sup>8</sup> Data structure definition of LBS is available at [www.bis.org/statistics/dsd\\_lbs.pdf#page=2](http://www.bis.org/statistics/dsd_lbs.pdf#page=2).

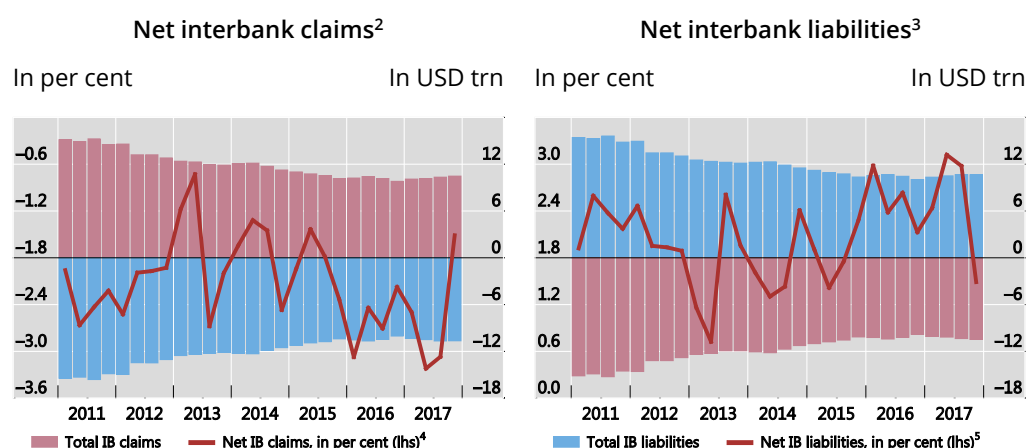
<sup>9</sup> Committee on the Global and Financial System (CGFS) Stage 1 and 2: "Improving the BIS international banking statistics", CGFS Papers, no 47, BIS, November 2012.

In our analysis, we exclude bilateral positions vis-à-vis central banks, which are reported with enhanced data from Q4 2013<sup>10</sup> subject to availability (a few countries started providing enhanced data in subsequent quarters). Using reported bilateral data and the methodology described above, Table C1.1 and Table C1.2 (Annex) respectively reveal results by country for positions in total of all currencies.<sup>11</sup> Both Tables show the comparison of net bilateral interbank claims and net bilateral liabilities for the same set of 44 individual reporting countries between two periods: Q4 2011 (before CGFS enhancements) and Q4 2017.<sup>12</sup>

Between 2011 and 2017, the size of net claims differences, at the level of all reporting countries, fell from USD –322.8 billion to USD –162.5 billion, which corresponds to a decline from –2.2% to –1.5% of the stock of net interbank claims (Chart C1 left-hand panel and Table C1.1).

At an aggregate level, this is represented with the opposite sign for net interbank liabilities (Chart C1 right-hand panel and Table C1.2 (Annex)). Of the 25 countries shown individually in the table, net interbank claims improved for 16 countries between 2011 and 2017, and also for nine of other 19 countries not shown individually. This trend is also observed for net interbank liabilities across countries with some exceptions.

**Chart C1 • Cross-border net interbank claims and liabilities in reporting countries<sup>1</sup>**  
Excluding positions vis-à-vis central banks



1 Interbank positions of banks in 44 reporting countries; CN, PH and RU started reporting after 2011 and are excluded. 2 Sum of all bilateral claims of banks in one reporting country vis-à-vis banks in the other 43 reporting countries minus sum of all bilateral liabilities by banks in the other 43 reporting countries to banks in a reporting country. 3 Sum of all bilateral liabilities of banks in one reporting country to banks in the other 43 reporting countries minus sum of all bilateral claims by banks in the other 43 reporting countries on banks in a reporting country. 4 Net claims (=total Interbank claims minus total Interbank liabilities) as a percentage of total Interbank claims. 5 Net liabilities (=total Interbank liabilities minus total Interbank claims) as a percentage of total Interbank liabilities.

Source: BIS locational banking statistics by residence (QR June 2018, Released database).

It is noteworthy that the accuracy of the results also depends on the availability of data reported on positions vis-à-vis central banks (CB), a subcategory of the total banks sector. Chart C2 represents the share of the central bank sector in total claims/liabilities, interbank claims (loans)

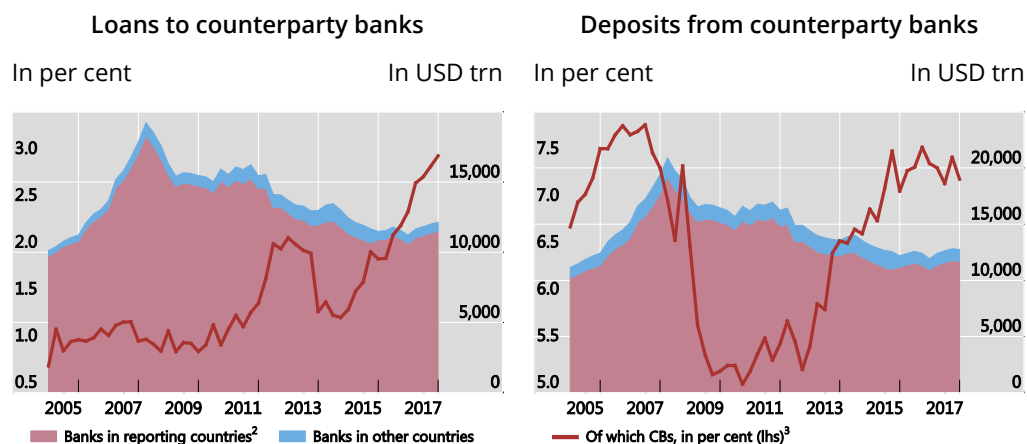
<sup>10</sup> According to the march 2013 'Reporting guidelines and practices for BIS international banking statistics' which incorporates Stage 2 enhancements, sub-sectors within the banking sector should be reported in both sets of locational statistics.

<sup>11</sup> We also examined total differences by currency – total, euro and dollar – but results in tables are for all currencies.

<sup>12</sup> Three countries (China, Russia and the Philippines) joined after Q4 2011 and are excluded for the comparison from these two tables.

and interbank liabilities (deposits) vis-à-vis the counterparty bank sector. It shows that global cross-border interbank claims and interbank liabilities are highly concentrated within BIS reporting countries (about 95% for claims and 92% for liabilities).

**Chart C2 • Global cross-border interbank loans and deposits vis-à-vis bank sector<sup>1</sup>**  
Counterparty banks in all countries



1 In the locational banking counterparty sector, "banks" includes central banks. 2 Among all counterparty countries in the world, the set of counterparties as reporting countries and as other countries adjusted in each quarter, depending on countries that contributed to the LBS in the respective quarter, ie 38 in 2014 and 47 in Q4 2017. 3 Share in total claims/liabilities vis-à-vis bank sector.

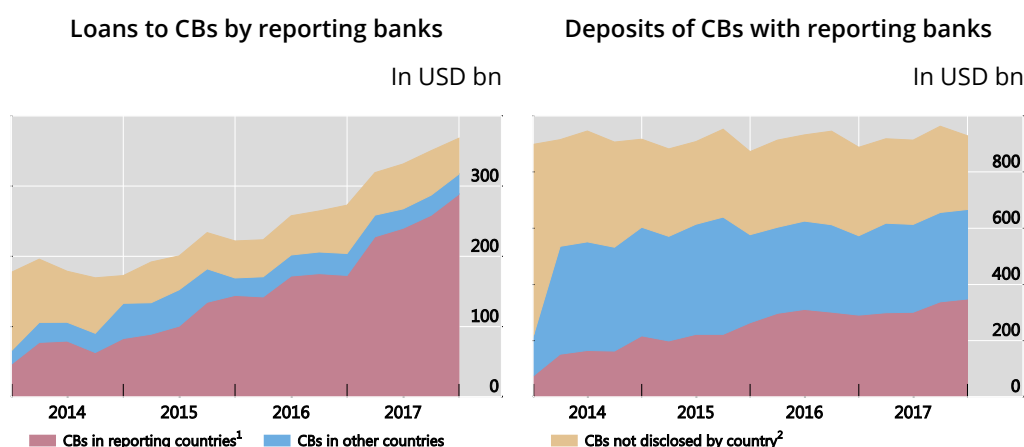
Source: BIS locational banking statistics by residence (QR June 2018, Released database).

On the other hand, the share of the CB subsector has been increasing over time with respect to loans and after 2009 for deposits. In 2017 the percentage of central bank (CB) loans and deposits was 3% and 7.5%, respectively, in the total amount of the "banks" sector.

We further analysed the loans to CBs and deposits from CBs by counterparty country location from Q4 2013 (Chart C3). The bilateral cross-border loans of reporting banks to CBs (left) are shown by location and for deposits of CBs (right) placed with reporting banks. Between 2014 and 2017, cross-border loans to CBs have increased from USD 177 billion to USD 368 billion, whereas for cross-border deposits from CBs increased from USD 898 billion to USD 929 billion. It can also be seen that in the case of loans, counterparty CBs located in reporting countries correspond to 80% of the total amount (compared with 14% in non-reporting countries and the remaining 6% undisclosed by location for confidentiality reasons). In the case of deposits, counterparty CBs in reporting countries correspond to only 37% (and 35% from CBs in non-BIS reporting countries and a remaining 28% undisclosed by location for confidentiality reasons).



**Chart C3 • Cross-border loans and deposits vis-à-vis central banks**  
By location of counterparty CBs



<sup>1</sup> Among all counterparty countries in the world, the set of counterparties as reporting countries and as other countries adjusted in each quarter, depending whether countries contributed to the LBS in the respective quarter, ie 44 in 2014 and 47 in Q4 2017. <sup>2</sup> Cross-border positions not allocated by country either to counterparty reporting countries or to other countries, mainly on account of confidentiality restrictions.

Source: BIS locational banking statistics by residence (QR June 2018, Released database).

When we consider the Portuguese case, net claims differences fell from USD –1.8 billion (end-2011) to USD –0.9 billion (end-2016). We investigated the interbank claims/liabilities of banks in Portugal vis-à-vis banks in other reporting countries between 2004 and 2017. We find that the loan claims and deposit liabilities of Portuguese banks are mostly vis-à-vis the bank sector in other reporting countries. Although the positions vis-à-vis the CB subsector in the case of banks in Portugal were immaterial, the exclusion of these positions, starting in 2014 when data became available, further diminished the already negligible differences between compared claims and liabilities. This also means that the quality of interbank data reported by Portugal (vis-à-vis other reporting countries) and by other reporting countries (vis-à-vis Portugal) has improved over time.

Differences identified in Table C1.1 and C1.2 indicate that the interbank assets/liabilities reported by countries may not be consistent with derived liabilities/assets provided by counterparty reporting countries. However, this does not necessarily mean that there are gaps or errors for the reporting country concerned. Some issues can be adduced to explain the differences:<sup>13</sup>

- 1 **Coverage** – incomplete coverage of the counterparty banks – eg banks in a reporting country may have claims on a specific bank located in another reporting country that exclude the bank from its reporting population.
- 2 **CB's positions** – not all concerned countries disclose bilateral positions vis-à-vis CB (official monetary authorities). These positions, if not excluded, will widen the gap in the reconciliation of interbank positions.
- 3 **Definition of bank sector** – a few countries include building societies or post-banks in their reporting banks but they are non-bank counterparty for other reporting countries. Non-bank financial institutions are also included in some reporting populations (eg development banks and export credit agencies).

<sup>13</sup> The relative importance of each issue will vary according to the reporting country.

- 4 **Instrument breakdown** – in some cases, there are gaps in instrument breakdown as well as issues with the inclusion/exclusion of items within loans and deposits. For example, non-negotiable debt instruments should be reported under loans and deposits, not in debt securities. By contrast, loans that become negotiable should be reported under debt securities (provided that a secondary market exists for the trading of such loans).
- 5 **Valuation** – varying valuation methods. According to the BIS guidelines, loans and liabilities (eg deposits) should be valued at nominal (or contractual) values rather than at market prices. However, it is recognised that national accounting rules may require different valuation methods for particular positions.
- 6 **Banking laws** – treatment of instruments could differ due to accounting or other reasons (eg Islamic banking).
- 7 **Legal/confidentiality restrictions** – country legal restrictions preventing the disclosure of bilateral loans/deposits for confidentiality reasons, even to the BIS.
- 8 **Different reporting practices** – with regard to fiduciary instruments (credit on a trust basis).

## LD2 Comparison domestic claims, local claims in all currencies and local liabilities of domestic banks between the LBS/N and CBS/IC<sup>14</sup>

We compare domestic claims in all currencies, local claims in all currencies and local liabilities in local currency vis-à-vis residents of the respective reporting countries using data reported in the CBS/IC and LBS/N.

Domestic claims are those vis-à-vis residents of a country, regardless of whether the claims/liabilities are booked by domestic banks' offices inside the country (local claims) or by offices outside the country (cross-border claims). In the LBS/N domestic claims are those vis-à-vis residents of the parent country and are reported by host LBS countries, while in the CBS/IC those vis-à-vis residents of the country that compiles/reports the data.

On the other hand, local claims and local liabilities of domestic banks are those vis-à-vis residents of country where banking offices are located, be in the reporting country or abroad. In our test, we consider local claims and local liabilities vis-à-vis residents of the reporting country that compile both data sets. In the LBS/N, both local claims and local liabilities are available with a currency breakdown into local (or domestic) and foreign currencies. However, in the CBS/IC local liabilities vis-à-vis residents are available only in local currency and are collected as a memo item. That is why we can compare domestic claims (local plus cross-border) and local claims from LBS/N (both excluding intragroup positions) with the reported figures in CBS/IC but only the local liabilities in local currency (defined as liabilities booked in the domestic currency of, and with a counterparty located in the reporting country in both the LBS/N and CBS/IC).

The intuition is that the above positions<sup>15</sup> of country "i" banks (domestic banks) in the consolidated banking statistics on an immediate counterparty basis vis-à-vis residents of country "j"<sup>16</sup> should be

<sup>14</sup> Domestic claims in all currencies, local claims in local currency and local liabilities in local currency, potentially include financial instruments (eg debt securities) in addition to loans and deposits.

<sup>15</sup> Positions vis-à-vis banks and non-banks located in the same country of residence of the reporting banking office.

<sup>16</sup> Available in the enhanced CBS/IC data from Q4 2013, and from Q2 2012 in the LBS/N data.

a good proxy for the domestic position, excluding intragroup, of country “i” banks in the locational by nationality statistics.

This test can be described for both claims and liabilities by the following:

$$LBS/N \text{ claims}_i^{DomesticAll} \approx CBS/IC \text{ claims}_i^{DomesticAll}$$

$$LBS/N \text{ claims}_i^{LocalAll} \approx CBS/IC \text{ claims}_i^{LocalAll}$$

$$LBS/N \text{ liabilities}_i^{LocalLocal} \approx CBS/IC \text{ liabilities}_i^{LocalLocal}$$

The results are shown in Tables C2.1, C2.2 and C2.3 (Annex). Domestic claims and liabilities in the LBS are available from Q2 2012 under enhanced requirements, while domestic claims are available in CBS/IC from Q4 2013.

Table C2.1 reveals that the differences in domestic claims between the LBS/N and CBS/IC diminished at an aggregate level in percentage terms from 16.6% in Q4 2014 to 15.9% in Q4 2017. It was possible to reveal figures in all cells for 19 countries but not for all countries due to data confidentiality or data gaps. The amounts between the two data sets are either almost the same or differ by less than 10% for 13 of the 19 reporting countries. On the other hand, relatively large differences exist for a number of countries

Table C2.2 compares local claims in all currencies on residents of the reporting countries by domestic banks located in the same country of residence as that of the reporting country. In the total of 16 countries, the difference increased from USD 3,603 billion (12.4%) in Q4 2014 to USD 3,716.3 billion (14.6%) in Q4 2017. However, the individual behaviour is heterogeneous, with a number of countries posting almost the same amount in both data sets.

Table C2.3 compares local liabilities in local/domestic currency between the LBS/N and CBS/IC. The table shows that the amounts between the two data sets are either the same or differ by less than 6% for a number of reporting countries while, for other countries, the gap between the two data sets has increased between 2014 and 2017.

Differences between the LBS/N and CBS/IC may relate to several different issues:

- 1 **Coverage** – the CBS/IC have a much broader coverage than the LBS/N data. In addition, while the CBS reporting population may exclude smaller banks and include non-financial subsidiaries (excluding insurance), the LBS/N population may include non-bank affiliates such as building societies, credit unions and other financial institutions that take deposits or issue a close substitute for deposits.
- 2 **Different criteria** – the LBS and CBS/IC use different criteria for the classification of domestic banks. Some countries classify banks with a private foreign ownership as non-domestic banks in the LBS/N but classify them as domestic banks in the CBS for supervisory purposes.
- 3 **Geographical breakdown** – domestic claims are aggregated by nationality in the LBS/N data (excluding inter-office claims) by the BIS, whereas they are reported by the concerned country in the CBS/IC. Different data sources, particularly inter-office positions, may not be completely consistent or correctly reported. In certain cases, inter-office positions may include those vis-à-vis non-bank affiliates.
- 4 **Reporting issues** – in the case of local liabilities in the CBS/IC, a number of countries report only loans and deposits, whereas other positions such as debt securities are also included in the LBS/N. Debt securities issues by counterparty country are also difficult to report under the CBS.

- 5 **Different scope/coverage** – in some countries, such as Austria and Finland, a very large number of small banks are not consolidated by a parent. If these very small banks have a reporting obligation only for the LBS/N, whereas in the CBS only “internationally active banks” are included, the local/domestic claims and liabilities are prone to differ. In such a case, the CBS’s focus on internationally active banks might actually lead to a situation where the LBS/N provide a broader coverage of domestic/local business, whereas the CBS are broader in their coverage of international banking businesses.
- 6 **Different scope of consolidation** – the “artificial consolidation” applied in this test by excluding intragroup positions is only applied to claims/liabilities from banks, whereas the scope of consolidation in the CBS is usually wider in scope (often a prudential scope of consolidation is used, also including various kinds of financial intermediaries). As a result, the LBS/N part of the test usually includes claims and liabilities that would be consolidated by the reporting bank in the CBS. Additionally, it is usually very hard for central banks to classify liabilities/debt securities as intragroup, which would not allow them to “artificially consolidate”.

There are varying experiences across countries. In Portugal, the main discrepancies for the recent periods are related to the geographical breakdown on interest owed but not yet paid. Austria explains that the difference is mainly due to the sample of reporting banks, in that only internationally active banks are included in the CBS. Another important difference between the LBS/N and CBS for liabilities for Austria is how debt securities are treated: while they are not included in local liabilities in the CBS, they are included in the LBS/N and assigned to a counterparty based on an estimation of the holder of the securities (based on the Securities Holdings Statistics or SHS data). In the Swiss case, interbank positions in the CBS are netted between the parent company and its subsidiaries/affiliates (netting in both directions) but, in the LBS/N, positions against parent companies or “sister” companies are not included in the counterparty sector “intragroup”.

### LD3 Comparison of loans and deposits between the BIS LBS/R and the IMF IIP

We examine the loans and deposits of deposit-taking institutions excluding CB between the LBS/R and the IMF IIP

We consider that cross-border loans and deposits for both claims and liabilities on the accounts of reporting banks in the LBS/R should be comparable with the country’s International Investment Position assets and liabilities for the functional category “other investment” comprising currency, deposits and loans for the deposit-taking corporations, excluding central banks.

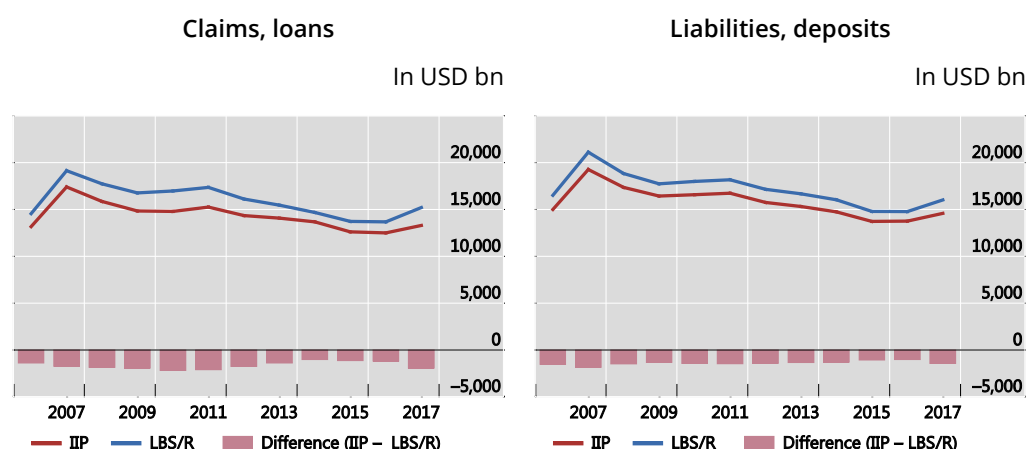
This test can be summarised as follows:

$$LBS/R \text{ assets}_i^{\text{Loans and deposits}} \approx IIP \text{ assets}_i^{\text{Loans and deposits}}$$

$$LBS/R \text{ liabilities}_i^{\text{Loans and deposits}} \approx IIP \text{ liabilities}_i^{\text{Loans and deposits}}$$

Chart C4 shows the evolution of LBS/R and IMF IIP claims and liabilities between 2006 and 2017. Note that loans and deposits have declined for these countries after the 2007–09 Great Financial Crisis. In addition, LBS/R amounts are higher than the IIP for this period.

**Chart C4 • Cross-border loans and deposits between the BIS LBS/R and the IMF IIP<sup>1</sup>**  
In billions of US dollars



<sup>1</sup> Claims and liabilities in the IIP comprise “Other investment” on account of currency and deposits, and loans of deposit corporations excluding central banks. This graph shows comparison for total loans and deposits for the 24 countries for which IIP data have been available since Q4 2006. The countries are AT, AU, BE, BR, CA, CH, CL, DE, DK, ES, FI, FR, GB, GR, IN, IT, JP, KR, LU, NL, PA, SE, TR and US. The latest available IIP data for GB related to Q4 2015 and were copied to Q4 2016 and Q4 2017. A number of other countries that started reporting IIP data after Q4 2006 are excluded from this graph (details in Table C3.1 and Table C3.2).

Source: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF International Investment Positions (IIP, 2018 M06 release)

We also compare LBS/R data with the IIP by country for two different periods – Q4 2014 and Q4 2017. Of the 47 reporting countries in the LBS/R, IIP data for loan claims and deposit liabilities of deposit-taking corporations are not available for 12 LBS/R reporting countries.<sup>17</sup> We thus make the comparisons for the remaining 35 LBS/R reporting countries.

Table C3.1 and C3.2 (Annex) confirm that, except in some instances, data on loans and deposits between LBS/R and the IIP reporting systems are complementary to each other as the differences are limited for most countries. While both sets exist for different purposes (eg granularity in the LBS/R, frequency), there are a number of benefits in such complementary data sources. For instance, the short-term and long-term split, not available in the LBS/R, can be found in the IMF IIP database.

In the case of loans claims, the difference in the total of all countries increased from –6.9% in Q4 2014 to –9.1% in Q4 2017. The difference between the two mirror sources fell for most other countries. In the case of deposit liabilities, the difference in the total of all countries fell from –7.7% in Q4 2014 to –6.7% in Q4 2017, and, except in a few cases, the differences between the two mirror sources also narrowed in the latest period of Q4 2017.

In the Portuguese case, the differences between the IIP and LBS/R for claims amount to USD –0.2 billion in Q4 2014 and USD –1.5 billion in Q4 2017 (Table C 3.3, Annex). These differences are mainly related to the geographical breakdown on interest owed not yet paid. The larger values for the Swiss IIP are related to the calculation from the monthly balance sheet survey, which includes more than 240 banks (larger than number of reporting banks in the LBS/R data). However, the difference between the IIP and LBS/R for Switzerland fell in Q4 2017 compared with Q4 2014.

<sup>17</sup> The IIP data on loans and deposits are not available for 12 LBS/R reporting countries (BS, BH, CN, CW, GG, IM, JE, KY, MO, MY, SG and TW).

Canada's main differences on the assets side are related to the inclusion of inter-office positions – equity and retained earnings in the LBS/R loans and deposits. On the liabilities side, the discrepancy is caused by the exclusion of repo transactions in the IMF IIP and the inclusion of covered bonds in the LBS/R.

## D Methodological framework and results for debt securities: Linkages between the LBS and other statistical domains

In this section, we discuss three broad categories of mirror relationship with subcategories for the debt securities claims/liabilities. Debt securities claims and liabilities (DS)

### DS1 Comparison of cross-border debt securities claims between the BIS LBS/R and the IMF IIP

We examine the cross-border debt securities claims between the BIS LBS and the IIP of deposit-taking corporations excluding the CB of that country.

The cross-border debt securities claims of deposit-taking corporations, except for those of CB, should, in principle, be comparable between the BIS LBS/R and the IMF IIP. The presumption in this case is that the cross-border debt securities assets of reporting banks in the LBS/R should be similar to the portfolio investment net acquisition of financial assets amounts of deposit-taking corporations (excluding those of central banks).

This test can be described by the following formula:

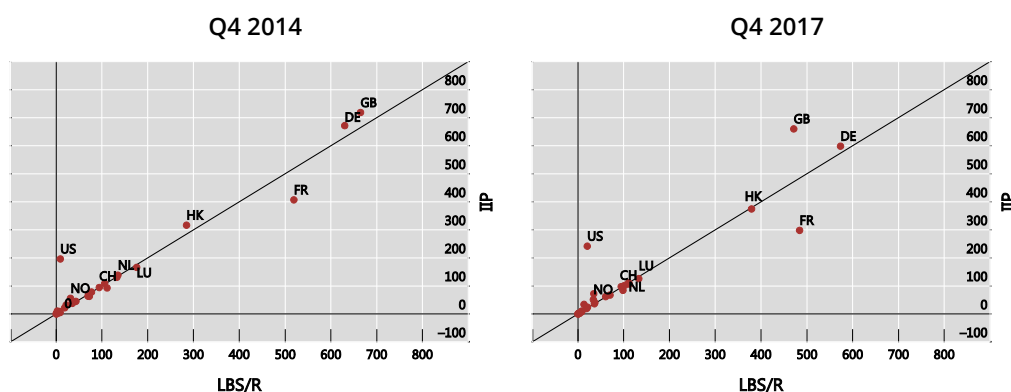
$$LBS/R \text{ assets}_i^{\text{Cross-border debt securities}} \approx IIP \text{ assets}_i^{\text{Debt securities}}$$

The IMF IIP data on portfolio investment debt securities claims are available for 34 of 47 countries with latest available data for Q4 2017 (2018 M06 release).<sup>18</sup> In the LBS/R, two countries (Bahrain and Curaçao) do not report cross-border debt securities claims and, of the remaining 45 countries, the data for two countries are not disclosed.

Graph D1 shows the relationship between the LBS/R and IIP for these two periods. It is noteworthy that almost all reporting countries are aligned between the two data sets. However, there are some exceptions for countries with larger LBS/R and IIP amounts. In particular, data are exactly or almost the same or they differ by less than 5% for 14 countries. On the other hand, large differences exist for three countries (GB, JP and US). A time series comparison shows high volatility in the data for the most recent quarters in a number of countries (eg Australia and France), which may be due to the provisional nature of the data. Further investigation is needed, with the help of reporting countries, to understand the underlying reasons and resolve any issues relating to concepts, coverage or reporting. A few large exceptions resulted in a broader gap in the total of 34 countries. Nevertheless, a comparatively good consistency between the two mirror sources for a large number of countries offers the added benefit that cross-border debt securities claims from the IIP are available with a maturity breakdown into short- and long-term.

<sup>18</sup> IIP data on cross-border debt securities claims are not available for 13 LBS reporting countries (BH, BS, CA, CN, CW, GG, IM, JE, KY, MO, MY, SG and TW).

**Chart D1 • Cross-border debt securities claims between the BIS LBS/R and the IMF IIP<sup>1</sup>**  
In billions of US dollars



1 The IMF IIP data for debt securities claims are available for 34 of the 47 LBS/R reporting countries. The graph shows data for 31 of the 34 countries, excluding JP, PH and RU (data of JP are not public whereas those for PH and RU are not available in Q4 2014). Further details provided in the footnote of Table D1.

Source: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF international investment positions (IIP, 2018 M06 release).

There are country-specific reasons for differences in the cross-border debt securities claims of deposit-taking corporations (except those of CB between the two sources. The main reasons for the differences between the two data sources are listed below:

- 1 **Coverage** – while debt securities issued by internationally active banks are included in the LBS, the IIP covers those by all deposit-taking institutions excluding central banks.
- 2 **Sources** – in most countries, the LBS data are compiled by central banks (official monetary authorities) while the IIP is compiled mostly by statistical agencies but CB in some other cases.
- 3 **Definition** – the definition and treatment of external/cross-border positions might differ between the LBS and the IIP.
- 4 **Treatment of instruments** – there is the possibility of incorrect classification of instruments by the reporting entities. In particular, debt securities that are held on a custodial basis for customers or acquired without cash collateral should not represent on-balance sheet claims (or holdings of debt securities).

## DS2 Comparison of cross-border debt securities liabilities between the BIS LBS/R and the IMF CPIS

We examine the debt securities liabilities of banks by counterparty country between the LBS/R and the CPIS. This section also benefits from information available from the IMF as well as from a few central banks. The concepts of counterparty country and counterparty sector are identical between the LBS/R and the CPIS: both follow the same BoP/IIP treatments or principles. The treatment of instrument classification is almost the same. In both data sets, loans that have become negotiable instruments are reclassified from loans to debt securities.

With regard to our purpose on debt securities liabilities by counterparty country, the main problem is that the issuer of a security (debtor) may not know the residency of the holder. This uncertainty for tradable instruments arises from the fact that foreign custodians or other intermediaries may hold the securities. The CPIS thus provides more reliable detailed cross-border positions because

the holder (creditor) will usually know its holdings. We explain below the conceptual framework that could be exploited to use the CPIS source to ascertain counterparty country names and the amounts of bank-issued debt securities liabilities. A further possibility is that the remaining amount could be either proportionally allocated to these known counterparty countries or assigned to unallocated (cross-border or unknown location) in the LBS/R.

The CPIS was first conducted for end-December 1997, but data are comparable annually from 2001 to 2012. From 2013 onwards, the CPIS was published semi-annually (end-June and end-December). According to the CPIS guidelines, a reporting economy provides data on its holdings of portfolio investment securities (separate data are reported for equity and investment fund shares, long-term and short-term debt instruments). Derived portfolio investment liabilities (all economies) by the economy of non-resident holders are also available in this survey.

The coverage of reporting countries in the CPIS has increased over time. Comparing the two sources, we find that 44 of 47 LBS/R reporting countries provide CPIS data to the IMF. The limitation for derived debt securities liabilities is that liabilities would be known only to CPIS reporting countries that voluntarily report holdings of such securities by issuing sector as an “encouraged” contribution. The usefulness of the CPIS is that, using the holding data by issuing sector, it is possible to obtain the derived debt securities liabilities of 120 countries vis-à-vis holders in a maximum of 26 CPIS reporting economies. For example, one can identify the names of a maximum 26 counterparty countries that hold debt securities liabilities of banks located in Australia.

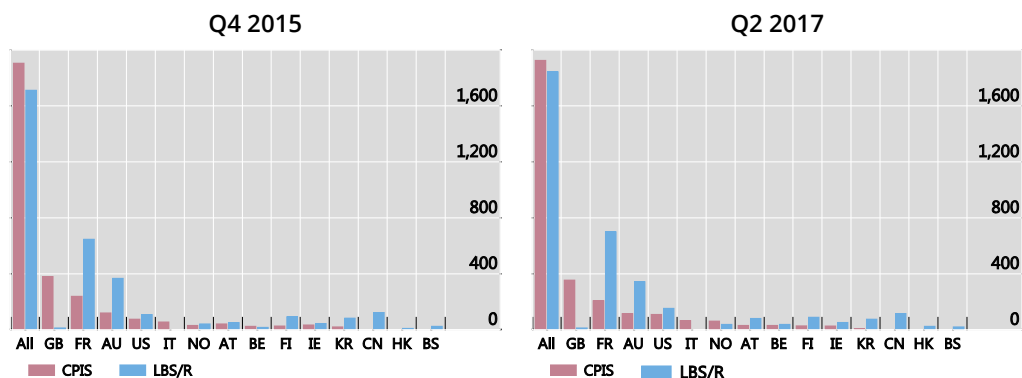
The voluntary reporting in CPIS for holdings of debt securities by issuer sector leads to our intuition that the total cross-border debt securities liabilities of reporting banks in the LBS/R in all currencies should be higher than those derived from the CPIS reporting countries’ holdings of debt securities that were issued by deposit-taking corporations (excluding central banks).

This test can be described by the following formula:

$$LBS/R \text{ liabilities}_{i,j}^{Cross-border \text{ debt securities}} > CPIS \text{ liabilities}_{i,j}^{Derived \text{ debt securities}}$$

We compare data as of end-December 2015 and end-June 2017<sup>19</sup> (Chart D2) and we demonstrate the results by country in Table D2 (Annex).

**Chart D2 • Border debt securities liabilities of banks by issuing country<sup>1</sup>**  
Amount outstanding; in billions of US dollars



<sup>1</sup> Countries having more 20 billion USD debt securities outstanding by individual counterparty countries either in CPIS or in LBS/R are shown in the graph. Sources: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF CPIS survey (15 March 2018 release).

<sup>19</sup> The reason for the choice of the first period was that both China and Russia started reporting LBS data from Q4 2015.



Although the gap in partially reported counterparty country breakdown between the CPIS and LBS/R has fallen by over 50% (from USD 193 billion in Q4 2015 to USD 83 billion in Q2 2017) within one and half years, it is surprising to note that the counterparty breakdowns within the LBS/R are underreported by almost 50% of the total cross-border amount (Table D2, columns 3 and 4 versus columns 7 and 8).

In addition, we investigated the gap between the LBS/R and CPIS for the same set of 47 BIS reporting countries. The derived debt securities liabilities of banks from the CPIS should be lower in amount as compared with the reported data in the LBS/R, because the number of reporting countries providing issuing sector breakdown is limited in the CPIS. There are other reasons that could potentially cause differences, even if all CPIS countries reported the breakdown, as encouraged. Differences between the two sources can be partially explained by valuation. In the case of the CPIS, holdings (from which we derived liabilities of banks in counterparty countries) are reported at market values, whereas the guidelines for the LBS/R reporting recommend the use of nominal (or contractual) values rather than market values. It is also recognised that national accounting rules may require different valuation methods for particular positions. However, additional factors probably need to be invoked to explain the large differences.

In our exercise, we find a number of interesting facts: First, the CPIS data suggest that banks in Bahrain, Curaçao, Greece and Singapore issued debt securities liabilities but these countries did not report such liabilities in the BIS LBS/R. Second, countries with large cross-border debt securities liabilities, such as the Cayman Islands, Germany and the United Kingdom, do not report any counterparty country breakdown in the LBS/R (reported as total cross-border) but country breakdowns are available in the mirror CPIS data (holdings of debt securities). Third, about USD 1.6 trillion are reported in LBS/R against unallocated by location (neither residents nor non-residents/cross-border). The countries with significantly large amounts vis-à-vis unallocated by country are, above all, Denmark, Japan, Luxembourg, the Netherlands Sweden and Switzerland.

The CPIS data on holdings of debt securities (claims) reported by CPIS participating economies vis-à-vis all other economies in the rest of the world (including unallocated) are informative and useful. These claims data by individual counterparty country and by counterparty issuing sector could serve the following needs:

- 1 They allow the debt securities liabilities of banks in individual countries to be derived vis-à-vis the reporting economies;
- 2 Reported debt securities liabilities in the LBS/R could be compared with derived debt securities liabilities from the CPIS; and
- 3 The country breakdown of debt securities liabilities from the CPIS can be used when such a breakdown is not available in the LBS/R, keeping the remaining amount (if any) in the unallocated category. One of the outcomes of this exercise is that the derived country breakdown of debt securities liabilities from the CPIS can be used to enhance data in other data sets (eg the LBS/R).

We also note below some limitations and sources of differences between the two sources:

- 1 **Frequency** – the CPIS is semi-annual (after 2013) whereas the LBS/R are quarterly.
- 2 **Vintages** – the CPIS data are available much later than the LBS/R data. Preliminary LBS/R data are available in about 120 days from the reference period but the CPIS data are available only about 250 days from the reference date.

- 3 **Reporting population** – only 26 countries report holdings of debt securities by issuing sector, whereas debt securities can be held by investors (creditors) in many more countries.
- 4 **Different sources** – in some cases, the main data sources for the LBS/R are the banks, while for the CPIS custodians and investment managers are the main data providers.
- 5 **Valuation** – holdings data in the CPIS are valued at market price whereas liabilities in the LBS/R are reported at book value. However, there are exceptions in the LBS/R that some countries report debt securities liabilities on market price (eg China, South Africa).

Finally, it is possible to use the country breakdown of debt securities liabilities from the CPIS and reconcile it with individual positions reported in the LBS/R. In future we plan to undertake such an exercise and demonstrate ways to use CPIS data for the counterparty country allocation of debt securities liabilities. In addition, as suggested by Austrian colleagues, the Centralised Securities Data Base (CSDB) would be also a good benchmark for comparisons within the euro area.

### DS3 Comparison of international debt securities liabilities between the LBS/R and IDS

This section deals with the concepts and the comparison of outstanding debt securities between the LBS/R and IDS. Reporting banks in the LBS/R provide information on their debt securities liabilities vis-à-vis resident and non-resident (cross-border) counterparties of concerned reporting countries. When banks do not know the residency of the debt holder, they report amounts against an unknown country. In the case of the IDS, total international debt securities outstanding from the banks are obtained using a security-by-security database,

Using reported data in the LBS/R, we assume that banks' international debt securities outstanding are the sum of debt securities liabilities to non-residents (cross-border) in all currencies, and those to residents and unallocated countries in foreign currencies. We exclude all debt securities in domestic currency that are reported vis-à-vis residents as well as vis-à-vis unallocated countries. We explain below some potential conceptual differences between these two mirror sources and also give our views on the motivation for such comparisons, even with known weak links.

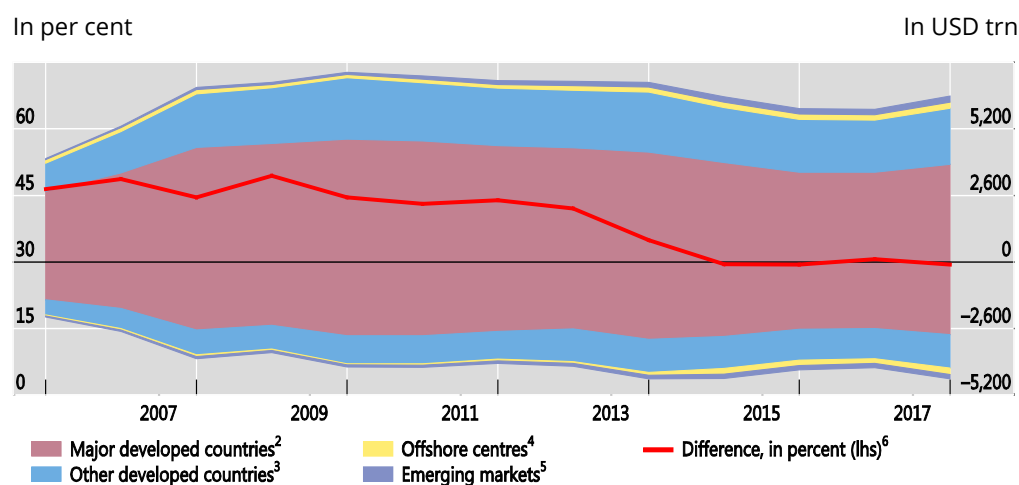
The concept in this case is that the aggregated outstanding debt securities liabilities of banks (LBS/R) should be comparable with the debt securities liabilities of banks from the IDS database. In other words, the international debt securities liabilities (LBS/R) of banks located in reporting country "i" should be similar to the outstanding amount of debt securities issued by public and private banks in the country "i" from the IDS databases.

This test can be described by:

$$LBS/R \text{ liabilities}_i^{\text{international debt securities}} \approx \text{International liabilities}_i^{\text{debt securities}}$$

We show the results by groups of countries having outstanding debt securities of more than USD 20 billion as of Q4 2017 in either the LBS/R or the IDS (Chart D3). Since 2007, the debt security differences between the IDS and LBS/R have been falling due mainly to the contribution of developed countries. By end-2017, the differences had fallen to 29.4% from 46.4% in 2007.

**Chart D3 • International debt securities liabilities of banks in LBS/R reporting countries<sup>1</sup>**  
By issuer region



1 Countries that either joined after Q4 2005 or do not have issuance recorded in the IDS or have not reported IDS are excluded. 2 Refers to largest issuers and comprises banks in DE, FR, GB, NL and US. 3 Comprises AU, AT, BE, CA, CH, DK, ES, FI, IE, IT, JP, LU, NO, PT, and SE. 4 Comprises BS, BM, KY, HK, MO and PA. 5 Comprises BR, CL, TW, IN, MX, KR and TR. 6 Percentage differences in amounts between IDS and LBS/R with respect to total IDS of the countries mentioned in footnotes.

Source: BIS locational banking statistics by residence (QR June 2018, Released database) and BIS international debt securities statistics (QR June 2018 release)

Table D3 (Annex) shows the results for Q4 2015 and Q4 2017. The reason for the choice of the first period was that China and Russia started reporting LBS data from Q4 2015. Total percentage differences fell from -7.7% (2015) to -6.7% (2017).

Nevertheless, Table D3 shows large differences for some countries. We examined why amounts in the IDS are always higher for securities denominated in the euro, primarily by banks in the euro area, followed by those denominated in US dollars. IDS statistics are compiled primarily from information on individual securities provided by commercial data sources. Regarding local currency-denominated debt securities (eg euro-denominated in the case of Portugal), the IDS consider a security as international if the governing law is not local and the security is listed on an exchange outside the borders of the country or if the security was issued as a euro bond. Among countries with a lower amount in the LBS/R are some that admittedly underreport debt securities liabilities compared with those in the IDS. There are different reasons for countries having a higher amount in the LBS/R than in the IDS. One reason is that the IDS do not include negotiable loans that are reported as debt securities liabilities in the LBS/R.

In the IDS database, some domestic bonds in local currency are reported as being listed on more than one exchange (for example, in the domestic market and in Luxembourg or London), and other domestic bonds may be subject to a foreign governing law (issued abroad). In both cases, they are treated as IDS, whereas the LBS/R excludes domestic local currency securities issued locally.

We are aware of conceptual differences between the two mirror sources. First of all, debt securities in the LBS/R should reflect liabilities to investors/buyers as of the reporting date whereas the BIS IDS reflect outstanding by place of issuance. In the LBS/R, a number of reporting countries assign the issuance country as the country of the debt securities holders in the LBS/R (He and Filková (2018) also note this from the country survey). The main reason is that debt securities are traded

in the secondary market, and hence the country of the actual holders is usually unknown to the issuing banks. The difficulty of ascertaining the actual holders is also the reason why a number of countries report debt securities liabilities vis-à-vis unallocated by country. Second, in our comparison we followed the standard definition for the LBS/R, which defines the international positions as those that are vis-à-vis non-residents in any currency and vis-à-vis residents in foreign currencies.

On the other hand, the definition of “international” in the BIS IDS is based primarily on the market of issuance (outside the home market) and governing law (international). We have attempted to compare these two sources for two main reasons. First, issuing banks tend to report debt securities in the LBS/R based primarily on the place of issuance (ie cross-border or a foreign country/market where securities were issued) or those issued in the home country but aimed at foreign investors (eg those denominated in a foreign currency irrespective of place). Second, an increasing number of studies combine international/cross-border deposits positions from the LBS/R with debt securities liabilities from the BIS IDS. We thus opted to test if such combinations of sources are meaningful in view of the fact that deposit or debt securities liabilities in the LBS/R are those vis-à-vis actual creditors of banks whereas the IDS reflect only outstanding issuance.

We summarise below the main reasons for differences between the two data sets:

1. **Concepts** – the concepts differ between the two sources. The IDS measure primary market issuance, whereas the LBS/R liabilities are intended to measure holdings (resident vs non-resident holdings).
2. **Definition** – the definition of “international” differs between the LBS/R and the IDS. In the first case, cross-border securities plus local securities in foreign currencies are treated as international, whereas in the IDS debt securities are classified as international if at least one of the following characteristics differs from the country where the borrower resides: registration domain (ISIN), listing place or governing law.
3. **Sources** – LBS/R data are reported by central banks, whereas IDS data are compiled from commercial sources.

## E Conclusion

We demonstrate at an aggregate level that data are available from multiple sources, although with differences in coverage and conceptual aspects. Their usefulness will depend on their granularity and on how widely available the data can be made, with a view to providing tools to validate data quality/reconciliation among reporting countries and fill in data gaps including estimation. Furthermore, mirror sources with good data quality would help provide better estimates of positions for and by non-reporting countries. As an example, the securities holding statistics from the CPIS allow users to obtain derived liabilities for about 120 countries. Similarly, the LBS/R allow BoP compilers in many countries to estimate the claims and liabilities of their residents vis-à-vis banks in BIS reporting countries.

Post-crisis, the enhancements approved by the Committee on the Global Financial System have spurred most of the reporting countries to improve data quality and coverage. These countries have closed reporting gaps and provided new breakdowns, and are reporting bilateral data with or without restrictions. The enhanced data have also allowed a better comparison of interbank positions for the first time. We hope that reporting countries will provide not only the recommended breakdowns at a granular level but will also consider providing encouraged

breakdowns with lower confidentiality restrictions to relevant international institutions such as the BIS and the IMF.

Finally, it is important to clarify that this work is a first step towards identifying possible data gaps including limitations and confidentiality issues. These we do not intend to highlight, but rather we aim to point out possible ways of looking at the data with a much more consistent approach, making appropriate use of complementary information to fill in incomplete data. Another conclusion is that countries should work closely together in order to help to identify missing data/reporting errors or bilateral asymmetries. Nevertheless, international institutions should also make comparable analyses to help reporting countries identify these situations. In this endeavour, the BIS could play a major role by encouraging and involving reporting countries to reconcile data between mirror sources. This will be no easy task, but if the similarities and differences between different data domains are explored and explained, all data users would be helped towards a better understanding of the correct use and interpretation of statistical data.

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## Annex: Statistical tables

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Table E	ISO codes and country/jurisdiction names

### Illustration of reported bilateral interbank claims/liabilities and derived net interbank claims/liabilities

For simplicity, we assume that there are only three reporting countries: Austria, Belgium and Portugal. Table 1 identifies bilateral claims (loans) and liabilities (deposits) of reporting banks vis-à-vis banks in the other two counterparty reporting countries. The actual reported bilateral positions are unpublished and mostly either restricted or confidential. Using these underlying data, we derived aggregated interbank positions and net positions (Table 2).

**Table 2 • Illustration of bilateral interbank claims and liabilities<sup>1</sup>**  
In USD

Reporting country (i)	Counterparty country (j)	Claims i,j	Liabilities j,i
AT: Austria	PT: Portugal	10	15
AT: Austria	BE: Belgium	15	12
BE: Belgium	AT: Austria	20	16
BE: Belgium	PT: Portugal	25	28
PT: Portugal	AT: Austria	15	24
PT: Portugal	BE: Belgium	35	28
<b>Total</b>		<b>120</b>	<b>123</b>

<sup>1</sup> Numbers are for illustration only.

Table 2 also demonstrates that while net interbank claims/liabilities for individual countries might differ, the total net interbank claims must be equal to total net liabilities, of all countries combined.

**Table 3 • Table 2 Illustration for derived total and net interbank claims and liabilities**  
In USD billions

Reporting country (net interbank claims)	Total claims [1]	Comparable liabilities of other countries [2]	Net claims [3] = [1] + [2]
AT: Austria	25	-40	-15
BE: Belgium	45	-40	+5
PT: Portugal	50	-43	+7
<b>Total</b>	<b>120</b>	<b>-123</b>	<b>-3</b>

Reporting country (net interbank liabilities)	Total liabilities [4]	Comparable claims of other countries [5]	Net liabilities [6] = [4] + [5]
AT: Austria	27	-35	-8
BE: Belgium	44	-50	-6
PT: Portugal	52	-35	+17
<b>Total</b>	<b>123</b>	<b>-120</b>	<b>+3</b>

**Table C1.1 • Net bilateral interbank claims by country**  
In USD billions

Reporting country (ISO Code)	End-2011				End-2017			
	Interbank claims [1]	Interbank liabilities [2]	Net claims [3]=[1]+[2]	% Net claims [4]= [3]*100/[1]	Interbank claims [5]	Interbank liabilities [6]	Net claims [7]=[5]+[6]	% Net claims [8]= [7]*100/[5]
<b>All (Total)<sup>1</sup></b>	<b>14,529.6</b>	<b>-14,852.3</b>	<b>-322.8</b>	<b>-2.2</b>	<b>10,474.5</b>	<b>-10,637.0</b>	<b>-162.5</b>	<b>-1.5</b>
GB	2,890.7	-3,097.1	-206.3	-7.1	2,280.6	-2,248.6	32.0	1.4
US	2,534.1	-2,350.4	183.7	7.2	1,541.8	-1,466.2	75.7	4.9
DE	1,074.7	-1,175.3	-100.5	-9.4	835.3	-853.1	-17.7	-2.1
FR	1,201.1	-1,081.5	119.6	10.0	818.3	-848.9	-30.5	-3.7
JP	612.1	-517.5	94.6	15.4	565.5	-542.2	23.3	4.1
KY	1,070.6	-1,114.8	-44.3	-4.1	560.8	-552.5	8.3	1.5
HK	362.2	-345.7	16.5	4.6	489.3	-472.8	16.5	3.4
NL	367.0	-367.4	-0.4	-0.1	384.9	-380.0	4.9	1.3
LU	378.8	-487.3	-108.5	-28.6	288.8	-349.1	-60.3	-20.9
SG	274.1	-364.6	-90.5	-33.0	281.9	-351.9	-70.0	-24.8
CA	262.1	-174.7	87.4	33.3	268.8	-182.6	86.2	32.1
SE	200.5	-187.1	13.4	6.7	236.4	-225.7	10.7	4.5
BE	349.4	-318.4	31.0	8.9	224.7	-215.4	9.2	4.1
CH	551.0	-662.1	-111.1	-20.2	200.7	-349.9	-149.3	-74.4
IT	208.9	-211.1	-2.2	-1.1	163.1	-162.6	0.5	0.3
ES	204.3	-200.9	3.5	1.7	139.6	-119.2	20.4	14.6
DK	94.8	-101.8	-7.0	-7.4	134.5	-125.2	9.3	6.9
JE	221.4	-225.2	-3.7	-1.7	125.4	-138.0	-12.6	-10.0
IE	222.5	-234.0	-11.5	-5.2	120.5	-131.0	-10.5	-8.7
AU	72.6	-120.7	-48.1	-66.2	116.4	-133.6	-17.2	-14.8
GG	109.1	-110.7	-1.6	-1.5	93.9	-91.8	2.0	2.2
TW	43.5	-56.4	-12.9	-29.8	81.5	-86.9	-5.5	-6.7
BS	539.6	-507.1	32.5	6.0	81.0	-87.5	-6.4	-7.9
NO	67.4	-82.1	-14.7	-21.9	47.6	-58.1	-10.5	-22.1
FI	69.0	-68.6	0.4	0.5	43.3	-45.9	-2.6	-6.0
Others(19)	547.9	-689.9	-142.0	-25.9	349.8	-418.0	-68.2	-19.5

<sup>1</sup> Total of all 44 BIS reporting countries, excluding CN, PH and RU. These three countries (CN, PH and RU) were excluded from bilateral pairs and we kept the other comparable 44 reporting countries in both periods (Q4 2011 and Q4 2017). Of the 25 countries in shown in the table, net interbank claims improved for 16 countries between 2011 and 2017, and also for nine of the other 19 countries.

Source: BIS locational banking statistics by residence (QR June 2018, Released database).



**Table C1.2 • Net bilateral interbank liabilities by country**  
In USD billions

Reporting country (ISO Code)	End-2011				End-2017			
	Interbank liabilities [1]	Interbank claims [2]	Net liabilities [3]=[1]+[2]	% Net liabilities [4]= [3]*100/[1]	Interbank liabilities [5]	Interbank claims [6]	Net liabilities [7]=[5]+[6]	% Net liabilities [8]= [7]*100/[5]
<b>All (Total)<sup>1</sup></b>	<b>14,852.3</b>	<b>-14,529.6</b>	<b>322.8</b>	<b>2.2</b>	<b>10,637.0</b>	<b>-10,474.5</b>	<b>162.5</b>	<b>1.5</b>
GB	3,042.5	-3,113.9	-71.4	-2.3	1,820.2	-1,730.5	89.7	4.9
US	2,694.5	-2,484.2	210.3	7.8	1,796.4	-1,658.7	137.6	7.7
JP	781.9	-579.9	202.0	25.8	1,030.9	-841.4	189.5	18.4
FR	1,240.5	-935.6	304.9	24.6	793.2	-912.6	-119.4	-15.1
DE	702.0	-769.4	-67.4	-9.6	672.6	-684.2	-11.6	-1.7
KY	831.6	-870.4	-38.8	-4.7	512.2	-500.7	11.5	2.2
HK	368.3	-329.0	39.4	10.7	410.1	-399.2	10.9	2.7
NL	451.7	-495.7	-44.0	-9.7	377.3	-416.4	-39.1	-10.4
SG	305.6	-430.6	-125.0	-40.9	369.4	-461.5	-92.1	-24.9
CH	341.2	-427.8	-86.6	-25.4	327.6	-346.2	-18.6	-5.7
IT	402.4	-394.0	8.4	2.1	264.9	-277.6	-12.6	-4.8
LU	382.6	-452.0	-69.4	-18.1	239.8	-210.0	29.8	12.4
ES	389.5	-352.0	37.5	9.6	205.7	-157.7	48.0	23.3
CA	249.3	-227.6	21.7	8.7	193.4	-199.6	-6.2	-3.2
BE	229.6	-201.1	28.4	12.4	170.1	-149.0	21.1	12.4
SE	164.4	-143.6	20.8	12.6	158.6	-170.7	-12.1	-7.6
NO	127.8	-148.7	-20.8	-16.3	131.9	-143.9	-12.1	-9.2
AU	110.5	-162.0	-51.5	-46.6	128.5	-167.5	-39.0	-30.3
FI	179.0	-148.4	30.6	17.1	112.9	-99.8	13.2	11.7
BR	103.9	-94.3	9.6	9.3	102.9	-74.0	28.9	28.1
IE	347.0	-264.4	82.5	23.8	102.3	-108.8	-6.5	-6.4
TW	56.5	-62.2	-5.7	-10.0	90.1	-83.9	6.2	6.9
DK	128.9	-110.1	18.8	14.6	86.0	-82.5	3.5	4.0
TR	55.9	-57.9	-2.0	-3.5	72.0	-73.8	-1.9	-2.6
BS	434.4	-446.8	-12.4	-2.8	65.0	-56.3	8.7	13.4
Others(19)	730.8	-828.1	-97.3	-13.3	403.1	-468.0	-64.9	-16.1

<sup>1</sup> Total of all 44 BIS reporting countries, excluding CN, PH and RU. These three countries (CN, PH and RU) were excluded from bilateral pairs and we kept the other comparable 44 reporting countries in both periods (Q4 2011 and Q4 2017). Of the 25 countries in shown in the table, net interbank liabilities improved for 19 countries between 2011 and 2017, and also for eight of the other 19 countries.

Source: BIS locational banking statistics by residence (QR June 2018, Released database).

**Table C2.1 • BIS LBS/N vs BIS CBS/IC – domestic claims of domestic banks vis-à-vis reporting countries<sup>1</sup> | Excluding intragroup claims, amounts outstanding in USD billions**

Parent /reporting country	Q4 2014		Q4 2017		Difference (amount) (LBS/N – CBS/IC)		Difference (percentage)	
	LBS/N	CBS/IC	LBS/N	CBS/IC	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5] = [1] - [2]	[6] = [3] - [4]	[7] = [5]*100 /[1]	[8] = [6]*100 /[3]
<b>Total<sup>2</sup></b>	<b>46,119.0</b>	<b>38,454.3</b>	<b>51,196.4</b>	<b>43,055.9</b>	<b>7,664.8</b>	<b>8,140.5</b>	<b>16.6</b>	<b>15.9</b>
AT	532.6	371.1	492.2	407.6	161.5	84.6	30.3	17.2
BE	286.6	266.2	357.1	331.4	20.4	25.7	7.1	7.2
CA	1,954.0	1,943.3	2,085.8	2,064.5	10.7	21.3	0.5	1.0
CH	1,165.3	1,172.4	1,382.9	1,390.0	-7.1	-7.1	-0.6	-0.5
CL	170.6	173.6	191.8	191.5	-3.0	0.4	-1.8	0.2
DE	5,447.3	5,222.8	5,568.5	5,435.1	224.5	133.4	4.1	2.4
DK	676.3	629.2	685.7	624.5	47.1	61.3	7.0	8.9
ES	2,357.4	2,164.1	2,090.4	1,943.4	193.3	147.0	8.2	7.0
FI	165.1	78.0	198.1	101.2	87.1	97.0	52.8	48.9
FR	4,051.1	3,761.8	4,602.1	4,426.4	289.3	175.7	7.1	3.8
GB	4,981.1	2,701.2	5,130.9	2,674.9	2,279.8	2,455.9	45.8	47.9
GR	289.9	298.6	247.6	257.1	-8.7	-9.5	-3.0	-3.8
IE	230.4	208.0	184.5	165.9	22.4	18.6	9.7	10.1
IT	3,304.5	2,893.1	3,133.1	2,739.9	411.4	393.2	12.4	12.6
JP	15,498.6	11,913.0	19,272.8	15,123.6	3,585.7	4,149.2	23.1	21.5
KR	1,553.7	1,533.0	1,873.2	1,853.5	20.6	19.7	1.3	1.1
NL	1,623.0	1,436.2	1,619.4	1,401.3	186.8	218.1	11.5	13.5
SE	761.0	695.7	770.8	722.9	65.4	47.9	8.6	6.2
TW	1,070.5	993.0	1,309.4	1,201.3	77.5	108.1	7.2	8.3
HK	57.9	...	65.9	...				
LU	52.4	...	62.9	...				
NO	326.1	...	314.8	...				
AU	2,294.7	NA	2,282.0	2,133.8				
BR	1,943.4	NA	1,722.5	NA				
IN	1,622.0	NA	2,046.7	NA				
MX	162.2	NA	170.2	NA				
PA	NA	NA	NA	NA				
PT	364.0	NA	263.5	224.0				
SG	NA	NA	NA	378.7				
TR	NA	666.2	NA	595.2				
US <sup>3</sup>	\$\$\$	10,062.7	\$\$\$	10,929.3				

1 NA stands for data either not available or not derived because the home reporting country itself does not report either or both in local or foreign currency (See Section LD2); three dots ("...") stand for suppressed (ie restricted or confidential). 2 Only for countries from AT to TW. 3 The United States does not report local claims/liabilities vis-à-vis residents in LBS/N. The domestic claims of US banks in other BIS LBS reporting countries vis-à-vis US residents were \$495 billion and \$377 billion as of Q4 2014 and Q4 2017 respectively (shown as "\$\$\$" and not included in the total).

Sources: BIS locational banking statistics by nationality and BIS consolidated banking statistics on an immediate counterparty basis ((QR June 2018, Released database for both sources).

**Table C2.2 • BIS LBS/N vs BIS CBS/IC – local claims in all currencies of domestic banks vis-à-vis reporting countries<sup>1</sup> | Excluding intragroup claims, amount outstanding in USD billions**

Parent /reporting country	Q4 2014		Q4 2017		Difference (amount) (LBS/N – CBS/IC)		Difference (percentage)	
	LBS/N	CBS/IC	LBS/N	CBS/IC	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5]=[1]–[2]	[6]=[3]–[4]	[5]*100/[1]	[6]*100/[3]
<b>Total<sup>2</sup></b>	<b>29,123.6</b>	<b>25,520.7</b>	<b>30,731.6</b>	<b>27,015.4</b>	<b>3,602.9</b>	<b>3,716.3</b>	<b>12.4</b>	<b>14.6</b>
BE	277.7	263.9	352.6	330.1	13.8	22.6	5.0	6.4
CA	1,916.7	1,916.7	2,042.0	2,042.0	0.0	0.0	0.0	0.0
CH	1,145.9	1,156.7	1,351.0	1,371.9	–10.8	–20.9	–0.9	–1.5
CL	170.6	172.7	191.8	190.9	–2.1	0.9	–1.2	0.5
DE	5,276.7	5,166.9	5,475.1	5,373.5	109.7	101.6	2.1	1.9
DK	661.0	628.1	653.8	622.0	32.8	31.8	5.0	4.9
ES	2,327.3	2,160.0	2,073.3	1,937.3	167.3	136.0	7.2	6.6
FI	165.1	78.0	198.1	100.9	87.1	97.3	52.8	49.1
FR	3,903.0	3,611.2	4,506.2	4,329.4	291.8	176.8	7.5	3.9
GB	4,845.9	2,632.5	5,028.5	2,635.9	2,213.5	2,392.6	45.7	47.6
GR	287.2	296.4	246.5	255.5	–9.3	–8.9	–3.2	–3.6
IT	3,249.9	2,856.0	3,091.5	2,707.5	393.9	384.0	12.1	12.4
KR	1,546.8	1,530.4	1,868.8	1,848.2	16.5	20.6	1.1	1.1
NL	1,584.4	1,417.0	1,599.2	1,370.8	167.4	228.4	10.6	14.3
SE	699.1	658.8	748.6	704.5	40.3	44.0	5.8	5.9
TW	1,066.2	975.1	1,304.5	1,195.0	91.1	109.5	8.5	8.4
HK	57.2	...	...	...				
IE	...	206.7	...	165.5				
LU	...	...	61.2	...				
NO	...	...	...	...				
AT	532.3	NA	491.5	406.0				
AU	2,269.2	NA	2,252.5	2,009.1				
BR	1,882.6	NA	1,677.1	NA				
IN	...	NA	...	NA				
JP	15,449.0	NA	19,210.5	NA				
MX	159.0	NA	164.0	NA				
PA	NA	NA	NA	NA				
PT	...	NA	...	...				
SG	NA	NA	NA	...				
TR	NA	NA	NA	NA				
US	NA	9,849.4	NA	10,728.9				

<sup>1</sup> Local claims in currencies on residents of the reporting country by their domestic banks. See additional details in explanatory texts. Cells with "NA" mean data are not reported or not reported and three dots ("...") mean they are suppressed (ie either restricted or confidential). <sup>2</sup> Only for countries from BE to TW, ie does not include suppressed values or those not available in both data sets in either of the periods.

Sources: BIS locational banking statistics by nationality and BIS consolidated banking statistics on an immediate counterparty basis (QR June 2018, Released database for both sources).

**Table C2.3 • BIS LBS/N vs BIS CBS/IC – local liabilities of domestic banks vis-à-vis reporting countries<sup>1</sup> | Excluding intragroup liabilities, amount outstanding in USD billions**

Parent /reporting country	Q4 2014		Q4 2017		Difference (amount) (LBS/N – CBS/IC)		Difference (percentage)	
	LBS/N	CBS/IC	LBS/N	CBS/IC	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5]=[1]–[3]	[6]=[2]–[4]	[5]*100/[1]	[6]*100/[2]
<b>Total<sup>2</sup></b>	<b>22,505.7</b>	<b>17,345.8</b>	<b>23,748.5</b>	<b>18,382.9</b>	<b>5,159.8</b>	<b>5,365.6</b>	<b>22.9</b>	<b>30.9</b>
BE	297.9	267.0	355.8	315.6	30.9	40.2	10.4	11.3
CA	1,256.7	1,177.0	1,393.2	1,310.4	79.6	82.8	6.3	5.9
CH	833.3	837.0	933.2	935.6	–3.7	–2.4	–0.4	–0.3
CL	128.7	123.4	146.2	141.6	5.3	4.6	4.1	3.1
DE	5,016.5	4,340.4	5,160.6	4,545.5	676.1	615.0	13.5	11.9
DK	161.9	160.9	171.0	163.5	1.0	7.5	0.6	4.4
ES	1,900.5	2,038.1	1,914.6	1,894.5	–137.6	20.1	–7.2	1.1
FI	102.0	36.1	117.6	52.7	65.9	64.9	64.6	55.2
FR	3,618.0	2,102.2	3,873.3	2,332.8	1,515.9	1,540.5	41.9	39.8
GB	3,851.0	1,873.1	4,076.6	2,062.8	1,977.9	2,013.8	51.4	49.4
GR	267.0	263.9	194.9	192.6	3.1	2.3	1.2	1.2
IT	3,256.4	2,451.1	3,186.8	2,429.0	805.3	757.7	24.7	23.8
KR	1,286.5	1,286.5	1,585.2	1,585.2	0.0	0.0	0.0	0.0
LU	48.6	48.8	58.3	58.4	–0.2	–0.1	–0.3	–0.2
SE	480.8	340.4	581.4	362.9	140.3	218.5	29.2	37.6
HK	58.2	...	68.5	...				
IE	...	135.8	...	137.6				
NL	...	...	...	...				
NO	...	...	...	...				
AT	463.6	NA	440.6	317.4				
AU	1,790.1	NA	1,759.7	1,514.7				
BR	1,692.1	NA	1,542.8	NA				
IN	1,464.4	NA	...	NA				
JP	16,078.2	NA	20,115.9	NA				
MX	121.2	NA	122.5	NA				
PA	NA	NA	NA	NA				
PT	...	NA	...	...				
SG	NA	NA	NA	...				
TR	NA	0.1	NA	0.4				
TW	1,018.6	NA	1,171.5	NA				
US	NA	NA	NA	NA				

<sup>1</sup> Local liabilities in local currency to residents of reporting countries by domestic banks located in the same country of residence of the reporting banking office. See additional details in explanatory texts. Cells with “NA” mean data are not reported and three dots (“...”) mean they are suppressed (ie either restricted or confidential). <sup>2</sup> Only for countries from BE to SE, ie does not include suppressed values or those not available in both data sets in either of the periods.

Sources: BIS locational banking statistics by nationality and BIS consolidated banking statistics on an immediate counterparty basis (QR June 2018, Released database for both sources).

**Table C3.1 • BIS LBS/R vs IMF IIP – loans claims of deposit-taking corporations except central bank<sup>1</sup> | Comparison BIS LBS/R and IMF IIP by country, in USD billions**

Country	Q4 2014		Q4 2017		Difference (amount) (IIP – LBS/R)		Differences (percentage)	
	IIP	LBS/R	IIP	LBS/R	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5]=[1]-[2]	[6]=[3]-[4]	[5]*100/[1]	[6]*100/[3]
<b>Total<sup>2</sup></b>	<b>15,173.7</b>	<b>16,220.8</b>	<b>14,810.1</b>	<b>16,163.5</b>	<b>-1,047.1</b>	<b>-1,353.4</b>	<b>-6.9</b>	<b>-9.1</b>
AU	236.8	187.0	236.2	238.9	49.8	-2.7	21.0	-1.2
AT	214.2	211.5	166.5	163.6	2.7	2.9	1.2	1.7
BE	367.8	372.0	338.8	341.7	-4.2	-2.9	-1.1	-0.9
BM <sup>3</sup>	3.0	4.6	2.6	3.6	-1.6	-1.0	-53.7	-40.5
BR	17.1	46.8	8.5	26.0	-29.7	-17.5	-173.6	-205.3
CA	257.7	419.0	347.9	537.6	-161.3	-189.7	-62.6	-54.5
CL	9.1	9.6	7.0	7.5	-0.5	-0.5	-5.4	-7.8
HK <sup>4</sup>	825.3	859.8	967.0	974.6	-34.5	-7.6	-4.2	-0.8
CY	26.1	26.5	17.8	19.4	-0.4	-1.6	-1.7	-8.9
DK	153.1	149.1	193.1	189.4	4.0	3.7	2.6	1.9
FI	129.3	128.7	49.0	49.0	0.6	0.0	0.5	0.1
FR	1,441.7	1,457.9	1,456.8	1,474.7	-16.2	-17.9	-1.1	-1.2
DE	1,594.9	1,594.2	1,443.8	1,442.9	0.7	0.9	0.0	0.1
GR	38.0	36.5	21.4	20.8	1.5	0.6	4.0	2.6
IN	11.4	31.1	20.3	60.5	-19.7	-40.2	-172.8	-198.6
ID	9.7	9.3	11.6	11.2	0.4	0.4	4.4	3.4
IE	220.0	220.0	191.8	194.9	0.0	-3.1	0.0	-1.6
IT	234.2	226.4	247.8	249.0	7.8	-1.2	3.3	-0.5
JP	690.5	688.5	758.2	784.5	2.0	-26.3	0.3	-3.5
KR	117.5	136.3	134.4	157.9	-18.8	-23.5	-16.0	-17.5
LU	531.3	531.5	479.5	479.4	-0.2	0.1	0.0	0.0
MX	10.3	10.0	11.8	16.4	0.3	-4.6	3.0	-38.6
NL	763.4	762.8	765.1	764.1	0.6	1.0	0.1	0.1
NO	116.0	110.5	109.0	106.1	5.5	2.9	4.7	2.7
PA	39.8	42.4	36.5	37.9	-2.6	-1.4	-6.4	-3.9
PH	14.7	14.7	15.3	16.4	0.0	-1.1	0.0	-7.1
PT	52.5	52.7	29.3	30.8	-0.2	-1.5	-0.4	-5.2
RU	189.5	189.5	134.2	134.5	0.0	-0.3	0.0	-0.2
ZA	33.3	32.9	32.7	32.5	0.4	0.2	1.3	0.5
ES	195.0	200.3	226.5	262.3	-5.3	-35.8	-2.7	-15.8
SE	312.7	300.0	349.4	331.4	12.7	18.0	4.0	5.1
CH	541.5	453.6	455.0	438.5	87.9	16.5	16.2	3.6
TR	26.5	19.9	41.8	35.3	6.6	6.5	24.9	15.6
GB <sup>5</sup>	3,989.0	4,030.7	3,690.7	3,740.0	-41.7	-49.3	-1.0	-1.3
US	1,760.8	2,654.5	1,813.0	2,790.2	-893.7	-977.2	-50.8	-53.9

1 Claims in IIP comprise "Other investments" on account of currency and deposits, and loans of deposit corporations excluding central banks, which is similar to LBS/R instrument G "Loans and deposits" including currency balances. 2 For the purposes of comparison, LBS/R total in Q4 2014 includes IIP amounts for PH and RU as both countries started reporting after Q4 2014 (PH from Q4 2016 and RU from Q4 2015). 3 Reports IIP data at annual frequency (Q4 of each year). 4 Data for Q4 2017 relate to that of Q4 2016 for both LBS/R and IIP (as IIP data not available for Q4 2017). 5 Data for Q4 2017 relate to that of Q4 2015 for both LBS/R and IIP (as IIP data not available for Q4 2016 and Q4 2017).

Sources: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF IIP data from data set "Balance of Payments (BoP), 2018 M06" release.

**Table C3.2 • BIS LBS/R vs IMF IIP – deposit liabilities of deposit-taking corporations excl. central bank<sup>1</sup> | Comparison BIS LBS/R and IMF IIP by country, in USD billions**

Country	Q4 2014		Q4 2017		Difference (amount) (IIP – LBS/R)		Differences (percentage)	
	IIP	LBS/R	IIP	LBS/R	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5]=[1]–[2]	[6]=[3]–[4]	[5]*100/[1]	[6]*100/[3]
<b>Total<sup>2</sup></b>	<b>16,376.0</b>	<b>17,642.2</b>	<b>16,125.5</b>	<b>17,207.9</b>	<b>–1,266.2</b>	<b>–1,082.4</b>	<b>–7.7</b>	<b>–6.7</b>
AU	204.4	174.0	239.1	216.2	30.4	22.9	14.9	9.6
AT	130.2	128.4	96.9	95.2	1.8	1.7	1.4	1.8
BE	331.2	344.4	302.1	301.6	–13.2	0.5	–4.0	0.2
BM <sup>3</sup>	6.6	2.0	6.6	3.3	4.6	3.3	69.8	50.2
BR	115.4	130.2	95.0	105.6	–14.8	–10.6	–12.8	–11.1
CA	395.6	467.2	516.7	517.4	–71.6	–0.7	–18.1	–0.1
CL	13.1	13.3	16.2	15.5	–0.2	0.7	–1.5	4.6
HK <sup>4</sup>	851.1	842.4	942.9	931.8	8.7	11.1	1.0	1.2
CY	29.3	30.5	23.4	25.6	–1.2	–2.2	–4.1	–9.3
DK	173.1	171.5	151.8	151.7	1.6	0.1	0.9	0.1
FI	176.7	176.5	135.1	135.2	0.2	–0.1	0.1	–0.1
FR	1,391.9	1,414.2	1,591.5	1,593.1	–22.3	–1.6	–1.6	–0.1
DE	1,015.1	1,005.1	1,088.7	1,077.7	10.0	11.0	1.0	1.0
GR	88.9	61.2	38.6	29.3	27.7	9.3	31.2	24.1
IN	114.8	113.0	129.1	135.6	1.8	–6.5	1.5	–5.1
ID	23.2	27.4	23.1	25.8	–4.2	–2.7	–18.0	–11.6
IE	240.1	240.1	162.1	164.1	0.0	–2.0	0.0	–1.2
IT	374.5	374.5	353.6	355.4	0.0	–1.8	0.0	–0.5
JP	899.7	1,192.1	1,018.7	1,280.3	–292.4	–261.6	–32.5	–25.7
KR	118.4	59.2	111.4	56.7	59.2	54.7	50.0	49.1
LU	451.7	452.1	405.0	405.3	–0.4	–0.3	–0.1	–0.1
MX	17.9	15.9	13.4	8.1	2.0	5.3	11.2	39.6
NL	711.3	711.3	745.8	745.8	0.0	0.0	0.0	0.0
NO	165.1	151.6	174.0	161.3	13.5	12.7	8.2	7.3
PA	40.4	31.5	41.0	30.2	8.9	10.8	22.0	26.4
PH	16.5	16.5	15.7	17.0	0.0	–1.3	0.0	–8.3
PT	83.7	82.1	58.7	58.2	1.6	0.5	1.9	0.9
RU	160.7	160.7	91.0	95.5	0.0	–4.5	0.0	–5.0
ZA	28.7	28.2	24.9	23.6	0.5	1.3	1.6	5.1
ES	376.2	383.7	321.4	322.2	–7.5	–0.8	–2.0	–0.2
CH	753.0	607.7	744.1	680.6	145.3	63.5	19.3	8.5
TR	144.2	124.8	144.1	128.3	19.4	15.8	13.5	11.0
GB <sup>5</sup>	4,182.5	4,176.6	3,770.1	3,765.3	5.9	4.8	0.1	0.1
US	2,341.3	3,537.6	2,298.6	3,333.0	–1196.3	–1034.4	–51.1	–45.0

1 Liabilities in IIP comprise “Other investments” on account of currency and deposits, and loans of deposit corporations excluding central banks. 2 For the purpose of comparison, LBS/R total in Q4 2014 includes IIP amounts for PH and RU as both countries started reporting after Q4 2014 (PH from Q4 2016 and RU from Q4 2105). 3 Reports IIP data at annual frequency (Q4 of each year). 4 Data for Q4 2017 relate to that of Q4 2016 for both LBS/R and IIP (as IIP data not available for Q4 2017). 5 Data for Q4 2017 relate to that of Q4 2015 for both LBS/R and IIP (as IIP data not available for Q4 2016 and Q4 2017).

Sources: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF IIP data from data set “Balance of Payments (BoP), 2018 M06” release.

**Table C3.3 • LBS/R vs IMF IIP – loans and deposits of banks located in Portugal<sup>1</sup>**  
Comparison BIS LBS/R and IMF IIP by country, in USD billions

Period	IMF IIP		BIS LBS/R		Difference in amount (IIP – LBS/R)		Percentage difference	
	Claims	Liabilities	Claims	Liabilities	Claims	Liabilities	Claims	Liabilities
	[1]	[2]	[3]	[4]	[5]=[1]-[3]	[6]=[2]-[4]	[7]= [5]*100/[1]	[8]= [6]*100/[2]
Q1 2011		179.6	86.2	178.7		1.0		0.5
Q2 2011		172.7	85.4	171.8		0.9		0.5
Q3 2011		154.7	76.5	153.9		0.9		0.6
Q4 2011		136.8	77.0	136.0		0.8		0.6
Q1 2012		135.0	83.5	134.2		0.8		0.6
Q2 2012		123.4	82.3	122.6		0.7		0.6
Q3 2012		119.7	81.8	119.0		0.7		0.6
Q4 2012		118.9	78.6	118.1		0.9		0.7
Q1 2013	74.8	112.9	75.1	112.1	-0.3	0.8	-0.4	0.7
Q2 2013	71.4	111.0	71.0	110.3	0.4	0.7	0.6	0.7
Q3 2013	57.7	95.1	57.4	94.4	0.3	0.7	0.5	0.8
Q4 2013	58.9	97.5	58.5	96.7	0.3	0.8	0.5	0.8
Q1 2014	60.1	95.9	59.7	95.1	0.3	0.8	0.5	0.8
Q2 2014	60.5	97.4	60.1	96.6	0.5	0.8	0.8	0.9
Q3 2014	60.6	83.0	58.4	81.4	2.3	1.6	3.7	1.9
Q4 2014	52.5	83.7	52.7	82.1	-0.2	1.6	-0.4	1.9
Q1 2015	45.5	73.2	45.8	72.0	-0.2	1.3	-0.5	1.7
Q2 2015	46.7	76.6	46.9	75.3	-0.2	1.3	-0.5	1.7
Q3 2015	39.6	70.5	40.0	69.2	-0.5	1.3	-1.2	1.8
Q4 2015	37.4	65.5	38.1	64.2	-0.8	1.3	-2.1	2.0
Q1 2016	36.5	67.2	37.0	65.8	-0.5	1.4	-1.4	2.1
Q2 2016	35.2	67.0	35.8	65.6	-0.6	1.4	-1.7	2.0
Q3 2016	34.4	62.9	35.7	62.4	-1.3	0.5	-3.7	0.7
Q4 2016	30.5	60.6	31.8	59.2	-1.3	1.4	-4.2	2.2
Q4 2017	29.3	58.7	30.8	58.2	-1.5	0.5	-5.1	0.9

<sup>1</sup> Claims in IIP comprise "Other investments" on account of currency and deposits, and loans of deposit corporations excluding central banks, which is similar to LBS/R instrument G "Loans and deposits" including currency balances. On the liabilities side, total liabilities in IIP comprise "Other investments" on account of currency and deposits, and loans of deposit corporations excluding central banks.

**Table D1 • BIS LBS/R vs IMF IIP – cross-border debt securities claims of deposit-taking corporations<sup>1</sup> | Amount outstanding, in USD billions**

Country	BIS LBS/R		IIP		Difference in amount		Percentage difference	
	Q4 2014	Q4 2017	Q4 2014	Q4 2017	Q4 2014	Q4 2017	Q4 2014	Q4 2017
	[1]	[2]	[3]	[4]	[5]=[1]-[3]	[6]=[2]-[4]	[5]*100/[1]	[6]*100/[2]
<b>Total<sup>2</sup></b>	<b>3,343.6</b>	<b>2,963.3</b>	<b>3,558.1</b>	<b>3,268.0</b>	<b>-214.5</b>	<b>-304.7</b>	<b>-6.4</b>	<b>-10.3</b>
AU	22.1	34.9	31.6	72.1	-9.5	-37.3	-42.7	-106.8
AT	77.4	60.8	77.9	61.8	-0.5	-1.1	-0.6	-1.7
BE	106.0	94.8	109.4	97.2	-3.4	-2.4	-3.2	-2.5
BM <sup>3</sup>	7.2	8.7	8.9	10.0	-1.7	-1.3	-23.9	-14.8
BR	3.1	4.0	5.3	4.4	-2.2	-0.4	-69.7	-9.7
CL	1.3	1.3	1.0	0.9	0.3	0.4	24.5	28.3
HK	284.9	379.4	316.5	374.3	-31.5	5.2	-11.1	1.4
CY	8.8	2.5	4.8	1.7	3.9	0.7	44.7	29.2
DK	35.7	19.3	38.4	22.2	-2.7	-2.9	-7.5	-14.8
FI	69.7	35.9	63.4	36.3	6.3	-0.3	9.1	-1.0
FR	519.1	484.1	407.4	298.5	111.8	185.6	21.5	38.3
DE	630.4	573.3	671.5	598.3	-41.1	-25.0	-6.5	-4.4
GR	70.9	19.3	71.0	19.3	-0.1	0.0	-0.2	-0.1
IN	0.0	0.3	0.4	0.3	-0.4	0.0		0.1
ID	1.5	1.1	1.7	0.9	-0.2	0.2	-10.2	21.2
IE	132.3	70.3	130.7	67.7	1.6	2.5	1.2	3.6
IT	72.5	112.1	62.6	107.2	9.9	4.9	13.6	4.4
JP	...	...	852.8	861.1				
KR	2.6	13.4	10.4	34.6	-7.8	-21.2	-304.2	-158.7
LU	176.0	133.0	166.3	126.5	9.7	6.5	5.5	4.9
MX	3.9	6.8	3.8	6.9	0.1	-0.1	1.9	-1.4
NL	134.7	110.6	138.2	111.4	-3.5	-0.9	-2.6	-0.8
NO	31.5	33.8	56.1	51.6	-24.7	-17.7	-78.4	-52.4
PA	6.8	8.4	6.8	7.8	-0.1	0.6	-0.9	7.0
PH	NA	9.9	7.3	10.1	-7.3	-0.2		-1.6
PT	18.8	20.8	22.2	24.1	-3.5	-3.3	-18.5	-15.7
RU	NA	38.8	37.7	37.9	-37.7	0.9		2.4
ZA	3.3	3.5	3.0	2.6	0.2	0.9	7.5	24.8
ES	111.4	98.7	93.2	84.7	18.1	13.9	16.3	14.1
CH	94.2	102.1	94.3	102.1	0.0	0.0	0.0	0.0
TR	0.8	0.8	0.8	0.6	0.0	0.2	-4.9	25.9
GB <sup>4</sup>	664.6	471.6	718.5	659.9	-53.9	-188.4	-8.1	-39.9
US	9.2	20.7	196.7	241.7	-187.5	-221.1	-2,029.0	-1,069.7

1 The IMF IIP data for debt securities claims are available for 34 of 47 countries. In the BIS LBS/R, two countries (Bahrain and Curaçao) do not report cross-border debt securities claims in the LBS and the data for remaining 11 countries including Japan are either restricted or confidential. 2 Of 34 countries in the table, the total excludes values of JP, PH and RU. 3 IIP data available up to Q4 2016, and hence LBS/R data of Q4 2016 are used in Q4 2017 for fair comparison. 4 IIP data available only up to Q4 2015, and hence LBS/R data used for Q4 2015 are used in Q4 2017 for fair comparison.

Sources: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF international investment positions (IIP, 2018 M06 release).



**Table D2 • BIS LBS/R vs IMF CPIS – counterparty country breakdown of cross-border debt securities liabilities between the BIS LBS/R and the IMF CPIS<sup>1</sup> | Amount outstanding, in USD billions**

Period	CPIS: Cross-border by individual country		LBS/R: Cross-border by individual country		Difference (CPIS – LBS/R)		Memo: LBS/R: unallocated cross-border	
	2015 Q4	2017Q2	2015 Q4	2017Q2	2015 Q4	2017Q2	2015 Q4	2017Q2
	[1]	[2]	[3]	[4]	[5]=[1]-[3]	[6]=[2]-[4]	[7]	[8]
<b>Total</b>	<b>1,904.2</b>	<b>1,925.0</b>	<b>1,711.5</b>	<b>1,842.4</b>	<b>192.7</b>	<b>82.6</b>	<b>1,541.4</b>	<b>1,604.9</b>
GB	379.5	355.1	12.8	12.3	366.7	342.7	808.2	854.1
FR	238.7	206.2	646.2	699.3	-407.5	-493.2		
AU	120.5	113.6	367.1	342.5	-246.6	-228.9		
US	74.9	108.9	108.3	152.3	-33.4	-43.4		
IT	55.2	64.5	2.7	5.3	52.5	59.2		
NO	30.9	62.0	41.4	38.2	-10.6	23.7	1.7	4.7
AT	41.4	31.0	51.5	79.7	-10.1	-48.8	11.7	
BE	24.4	30.3	16.5	38.9	7.9	-8.6		
FI	26.9	27.7	91.9	88.8	-64.9	-61.1		
IE	33.8	26.6	45.3	52.8	-11.5	-26.2		
KR	20.4	6.5	82.8	75.2	-62.4	-68.7		
GG	11.7	6.7	8.8	9.2	2.9	-2.4		
JE	2.3	6.4	1.7	0.4	0.6	6.1		
BR	7.7	6.2	19.0	13.1	-11.3	-6.9		
CN	1.8	4.0	123.2	115.0	-121.4	-111.1	16.7	15.6
HK	4.0	3.9	9.7	25.4	-5.6	-21.5		
CL	5.3	3.3	9.9	9.2	-4.7	-5.9		
IN	1.7	3.2	2.2	0.3	-0.5	2.9		
PT	5.7	2.7	0.4	0.3	5.4	2.4		
MX	1.9	1.5	11.6	7.9	-9.8	-6.4		
PA	0.7	0.6	16.2	14.4	-15.5	-13.8		
BS	0.6	0.4	25.1	20.7	-24.5	-20.3		
ID	0.3	0.3	4.7	3.6	-4.4	-3.3		
BM	0.1	0.1	0.1	0.1	0.0	0.0		
RU	0.1	0.1	2.0	2.5	-1.8	-2.4	3.8	3.1
MO	0.0	0.1	0.6	3.7	-0.6	-3.6		
PH	0.1	0.0	0.0	1.5		-1.4		
CY	0.0	0.0	0.5	0.1	-0.5	-0.1		
TW	0.2	0.0	1.5	0.3	-1.3			
CA	113.8	151.0	0.3	...	113.5			
ES	101.1	78.3	...	...				
MY	4.6	0.2	...	...				

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**Table D2 • BIS LBS/R vs IMF CPIS – counterparty country breakdown of cross-border debt securities liabilities between the BIS LBS/R and the IMF CPIS<sup>1</sup> (cont.) | Amount outstanding, in USD billions**

Period	CPIS: Cross-border by individual country		LBS/R: Cross-border by individual country		Difference (CPIS – LBS/R)		Memo: LBS/R: unallocated cross-border	
	Q4 2015	Q2 2017	Q4 2015	Q2 2017	Q4 2015	Q2 2017	Q4 2015	Q2 2017
	[1]	[2]	[3]	[4]	[5]=[1]–[3]	[6]=[2]–[4]	[7]	[8]
DE <sup>2</sup>	112.6	108.5					646.0	693.9
KY <sup>2</sup>	5.5	2.6					51.4	31.9
ZA <sup>2</sup>	0.2	0.2					2.1	1.7
SG	15.4	17.6						
BH	0.2	0.1						
CW	0.7	0.1						
GR	0.2	0.0						
IM								
NL <sup>3</sup>	233.8	227.3						
SE <sup>3</sup>	111.7	114.7						
DK <sup>3</sup>	60.3	57.6						
JP <sup>3</sup>	19.2	41.1						
LU <sup>3</sup>	23.0	29.7						
CH <sup>3</sup>	6.8	19.9						
TR <sup>3</sup>	4.0	4.3						

<sup>1</sup> CPIS data on holdings of cross-border debt securities issued by deposit corporations excluding central banks. As the sector breakdown of issuers is an encouraged item in the CPIS, only 26 of 85 plus countries report these data. <sup>2</sup> Reports only vis-à-vis unallocated by location without classifying vis-à-vis residents or cross-border. <sup>3</sup> In the LBS/R, amounts are reported almost entirely without any country breakdown (ie only total cross-border amounts are reported).

Sources: BIS locational banking statistics by residence (QR June 2018, Released database) and IMF CPIS survey (15 March 2018 release).

**Table D3 • BIS LBS/R vs BIS IDS – international debt securities liabilities<sup>1,2</sup> | Amount outstanding, in USD billions**

Period	BIS LBS/R		BIS IDS		Difference in amount (LBS/R – IDS)		Percentage difference	
	Q4 2015 [1]	Q4 2017 [2]	Q4 2015 [3]	Q4 2017 [4]	Q4 2015 [5]=[1]-[3]	Q4 2017 [6]=[2]-[4]	Q4 2015 [5]/[1]	Q4 2017 [6]/[2]
<b>Total</b>	<b>4,444.1</b>	<b>4,832.8</b>	<b>6,227.4</b>	<b>6,736.6</b>	<b>-1,783.3</b>	<b>-1,903.8</b>	<b>-40.1</b>	<b>-39.4</b>
AT	68.0	68.1	101.3	83.8	-33.2	-15.7	-48.8	-23.1
AU	372.1	356.6	329.7	338.0	42.4	18.6	11.4	5.2
BE	18.1	49.1	20.1	21.9	-1.9	27.2	-10.7	55.3
BR	20.1	12.5	36.6	28.6	-16.6	-16.1	-82.4	-128.5
BS	26.6	26.6	5.5	7.4	21.0	19.2	79.2	72.1
CA	2.2	5.8	263.8	309.3	-261.6	-303.5	-11,820.0	-5,213.9
CH	21.2	42.8	27.7	34.9	-6.5	7.9	-30.8	18.5
CN	139.9	183.9	48.6	79.1	91.3	104.8	65.2	57.0
DE	678.8	721.8	466.7	570.5	212.1	151.3	31.2	21.0
DK	89.8	97.8	60.0	63.1	29.9	34.8	33.2	35.5
ES	13.0	48.5	131.7	140.5	-118.7	-92.0	-915.1	-189.6
FI	93.3	95.9	65.5	69.9	27.8	26.0	29.8	27.1
FR	662.9	741.9	588.6	648.2	74.3	93.7	11.2	12.6
GB	923.2	1,011.5	1,289.8	1,333.6	-366.6	-322.0	-39.7	-31.8
HK	116.8	160.6	98.7	140.3	18.1	20.3	15.5	12.7
IE	46.0	52.0	115.0	101.2	-69.0	-49.2	-150.1	-94.5
IT	20.6	28.5	266.2	258.3	-245.7	-229.8	-1,193.9	-805.7
KR	85.5	84.3	96.6	99.6	-11.1	-15.3	-12.9	-18.2
KY	51.4	34.5	94.5	96.7	-43.1	-62.2	-83.9	-180.4
LU	31.7	31.7	128.3	136.0	-96.6	-104.2	-305.0	-328.3
NL	269.1	249.7	616.9	636.6	-347.9	-386.9	-129.3	-154.9
NO	45.5	48.3	180.9	188.2	-135.4	-139.9	-297.9	-289.6
RU	9.4	7.6	32.9	29.3	-23.5	-21.7	-251.1	-287.0
SE	299.1	302.0	203.4	208.5	95.7	93.5	32.0	31.0
TR	27.5	34.5	40.5	65.1	-13.0	-30.6	-47.5	-88.7
US	108.3	130.4	550.6	622.5	-442.3	-492.1	-408.4	-377.5
JP	...	...	148.2	222.5				
MY	...	...	13.5	15.5				
Others	115.7	121.9	205.6	187.5	-89.9	-65.6	-77.7	-53.8

1 Banks in five jurisdictions, namely, BH, CW, GR, IM and SG do not report international debt securities in the LBS/R. However, the IDS database shows that BH, CW, GR and SG have issued debt securities in international markets. On the other hand, GG and JE report international debt securities in LBS/R but the IDS database shows no issuances of debt securities in international markets by banks. 2 The cell with "..." means reported data are either restricted or confidential.

Sources: BIS locational banking statistics by residence and BIS international debt securities database (QR June 2018, Released database for both sources).

**Table E • ISO codes and country/jurisdiction names**

ISO code	Name of jurisdiction	ISO code	Name of jurisdiction
AT	Austria	IM	Isle of Man
AU	Australia	IN	India
BE	Belgium	IT	Italy
BH	Bahrain	JE	Jersey
BM	Bermuda	JP	Japan
BR	Brazil	KR	Korea
BS	Bahamas	KY	Cayman Islands
CA	Canada	LU	Luxembourg
CH	Switzerland	MO	Macao SAR
CL	Chile	MX	Mexico
CN	China	MY	Malaysia
CW	Curaçao	NL	Netherlands
CY	Cyprus	NO	Norway
DE	Germany	PA	Panama
DK	Denmark	PH	Philippines
ES	Spain	PT	Portugal
FI	Finland	RU	Russia
FR	France	SE	Sweden
GB	United Kingdom	SG	Singapore
GG	Guernsey	TR	Turkey
GR	Greece	TW	Chinese Taipei
HK	Hong Kong SAR	US	United States
ID	Indonesia	ZA	South Africa
IE	Ireland		



