DRIVEN BY DATA: PAPERS PRESENTED AT NATIONAL AND INTERNATIONAL CONFERENCES | 2019

MAR. 2020

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MAR. 2020

Contents

Foreword

Driven by Data is a publication series of Banco de Portugal that showcases the articles and technical papers prepared and presented in national and international *fora,* by the staff of the Bank's Statistics Department. Its main purpose is to publicise the diversity of work related to statistics conducted by the staff of the Statistics Department.

This second issue of *Driven by Data* is divided in two sections: (i) Micro-databases – Potential for statistics; and (ii) Compiling statistics – Special case studies. To help guide the reader through the collection of papers, a brief summary of each is initially presented. There are two main highlights from the past year's work.

First, the work on the development and international dissemination of the Bank's integrated micro-databases, in particular the remarkable case of the recent developments of the Portuguese Central Credit Register (CCR) that was presented at the International Statistics Institute (ISI) World Statistics Congress. The continuous efforts to improve available statistical resources and processes is of utmost importance in the Bank's fulfilment of the highest standards in the fields of statistics. Moreover, improved granular databases are essential tools for the enhancement of the existing information that supports policy, supervision and research. As such, this work translates not only in improved statistics, but also to a better performing of the multiple tasks carried out in regard to the fulfilment of the missions of the central bank.

Second, the continuation of the joint work with the Bank for International Settlements (BIS), in a further effort to improve data quality and existing datasets worldwide, via the application of the mirror data approach.

Among the very relevant national and international *fora*, a special word goes to the Jornadas de Classificação e Análise de Dados (JOCLAD), where four pieces of research have been presented, given the importance of assuring a continuous representation of Banco de Portugal in this event

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Board member | Banco de Portugal

I Micro-databases – Potential for Statistics

Luís Teles Dias and António Jorge Silva, "The new Portuguese Central Credit Register: a powerful tool for a Central Bank", 62nd ISI World Statistics Congress, Kuala Lumpur, Malaysia, August 2019

The Portuguese Central Credit Register (CCR) has evolved significantly during its first four decades of operation, but its main objective remains the same: to provide participating institutions with accurate information used in risk assessment when granting credit. However, the CCR nowadays has a much broader use supporting several functions at the Banco de Portugal, such as supervision, economic research, monetary policy or financial stability analysis. This paper details the main developments that have occurred in the Bank's CCR and how a redesigned granular loan-by-loan database has helped the Bank to fulfil its mission, with a particular emphasis on how such granular information is used to assess the compliance of financial institutions with recently enacted macroprudential measures.

II Compiling Statistics – Special case studies

Ana Bárbara Pinto and Diogo Silva, "The value relevance of consolidated financial information", XXVI JOCLAD – Jornadas de Classificação e Análise de Dados, Viseu, Portugal, April 2019

This research examines the value relevance of International Financial Reporting Standards (IFRS) information, that is, the ability of this information to explain investors' decisions, which in turn is transmitted to market prices and therefore market valuation of firms. More specifically, the approach applied follows the idea that the joint explanatory power of book value and net income gauges the extent to which financial information is relevant to investors. Findings suggest that the relevance of financial information has been displaying a negative trend. Furthermore, value relevance is higher for groups in the construction and the energy sectors and tends to increase with size.

Ana Filipa Carvalho, Cloé Magalhães, João Meneses and Mário Lourenço, "Identifying high-growth enterprises using different criteria", XXVI JOCLAD – Jornadas de Classificação e Análise de Dados, Viseu, Portugal, April 2019

This paper discusses the various criteria available to identify high-growth enterprises (HGEs), such as growth criteria or size thresholds, and how the different criteria applied entail different classifications of HGEs. Due to the contingency of the classification on the criterion used, it points to the fact that analysts should be aware that some sectors of activity can be over or under-represented in terms of HGEs.

André Fernandes, José Soares, Pedro Silva, Rafael Figueira and Ricardo Correia, "Loans and debt securities – an analysis of corporate financing", XXVI JOCLAD – Jornadas de Classificação e Análise de Dados, Viseu, Portugal, April 2019

In the past 10 years, there has been a change in euro area non-financial corporations (NFCs) debt structure, with a shift from loans to debt securities. This paper argues that Portuguese companies have followed the same trend. The paper further includes a depth analysis of the financing structure of NFCs.

André Fernandes, José Soares, Pedro Silva, Rafael Figueira and Ricardo Correia, "What are we holding? Households' investments in negotiable financial instruments", XXVI JOCLAD – Jornadas de Classificação e Análise de Dados, Viseu, Portugal, April 2019

This paper addresses Portuguese households' investment decisions, with a focus on negotiable financial instruments. It shows a shift in the investment strategy of Portuguese households between 2013 and 2015: holdings experienced a decrease in corporate debt securities and an increase in public debt securities. Furthermore, investment in non-resident and resident investment funds increased over the whole period analysed. Portuguese households also have a lower preference for negotiable instruments compared to the euro area. Using survey data, results suggest that the preferences for investing in these instruments are a function of demographic and economic factors.

João Falcão Silva and Swapan-Kumar Pradhan, "Uses of mirror data: estimation of households' assets with banks", 62nd ISI World Statistics Congress, Kuala Lumpur, Malaysia, August 2019

This study discusses the estimation of cross-border assets of households, by examining the data elements that are common to the BIS external statistics such as the Balance of Payments and International Investment Position. The study explores the conceptual relationships between different data sources and shows the validity of cross data source relations, using country data at an aggregate level. Furthermore the paper describes the methodological framework and highlights data gaps, helping users to better use the available information.

I Micro-databases – Potential for Statistics

The new Portuguese Central Credit Register:
a powerful tool for a Central Bank

The new Portuguese Central Credit Register: a powerful tool for a Central Bank

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Abstract

The use of integrated micro-databases has been the cornerstone of the Banco de Portugal's long-term strategy for data management, allowing for the fulfilment of its statistical requirements and contributing with key information to several business areas within the central bank's remit. The Portuguese Central Credit Register (CCR), developed and managed by Banco de Portugal, constitutes an important case in point of this approach. In fact, CCR data have proven their relevance for a variety of purposes, from, inter alia, the compilation of very comprehensive and detailed statistics on credit, to the promotion of a better understanding of the risks underlying banks' balance sheets.

Aiming at streamlining the credit and credit-risk data available to Banco de Portugal in a single reporting framework and in a single database, and significantly increasing the detail of information reported, a new loan-by-loan CCR has recently been developed. The new CCR went considerably beyond the previous CCR, covering around 200 attributes, far more than the 29 offered by the former.

This new and enhanced CCR allows to significantly improve the depth and completeness of the credit and credit risk data available for several policy and analytical purposes, namely, banking supervision, financial stability, monetary policy and economic research.

An interesting case study is the use of data from the new CCR to assess commercial banks compliance with the macroprudential measure introduced by Banco de Portugal in 2018. This macroprudential measure introduced limits to new credit granted from 1 July 2018 onwards in terms of loan-to-value ratio (LTV), debt-service-to-income ratio (DSTI) and loan maturity at origination. It aims to prevent the accumulation of excessive risk in banks' balance sheets and ensure that households obtain sustainable financing.

Keywords: Credit register data; AnaCredit Regulation; Macroprudential analysis; Microdata.

JEL classification: C80; E42; E58; G21

1   Introduction

The Great Financial Crisis (GFC) made clear the existing gaps in the availability of detailed information essential for the timely assessment of risks. Particularly relevant for central banks, traditional aggregate statistics have proved insufficient to monitor and analyse the many aspects of the monetary transmission mechanism and the evolution of credit to companies and households.

Early on, Banco de Portugal (hereinafter referred to as the "Bank") understood that complementing aggregate data with more granular data was not only a solution to the need for more flexible and detailed information, it was also a movement towards more efficient and reliable systems.[1] This is particularly true when a single report using granular data can substitute several aggregate data reports representing different perspectives on a given reality (for instance, credit). In these instances, of which the Portuguese Central Credit Register (CCR) is an example, central banks can have one consistent and coherent multipurpose granular database. This can be used by several functions of the Bank, with each one of them analysing the granular data from its own perspective. This increases not only the flexibility of the data, but also the efficiency of the reporting systems themselves.

The Portuguese CCR was created in the late 1970s with the objective of providing the participating institutions with relevant information to assist them in the assessment of risks when granting credit. The CCR has evolved significantly over four decades but the original objective remains its main purpose. However, today the CCR is vastly important for other purposes: data can be used in the context of several specific functions of the Bank, such as statistics, prudential and conduct supervision, economic research, monetary policy, financial stability analysis and risk management.

In this paper we present the main developments that have occurred recently in Banco de Portugal's CCR and how a redesigned granular loan-by-loan database helps the Bank in fulfilling its mission, with particular emphasis on how such granular information is used to assess the compliance of financial institutions with recently enacted macroprudential measures. In section 2 we provide a brief overview of the new Portuguese CCR, section 3 focuses on the role of the CCR in supporting the Bank in macroprudential analysis and policymaking and section 4 presents some final remarks.

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[1] For a more detailed analysis on how the Banco de Portugal has been complementing traditional aggregate statistics with granular data, particularly on monetary and financial statistics, please see Dias & Silva (2017).

2 The New Portuguese Central Credit Register

The Portuguese CCR is an information system managed by the Statistics Department of the Bank, which contains monthly granular information on credit granted[2] by the institutions participating in the system – all resident credit-granting institutions.[3]

Over time, the CCR has shown a significant and increasing potential and usefulness to support several central banking functions. Currently, given their granularity and virtually complete coverage, CCR data are used by the Bank for a variety of tasks,[4] namely:

- To compile very comprehensive statistics on credit, with breakdowns by institutional sector of borrower, sector of activity, type of instrument, purpose, size of firms, location/region, original and residual maturity, type of guarantees, and amount of credit exposure;
- To assess credit concentration and distribution;
- To monitor the evolution of overdue loans and overdue loan ratio;
- To understand the risks underlying banks' balance sheets;
- To create an in-house credit risk assessment system in Banco de Portugal;
- To monitor the use of credit claims as collateral for Eurosystem5 credit operations.

The impact of AnaCredit on the Portuguese CCR

In order to obtain a better overview of credit developments across European Union Member-States, since 2007 the European System of Central Banks has been exploring the potential statistical use of CCRs. In particular it has sought to understand how the content of national CCRs could be enhanced and adapted to European statistical needs, so that it fostered a reduction in the reporting burden of the participants and promoted an increase in transparency.

In 2011, the European Central Bank (ECB) alongside all the euro area and some non-euro area national central banks, launched the AnaCredit[6] project. AnaCredit is a dataset containing detailed information, updated monthly on individual bank loans in the euro area. It uses new data and existing national credit registers to achieve a harmonised database that supports several central banking functions, such as decision-making in monetary policy and macroprudential supervision.

The creation of AnaCredit is important at European level for two main reasons: (i) the GFC showed that economic sectors in different countries do not have a homogenous response to economic shocks, so granular data are essential to monitor responses and, (ii) following the GFC, the ECB and some national central banks in Europe have taken on new macroprudential tasks that require new instruments and knowledge, namely granular and comparable information on credit.

With a view to fulfilling the AnaCredit requirements, the Portuguese CCR was completely redesigned in 2018 and adopted a new data model: a loan-by-loan basis instead of a borrower-

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[2] There is virtually complete coverage – all loans with an initial amount of €50 or more must be reported.

[3] The participating institutions are the following: banks, savings banks and mutual agricultural credit banks (MFIs); other non-monetary financial institutions that grant credit; public agencies that grant credit, and non-financial corporations acquiring loans from the resident financial sector. By law, the participation of these types of institutions in the CCR is mandatory.

[4] For a more detailed discussion on the Portuguese CCR and its several uses please see Matos (2015) and Matos & Dias (2017).

[5] The Eurosystem comprises the European Central Bank and the national central banks of the Member States whose currency is the euro.

[6] The name stands for "analytical credit datasets".

by-borrower approach, which had been in place since its inception. Although the first stage of AnaCredit comprises only loans granted by banks to legal persons (thus excluding, for the moment, households) with an exposure above €25,000, the Portuguese CCR has kept its extensive coverage, both in terms of its participating institutions (all resident credit-granting institutions), borrowers (legal and natural persons), and threshold (50€), in an attempt to cover all the attributes for most of this universe.

In reality, the redesign of the Portuguese CCR was not only due to the need to meet AnaCredit requirements – rather, there has been a paradigm shift in data management at the Bank in which the CCR operates as the single entry point for all credit and credit-risk data, thus creating a multipurpose hub of credit information that can be used by numerous business areas of the Bank.

The new CCR

The implementation of the new CCR information system carefully took into account other data needs (unrelated with AnaCredit) and specific functionalities identified as relevant by the participant institutions and the users. The resulting new data model includes not only the 94 attributes requested by AnaCredit but also other credit data attributes needed by the Bank's internal users. This allows for the rationalisation of the data reports by financial intermediaries, through the usage of the single entry point approach, as Figure 1 summarises, thus achieving a high standard of data integration.

Figure 1 • Rationalisation of credit data reports to Banco de Portugal

In order to improve the performance of the Bank's tasks related with monetary policymaking, risk management, statistical compilation, supervision and financial stability, the new CCR covers more than 200 attributes. This means that when a loan is eligible to report to the CCR, the participant institutions report information on the instrument, the debtor(s), the protection/guarantees, the accounting and risk information. Moreover, to meet the needs of the financial intermediaries, the CCR also deals with daily data[7] on relevant credit events, thus fostering a better assessment of the credit risk of the borrowers and enabling the Bank to follow the evolution of the credit on the financial system with a much smaller time lag.

Institutions do not need to report any reference data on resident legal and natural persons. For the identification of resident borrowers (and guarantors) it is sufficient that their taxpayer number is reported to the Bank. The enrichment of the database with reference data on these entities is done by the Bank through its business register. This procedure ensures that the Bank does not

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[7] The system is fully prepared to deal with daily data but this module will only go live after an amendment in the legislation regulating the CCR that is undergoing the Government approval process.

receive different classifications (e.g. by sector, by size) for the same borrower reported by different participant institutions.

3 Financial Stability and macroprudential policy – what's in it for the new CCR?

As discussed in the previous section, the Bank has been leveraging the Portuguese CCR to fulfill its tasks in several domains. One of the most relevant tasks entrusted to Banco de Portugal through its Organic Law is to ensure "the stability of the national financial system, performing for this purpose, in particular, the functions of lender of last resort and national macroprudential authority" and to participate "in the European system for the prevention and mitigation of risks to financial stability and in other bodies pursuing the same goal". To meet this challenge, the Bank resorts to a number of different inputs and techniques that allow for a systemic view of the financial system and of the build-up of systemic risks.

In this context, data from the CCR are an instrumental and extensively used input, analysing the various dimensions and characteristics attached to loans, debtors and/or creditors. Indeed, in light of its intrinsic homogeneity and of the possibility to compare its data with other databases, the CCR data allows for a complementary analysis to the "traditional" aggregate data by providing the underlying distribution measures and by enabling the enhancement of the testing and monitoring (e.g. stress testing) of the banks' results in ever-changing and increasingly complex scenarios.

Indeed, Lima & Drumond (2015) discussed the insufficiencies attached to aggregate data when assessing financial stability and showed how microdata databases, such as the CCR, enable an evaluation of the causes of the movements behind the aggregates and thus uncover the potential build-up of imbalances. Moreover, they also recognise that some macroprudential tools specifically require the use of characteristics that are only available in granular datasets – such as the collateral amount of real estate and debt instalments.

Macroprudential measure on new credit agreements for consumers

Aiming to promote financial stability, in February 2018 the Bank announced a macroprudential measure ("Recommendation") addressed to credit institutions and financial companies.[8] More specifically, it promotes the adoption of prudent credit standards on loans granted by the Portuguese financial system to consumers, in order to enhance the resilience of the financial sector and the sustainability of household financing thereby minimising the risk of defaults. Furthermore, the Bank seeks to prevent excessive risk taking by the financial sector, in a context where an easing of credit standards has been observed and standards are expected to become even less restrictive.[9]

This Recommendation, based on the comply or explain principle, introduced, for new credit granted from 1 July 2018, the following terms:

- Limits to the loan-to-value ratio (LTV), i.e. the ratio between housing loan(s) and the minimum between the purchase price and the appraisal value of the house granted as collateral;
- Limits to the debt service-to-income ratio (DSTI); i.e. the ratio between monthly instalments of total credit agreements and the borrower's income, net of taxes and contributions to social security;
- Limits to the maturity of loans;
- Requirement of regular payments of interest and capital.

[8] The set of recommendations can be found in Banco de Portugal (2018a).

[9] For a detailed analysis of the Recommendation and its justification please see Banco de Portugal (2018b).

Figure 3 • Summary of the Recommendation

A LTV limits	New credits relating to residential immovable property for the purchase or construction of own and permanent residence **LTV ≤ 90%**
	New credits relating to residential immovable property or credit secured by a mortgage or equivalent guarantee for other purposes than own and permanent residence **LTV ≤ 80%**
	New credit relating to residential immovable property or credit secured by a mortgage or equivalent guarantee for purchasing immovable property held by the institutions themselves and for property financial leasing arrangements **LTV ≤ 100%**

B
DSTI limits
	Credit contracts should have:
	DSTI ≤ 50%, with the following exceptions on the total amount of credit granted by each institution in each year
	   - Up to 20%: DSTI ≤ 60%
	   - Up to 5%: no DSTI limit

C
Limits to maturity
	For credits relating to residential immovable property or credit secured by a mortgage or equivalent guarantee:
	   - Maturity of new credit agreements ≤ 40 years
	   - Average maturity of new credit agreements should gradually converge to 30 years until the end of 2022

	For consumer credit agreements: - Maturity of new loans ≤ 10 years
D Requirement of regular payments	New loans should be granted with regular payments of interest and capital

According to the Recommendation, "Banco de Portugal shall monitor the implementation of this Recommendation at least once a year as well as the evolution of credit agreements for consumers excluded from the scope of this Recommendation." In previous years, compliance with a Recommendation such as this would have to be done via an annual ad hoc request addressed to all credit institutions, or alternatively, directed to only a sample of institutions with the inherent negative impact on the preservation of a level playing field amongst credit institutions in Portugal. Nowadays, the universal coverage of the CCR, together with the level of detailed information (number of attributes) available on a loan-by-loan basis, allows the Bank to assess compliance with the Recommendation for all credit institutions without needing to set up an ad hoc request to obtain additional information from them.

Furthermore, the data on the CCR allows for a more in-depth analysis that makes it possible for the Bank to calibrate the Recommendation almost in real time, if such a need arises, instead of having to wait several months to receive ad hoc information from the credit institutions to conduct such analyses.

4   Final remarks

The development of the new Portuguese CCR was a major challenge due to its ambition – to act as the single entry point of all credit and credit-risk data with the maximum level of granularity. This allowed for the enhancement of the service provided to the participant institutions (and to the general public who can easily access their own reports) and also facilitates the institutions' reporting procedures , not only because of fewer transformation rules to be applied, but mainly because of integration into a single reporting system of a number of autonomous reports on credit data (with different concepts, nomenclatures, formats, frequencies, timeliness, etc.) that they hitherto had to comply with.

However, the main challenge of the new CCR was internal as it brought about important organisational changes in data management: (i) the Statistics Department of the Bank is the system owner of the new CCR but the ownership of the data is collective (five departments); (ii) data management, including data quality assurance, is a shared responsibility implying individual (business areas) commitment in contributing to the overall quality of the data; (iii) a governance/relationship model had to be established between the different data owners; (iv) the new CCR champions the paradigm of data-sharing and helps to eradicate the traditional data silos; and (v) the high volumes and granularity of the data calls for new skills among the staff.

Despite the challenges, the benefits are evident. The policy measure described in the paper – macroprudential measure on new credit agreements for consumers – is just one good example of the usefulness of a CCR with such characteristics. The design of the measure was highly facilitated by the extensive availability of the underlying data via the CCR. The decision-makers only needed to focus on the definition of the rules to be met by the financial institutions when granting credit and definitely not on how the data needed to monitor the recommendation would be obtained. This was guaranteed by the CCR.

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II Compiling Statistics – Special case studies

The value relevance of consolidated financial information

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Abstract

The value relevance measures the ability of financial information to explain investors' decisions, which are reflected in the groups' market value. The study examines the value relevance of IFRS financial information for 8 European countries from 2012 until 2016, throughout sectors and also within group size categories. The approach applied follows the idea that the joint explanatory power of book value and net income gauges the extent to which financial information is relevant to investors. The results point out that the relevance of financial information has been following a negative trend and it appears to be higher in Belgium, whereas Greece displays the lowest value. Also, it is higher for groups from the construction and the energy sectors and tends to increase with size. Robustness tests support the results obtained.

Keywords: Consolidated financial information; IFRS; Value relevance.

1 Introduction

The main purpose of financial reporting is to provide useful information about groups' financial performance and positions. According to the International Accounting Standards Board (IASB), financial information should be relevant, transparent and comparable, whilst its main users are investors, lenders and other creditors. If financial reports provide useful information, that is, if financial information correctly represents a group's performance and position, then investors will be able to more accurately assess the value of a certain entity. Higher quality in groups' financial reports should lead to better informed decisions, thus promoting capital allocation efficiency.

Since the 2005 financial year, preparation of consolidated financial statements in compliance with International Financial Reporting Standards (IFRS) became mandatory for listed groups in the European Union's (EU) stock markets. Given the development and internationalisation of financial markets, providing comparable information within groups from different countries through international standards yields additional importance. With the strengthening of the integration of European capital markets and increasingly dynamic capital flows, cross-border investments have gained significance. Thus, the benefits in terms of capital allocation of producing relevant financial information became even greater. This points to how meaningful it is to assess the relevance of financial information.

Financial information is relevant if it is used by agents when making economic decisions. As the IFRS Conceptual Framework (Chapter 3, QC6 and QC7) describes:

"Relevant financial information is capable of making a difference in the decisions made by users. (...) Financial information is capable of making a difference in decisions if it has predictive value, confirmatory value or both."

This study examines the value relevance of financial information for each year from 2012 until 2016, per country, throughout sectors and also within group sizes. The value relevance measures the extent to which financial information can explain investors' decisions, which are reflected in the groups' market value. IFRS need to be flexible enough so that they can be applied to different contexts and to particular business environments. Note that international standards must also fit countries with different economic and social frameworks. Furthermore, today groups face innovative and constantly changing environments that demand adaptable and flexible accounting standards. This shows the importance of assessing time, country, size and sector dimensions separately. Since all groups apply the same accounting standards, differences in the value relevance of accounting information between countries (sectors, dimensions or years) are likely to be linked with countries' (sectors, dimensions or years) specific features. Note for example that some groups may have more incentives to provide bank-oriented information if they finance themselves through bank debt. Groups that rely on publicly issued bonds as well as groups listed on dynamic stock markets may be more likely to disclose investor-oriented information. Groups from countries in which taxation and accounting are linked to a greater extent may produce less investor-oriented reports.

Assessing value relevance is an important diagnostic given that if investors receive more relevant information, they have more with which to back their decisions to buy, sell or hold equities, just as an agent that has decided to buy, sell or hold some kind of debt instrument. Again, the information is relevant if it is used by investors. If investors have more (relevant) information at their disposal, their decisions will also be backed up with further information, which reduces the risk that investors face and boosts confidence in the respective choices made. This is likely to soften returns demanded by investors, which will ease investments.

Comparability, transparency and usefulness are all desirable qualitative attributes of groups' reports. All these attributes should increase the value relevance of financial information. Addressing the value relevance of financial information also means checking whether groups' reports possess, at least to some extent, these characteristics.

Some researchers have addressed the value relevance of IFRS. Commonly, these studies compared the value relevance of information that was in compliance with IFRS and countries' General Accepted Accounting Principles (GAAPs). Most of them focus on the early years of IFRS adoption. These researchers produced important insights although those were years in which groups and investors were still adjusting to IFRS. Thus, they mainly gauge the short-term impact of the mandatory adoption of IFRS. The value relevance of financial reports should have been continuously assessed, because new standards continued to be released. In addition, the value relevance of financial information would only be constant throughout time by chance, especially when considering the dynamism of the business environment. Assessing the impact and implementation of IFRS is the primary focus of ERICA WG.

Section 2 provides a description of the dataset used. Sector 3 defines the methodology. The results are presented in Section 4. Section 5 shows the main conclusions.

2   Description of the Dataset

This analysis uses consolidated annual data available at the ERICA database from 2012 to 2016. The study relies on a static sample, that is, groups considered are the same for all years. Three main variables were used: Total Capitalisation (code G0173 on ERICA Database) as a measure of the group's market value; Profit (loss) attributable to owners of parent (code CC_10_29 on ERICA Database) which represents groups' net income; Equity (code CC_50_56 on ERICA Database), which is the groups' book value. Groups' market value was available in ERICA Database only for ERICA+ cases from 2014 onwards. As a result, groups' market value was retrieved from the Thomson Reuters database. The variable used is denominated "market capitalisation". Groups' data from the ERICA database and Thomson Reuters were linked through International Securities Identification Number (ISIN). The ERICA static sample is from 2012 to 2016 and includes 677 groups. As it was not possible to link all the ISINs, the final sample is composed of a total of 632 groups for the years of 2012-2016, meaning that 3160 observations are used. Chart 1 shows the evolution of the variables considered during the sample period. It suggests that groups' market value has been increasing, although their book value appears to have remained stable over time.

Chart 1 • Market value, book value and net income – All groups |Billions
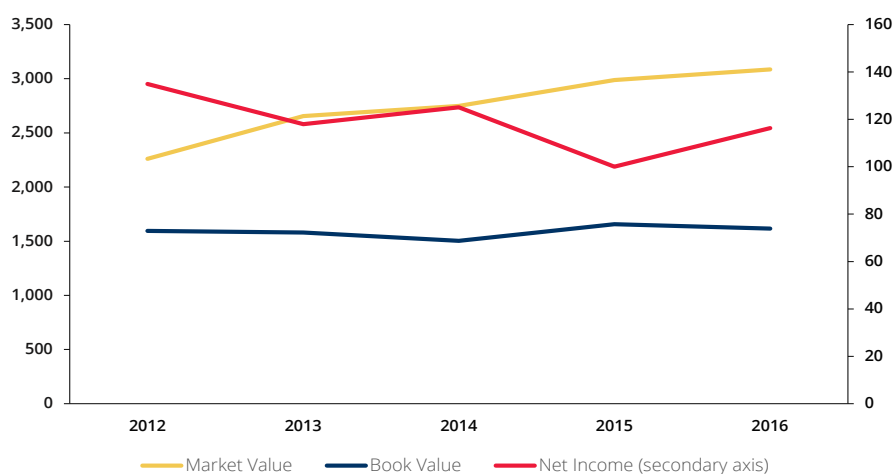
The number of groups per country is displayed in the second column of Table 1. France and Germany have the highest number of groups, 182 and 138, respectively. On the other hand, Austria (29), Portugal (35) and Greece (37) have the lowest number of groups.

Groups were classified by size in three different categories, depending on their revenue. The distribution of groups by size is dispersed between the three categories: Small groups account for 37% of the sample, while medium and large groups' share is close to 31% each (Table 1). There are also countries where the small groups have a higher share, which is the case of Portugal (51%), Belgium (47%) or Greece (45%). Germany (28%) and Austria (28%) have the lowest shares. It is also worth noticing that the percentage of large groups is especially small for Greece (12%), which is then followed by Portugal (21%). In contrast, their share is the highest for Germany (38%).

Classification of each group by sector was done through a mapping with the NACE code of the groups' main activity. Code G0150 of the ERICA Database provided the sector of the groups' main activity. Groups' distribution by sector is displayed in Table 1. Industry (44%) and Services (42%) are the sectors with the highest weights in the sample. The combined share of these sectors is even higher for France and Germany (93% for both).

Table 1 • Group's distribution – size and sector | percentage

Country	No. of groups	Size			Sector			
		Small	Medium	Large	Construct.	Energy	Industry	Services
Austria	29	28%	37%	34%	10%	10%	59%	21%
Belgium	52	47%	31%	22%	8%	5%	55%	33%
France	182	36%	31%	33%	2%	4%	40%	53%
Germany	138	28%	34%	38%	1%	6%	49%	44%
Greece	37	45%	43%	12%	12%	14%	27%	47%
Italy	82	46%	26%	28%	6%	17%	53%	25%
Portugal	35	51%	28%	21%	9%	9%	26%	57%
Spain	77	35%	30%	35%	14%	10%	38%	39%
Total	632	37%	31%	31%	6%	8%	44%	42%

Table 2 presents descriptive statistics by size. Statistics disclosed are mean, median, coefficient of variation (Coef. var.), skewness and kurtosis. It is shown that the coefficient of variation of the three variables under analysis is higher for small groups. A greater coefficient of variation means higher heterogeneity. The skewness of the distribution of the variables also decreases with size. Absolute values closer to 0 indicate that the data is less skewed, that is, the distribution of the data is more symmetric. Hence there is more asymmetry within small groups, which are then followed by medium groups. The kurtosis shows the weight of extreme values, that is, how heavy the tails of the distribution are. When it comes to market and book value, the kurtosis decreases with size. Thus, one can find groups that present relatively more extreme values between small groups. Overall, within smaller groups, there is more heterogeneity, asymmetry and particularly extreme values.

Groups from the energy sector are the biggest, considering both mean and median values. What is more, energy and construction sectors are more homogeneous and less asymmetric, given that both the coefficients of variation and skewness are higher for groups in those sectors. Industry and services include more particular cases, which is reflected in higher values for kurtosis. This is consistent with the energy and construction sectors being those with larger groups, which were shown to be more homogeneous and symmetric, while also including relatively less specific cases.

Table 2 • Descriptive statistics – size and sector

Size/Sector	Variable	Mean (€ Million)	Median (€ Million)	Coef. var.	Skewness	Kurtosis
Small	MV	184	68	2.21	5.07	30.14
	BV	115	56	2.40	6.98	59.20
	NI	6	3	6.28	5.50	74.88
Medium	MV	851	363	1.64	3.94	20.54
	BV	506	273	1.90	5.86	47.82
	NI	34	18	4.36	0.30	99.67
Large	MV	12,540	4,472	1.70	3.51	16.27
	BV	7,572	2,499	1.76	3.23	12.06
	NI	573	179	2.98	3.00	34.30
Construction	MV	1,920	298	2.64	4.62	23.73
	BV	1,647	431	1.88	3.04	9.80
	NI	87	20	5.86	1.24	11.27
Industry	MV	6,011	410	3.00	5.03	31.66
	BV	3,017	241	3.10	5.65	39.05
	NI	321	15	3.96	7.49	87.61
Services	MV	2,297	211	2.69	6.12	52.31
	BV	1,387	189	2.91	5.77	38.76
	NI	109	12	3.76	1.84	56.12
Energy	MV	9,965	1,998	1.82	3.21	12.21
	BV	9,535	1,925	1.78	2.29	4.62
	NI	269	82	6.74	-0.35	15.05

3   Methodology

To study the value relevance of financial information this research follows an approach known as the "Price Regression Model". This model supports the idea that if investors rely on financial reports to make economic decisions and given that groups' market value is the result of investors' orders, then financial information should explain groups' market value. The model assesses the extent to which book value and net income explain groups' market value.

The structure of the model was formulated by Ohlson (1995) and Feltham and Ohlson (1995). Embedded in the development of the model are two major points. The first is described as the "clean surplus relation". It refers to the idea that changes in book value over two consecutive periods must be equal to net income minus dividends. Also, dividends paid do not impact on current net income, but they do reduce groups' book value. The second point relates to the assumption that a group's market value equals the present value of expected future dividends. This is usually described as the dividend discount model and was firstly proposed by Gordon (1959). By assuming that these two ideas hold, Ohlson (1995) was able to show that the present value of future expected dividends can be computed through accounting figures. Another important feature of the model is market efficiency (Beisland, 2009). It plays a role because it is actually assessing the extent to which equity investors adjust to information. The semi-strong form of market efficiency suggests that prices incorporate at least all publicly available information, such as listed groups' reports (Fama, 1970).

The "Price Regression Model" was widely applied to assess the impact of adopting the IFRS. As the model measures the extent to which accounting data explains market valuation, the explanatory power of financial statements within the first years of the mandatory adoption of IFRS was frequently compared to the explanatory power of accounting information before the mandatory adoption, in which firms were applying national GAAPs. Regarding the ERICA WG countries, consider for example Callao et al. (2008) who developed an analysis for Spain, Tsalavoutas et al. (2012) for Greece, Paglietti (2009) for Italy, Paananen and Lin (2008) for Germany or Morais and Curto (2008) for Portugal. There are also researchers who applied this model to different countries at the same time, which more easily allows for comparisons between countries. As examples, one can consider Aharony et al. (2010), Clarkson et al. (2011) or Devalle et al. (2010). Their analyses assess the impact of IFRS adoption for countries such as Austria, Belgium or France.

Overall, the "Price Regression Model" is a generally accepted and widely used approach to assess the value relevance of financial information. The model is estimated through the following equation:

$$MV_{it} = B_0 + B_1.BV_{it} + B_2.NI_{it} + e_{it} \qquad\qquad (1)$$

Where, for group i and year t,

MV: Market value; *BV*: Book value of equity; *NI*: Net income;

e: Residuals; B_0, B_1 and B_2: Regression coefficients to be estimated.

Equation (1) is applied for each country, year, sector and size. It allows comparisons to be drawn on the value relevance of financial information between different countries, years, sectors and sizes. The value relevance is measured by the adjusted R-squared of each regression. The R-

squared corresponds to the coefficient of determination which indicates the proportion of the variance of the dependent variable that is explained by the independent ones. The adjusted R-squared, in contrast with the R-squared, does not assume that all independent variables are statistically significant.

Robustness checks are applied. While focusing on one of the four dimensions considered (e.g. country) the model is augmented with dummy variables that incorporate information regarding all other dimensions. For example, when estimating the model for a certain country, dummy variables are added to capture sectorial, size and year effects. This may be important for countries whose groups are, for example, scattered around different sectors. In addition, the model is also re-estimated but instead of considering the groups' market value at the end of year t, groups' following year (t+1) average market value is applied.

4 Results

4.1 Size: The bigger the size of groups, the higher the value relevance of financial information

Following the approach described in the preceding section, the model was firstly estimated for each group size. The results are presented in Table 3. Row 2 of Table 3 displays the adjusted R-squared of the estimations computed for each size. The adjusted R-squared proxies for value relevance. The following rows present, for each size, the p-value of a t-test in which the null hypothesis is that the independent variables' coefficient is 0. If the p-value is smaller than 0.05 or 0.01, that suggests the variable's coefficient is statistically significant (different from 0) at 95% or 99% confidence level, respectively.

The bigger the size of groups, the higher the value relevance of financial information. As can be seen, the adjusted R-squared appears to be an increasing function of group size. What is more, the significance of net income is not even statistically significant at 95% confidence level for small groups. In section 2, it was verified that homogeneity, symmetry and lesser particular cases were also positively related with group size. These attributes may, to some extent, help clarify the results obtained.

Table 3 • Results – size level estimations

	Small	Medium	Large
Adj. R-Squared	0.24	0.52	0.73
Const. – p-value	0.00	0.00	0.00
BV – p-value	0.00	0.00	0.00
NI – p-value	0.06	0.00	0.00

4.2   Sector: Investors appear more responsive to financial information of groups from the construction and the energy sectors

Sector-level estimation results are described in Table 4. Accounting information has the lowest value relevance for groups in the industry sector (0.77), followed by the services sector (0.84). These are also the two sectors with the highest shares of observations. Investors appear to be more responsive to the financial information of groups from the construction and the energy sectors. The adjusted R-squared of the estimations for these sectors was 0.91 and 0.88 respectively. Furthermore, although industry and services sectors are those with higher representativeness, both of them have bigger shares of small groups, while construction and energy sectors are, to a greater extent, composed of large groups. Overall, the results indicate that, for all sectors, both book value and net income significantly contribute to investors' decisions.

Table 4 • Results – sector level estimations

	Construction	Services	Industry	Energy
Adj. R-Squared	0.91	0.84	0.77	0.88
Const. – p-value	0.00	0.00	0.00	0.00
BV – p-value	0.00	0.00	0.00	0.00
NI – p-value	0.00	0.00	0.00	0.00

4.3   Country: Financial information appears to be more relevant in Belgium and Italy, whereas Greece displays the lowest value

Table 5 discloses the results for country level estimations. Considering the weighted mean and the median (both approximately equal to 0.78) of the adjusted R-squared as a benchmark, it is possible to point out that the relevance of financial information is relatively moderate in Portugal (0.75), Spain (0.75), Austria (0.78), Germany (0.79) and France (0.83). The countries in which financial information appears to be more relevant are Belgium (0.97) and Italy (0.88); whereas Greece displays the lowest value (0.49). Greece is the country with the smallest percentage of large groups, where financial information seems to be more relevant. At a 99% confidence level, both book value and net income are statistically significant for all estimations, except for Portugal, where net income is significantly only at 95% confidence level.

Table 5 • Results – country level estimations

|	Austria	Belgium	France	Germany	Greece	Italy	Portugal	Spain
Adj. R-Squared	0.78	0.97	0.83	0.79	0.49	0.88	0.75	0.75
Const. – p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BV – p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NI – p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00

4.4 Year: Value relevance has been decreasing since 2013, standing in 2016 close to the level of 2012

Year-level estimations are shown in Table 6. The value relevance of financial information increased from 2012 (0.78) to 2013 (0.84). Nevertheless, it has been decreasing since, standing in 2016 (0.77) close to the level of 2012 (0.78). Net income also lost statistical significance in 2016. Chart 2 illustrates the decreasing trend that the relevance of financial information has followed. Confidence intervals were calculated using a 95% confidence level. The equation presented is representative of the trend line. It suggests that, on average, the value relevance of financial information decreased at a pace of half a percentage point a year.

Table 6 • Results – year level estimations

	2012	2013	2014	2015	2016
Adj. R-Squared	0.78	0.84	0.83	0.80	0.77
Const. – p-value	0.17	0.05	0.23	0.41	0.27
BV – p-value	0.00	0.00	0.00	0.00	0.00
NI – p-value	0.00	0.00	0.00	0.00	0.03

Chart 2 • Adjusted R-Squared by year

$$y = -0.0059x + 0.8129$$
$$R^2 = 0.0765$$
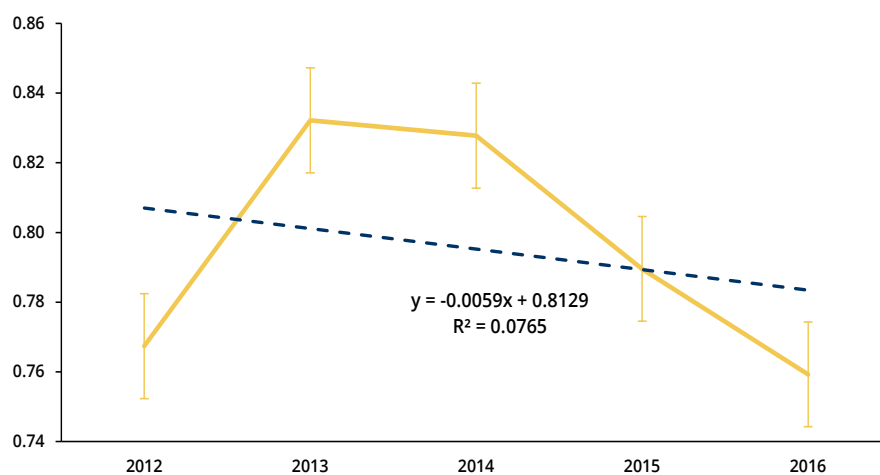
4.5 Robustness Checks

To assess the robustness of the results, some check-ups were performed. Firstly, the original model was augmented with dummy variables, just as described in section 3. This approach did not meaningfully change the results, except for the country level estimations. For the analysis focusing on value relevance differences across countries, the impact of incorporating sector, size and year dummy variables is presented in Chart 3.

Chart 3 • Adjusted R-Squared – standard vs augmented model

As expected, the adjusted R-squared of the models with dummy variables is higher for all countries, albeit slight for some. This increase is most noticeable in countries that presented the lowest values in the original model, i.e. Austria, Portugal, Spain and Greece. The main impact of including dummy variables in country level estimations is that the relevance of financial information of Austrian groups surpasses German ones. All other conclusions hold. When the groups' market value considered was changed to the following year's average, results obtained were also very similar.

5   Conclusions

The main purpose of this research was to assess the value relevance of groups' financial information for each country available on the ERICA database for each sector, size and over time. The approach applied follows the idea that the joint explanatory power of book value and net income gauges the extent to which financial information is relevant to investors.

The results suggest that the value relevance of financial information is higher in Belgium and Italy whereas the lowest relevance was found for Greece. The values for all other countries were close. Construction and energy are the sectors where information is most relevant. Both industry and services sectors present lower values. These sectors include relatively larger groups and the value relevance of financial information appears to be an increasing function of group size. Finally, it was discovered that the relevance of financial information has been decreasing since 2013.

However, the interpretation of the results should be done with caution. Financial information is not the only source of information to investors. Factors that affect investors' decisions go beyond financial information. A decreasing trend in the value relevance of financial information may be linked with increased investor confidence, just as country level results can be derived from countries' specific risk or stock market dynamism. The financial information may be less relevant for groups whose shares have lesser levels of liquidity. Nevertheless, addressing the value relevance of financial information is an important diagnostic. This study considered four dimensions separately (countries, sectors, sizes and years). Estimations could be made while considering more than one dimension at the same time. It would be possible to answer questions, such as: does the relevance of financial information increase with size in all countries? Or has the relevance of financial information been decreasing in all countries? Hence, a possible follow up may assess the value relevance of financial information while crossing dimensions.

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Identifying high growth enterprises using different criteria[1]

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Abstract

High-growth enterprises can be defined according to different underlying variables, growth criteria and size thresholds, with implications on the benchmarking of the most dynamic companies in the economy. Some sectors of activity can be over or under-represented within the population of high-growth enterprises. This is a situation of which analysts should be aware when conducting this kind of analysis.

Keywords: Enterprises; Growth; Dynamics.

Different measures can be considered in order to determine which companies have registered growth within a certain time period and how high that growth is. According to Eurostat-OECD (2007), high-growth enterprises (HGEs) comprise all enterprises with average annualised growth greater than 20% per annum, over a three year period. Growth can be measured using the number of employees and/or turnover. The same publication suggests that a meaningful size threshold should be set to avoid distortions caused by the growth of small enterprises, while recommending that the size threshold should be low enough to avoid excluding too many enterprises.

More recently, Commission Implementing Regulation (EU) No 439/2014 set the compulsory collection of data on HGEs with at least 10 employees at the beginning of the growth period and having an average annualised growth in the number of employees greater than 10% per annum, over a three year period.

Given the multiple definitions available, it is useful to be aware of the impact of analysing HGEs using one criterion or another, not only in terms of the variable under assessment (turnover or number of employees) but also the different thresholds (size threshold and growth threshold).

Using Banco de Portugal's Central Balance Sheet Database, several criteria were implemented (including the methodology stated in Banco de Portugal (2019) leading to the identification of different sets of HGEs for the period between 2013 and 2017. An analysis of the differences between these sets of enterprises led to the following conclusions:

- The number of HGEs identified in 2017, for instance, ranges, from around 2 thousand up to almost 48 thousand, according to the implementation of different criteria.
- A size threshold of 10 employees leads to the exclusion of more than 90% of NFCs from the set of potential HGEs (40% of NFCs' turnover and number of employees).
- If the growth variable and its threshold are held constant, a size threshold of 10 employees (instead of one employee) implies a drop in the number of HGEs of at least 80%.
- The change in the growth threshold (20% or 10%) is the modification in the criteria which has the strongest impact on the weight of HGEs within total NFCs in terms of both turnover and number of employees.
- Considering the number of enterprises, the relevance of microenterprises falls to less than 5% when the size threshold of 10 employees is applied, while that of small and medium-sized enterprises increases to more than 90%. The share of small and medium sized enterprises, measured in terms of turnover and number of employees, increases when growth is measured using turnover, while large enterprises gain relevance when growth is measured according to number of employees.
- The share of the manufacturing sector increases when the size threshold of 10 employees is used, while the relevance of the trade sector decreases.
- When the size threshold of 10 employees is applied and growth is assessed using the number of employees, the share of enterprises with their head office in the Lisbon Metropolitan Area rises, in terms of turnover and number of employees.
- The share of HGEs belonging to the export sector is strongly influenced by the number of identified HGEs, which varies significantly when using different criteria. For instance, the implementation of a size threshold of 10 employees leads to a decrease in the number of HGEs in the export sector. However, the weight of the export sector within HGEs increases as the number of HGEs is smaller (which may be linked to the exclusion of the majority of microenterprises from the set of HGEs when such a threshold is used).

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Loans and debt securities – an analysis of corporate financing[1]

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Abstract

For the 2008-2017 period, euro area non-financial corporations presented a more pronounced increase in financing through debt securities rather than loans. Indebtedness of Portuguese non-financial corporations has followed the same trend and is characterised by: (i) a highly concentrated debt securities market in terms of the number of issuers; (ii) a relatively higher proportion of short-term debt securities, when compared to the euro area.

Keywords: Commercial Paper; Debt Securities; Loans; Non-Financial Corporations.

Over the past 10 years, euro area non-financial corporations (NFCs) have changed their debt structure. As presented in Chart 1, Portuguese and other European peripheral countries' (OEPC - Spain, Italy and Greece) NFCs presented a reduction in their amounts of loans, contrasting to the euro area pattern. Regarding debt securities, OEPC, and to a lesser degree Portugal, followed the euro area tendency, increasing their amounts issued.

Chart 1 • Evolution of liabilities of NFC in loans and debt securities – consolidated stocks
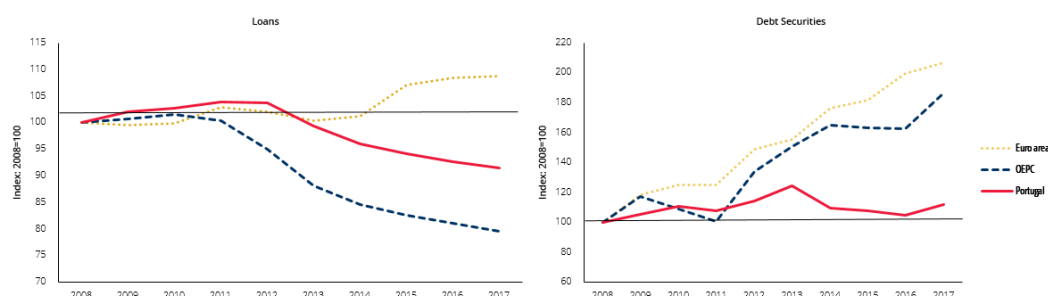
Sources: Banco de Portugal and Eurostat.

Despite the fact that loans continued to be the preferred choice for euro area NFCs, the increase of funding through debt securities should be highlighted. In Table 1, it is observable that the share of euro area NFC financing via debt securities increased from 9.0% of total debt in 2008 to 15.9% in 2017. This is also observable in the case of Portuguese NFCs, where debt securities weighed 18.9% in 2017, an increase of almost 3 p.p. from 2008. Moreover, even though the total short-term financing (i.e. loans and debt securities) of Portuguese NFCs is in line with the euro area throughout the period under analysis (close to 20%), the relevance of short-term debt securities must be pointed out: 6.3% in Portugal, contrasting to 0.8% in the case of euro area NFCs in 2017. This fact may be explained by the benefits for financing through commercial paper, such as an exemption from stamp duty.

Table 1 • NFCs debt structure across euro area

|	Region	2008			2013			2017		
		Short-Term	Long-Term	Total	Short-Term	Long-Term	Total	Short-Term	Long-Term	Total
Loans	Euro Area	28.3%	62.6%	91.0%	23.4%	63.3%	86.7%	21.8%	62.3%	84.1%
	OEPC	27.2%	68.8%	96.0%	21.4%	72.0%	93.4%	19.0%	72.2%	91.2%
	Portugal	21.5%	62.5%	84.0%	14.5%	66.2%	80.7%	15.8%	65.3%	81.1%
Securities	Euro Area	1.5%	7.5%	9.0%	0.9%	12.4%	13.3%	0.8%	15.1%	15.9%
	OEPC	0.3%	3.6%	4.0%	0.3%	6.3%	6.6%	0.3%	8.6%	8.8%
	Portugal	10.5%	5.6%	16.0%	8.1%	11.1%	19.3%	6.3%	12.6%	18.9%

Sources: Banco de Portugal and Eurostat.

Using microdata on securities holdings and issues available at Banco de Portugal, it is possible to gain a deeper understanding about Portuguese NFCs debt securities funding. Two characteristics should be noted: (i) the commercial paper could be viewed as a close substitute of short-term loans; (ii) the market players' concentration. Regarding the former, one could argue that, in Portugal, commercial paper is similar to a loan, given its limited negotiation in the market. In fact, 70.5% of this instrument's outstanding amount is held by Portuguese banks, showed in Chart 2, and it is mostly held by the same institution until final redemption. For the latter, the number of NFCs that issue debt securities is very limited when compared to the total number of Portuguese

NFCs (around 700 in a universe of over 400,000). In addition, taking into consideration the Lorenz curve presented in Figure 3, it can be concluded that the Portuguese NFCs debt securities issues have a high degree of concentration, since 3% of NFCs issuers of debt securities are responsible for 72% of the total amount issued in 2018. Comparing to 2008, there was an increase of concentration, given that for the same percentage of NFCs, the amount outstanding was 59%.

Chart 2 • Commercial paper investors and Lorenz curve for Portuguese NFCs issuers
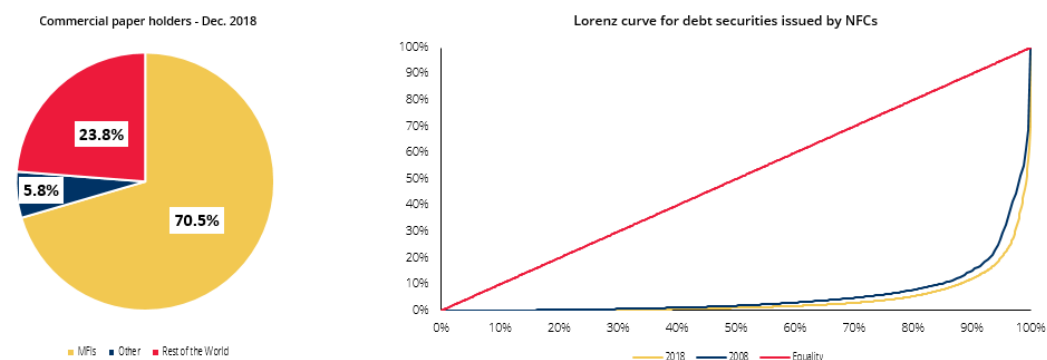
Source: Banco de Portugal.

What are we holding? – Households' investments in negotiable financial instruments[1]

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Abstract

Negotiable Financial instruments, namely debt securities (F3), listed shares (F511) and investment funds shares (F52), represent 9% of the total financial assets held by Portuguese households in 2018Q3. Investment funds shares are the preferred investment, amounting to half of households' portfolios. From 2008 to 2017, the Portuguese households' portfolio structure followed the euro area pattern, with an increase in investment funds shares and a decrease in debt securities exposure.

Keywords: Households; Investment Portfolio; Portugal; Securities.

In 2018Q3, Portuguese households' investment in financial negotiable instruments amounted to 37.0 billion euros, which represented 9% of the total financial assets held by this sector. Currency and deposits was the main financial asset with 45% of the total.

Chart 1 • Portuguese households' transactions by financial negotiable instrument – yearly transactions
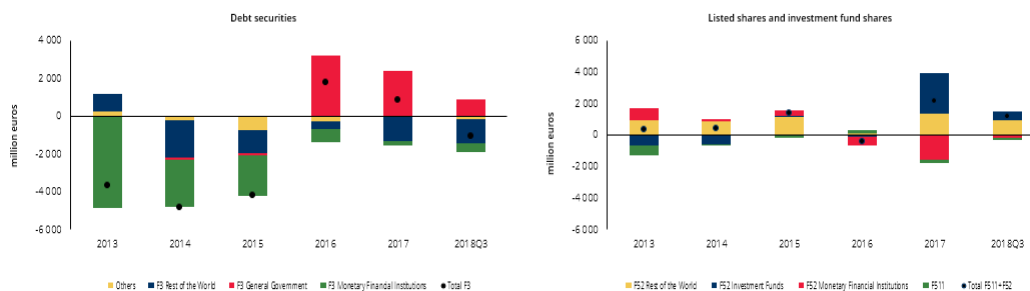
Source: Banco de Portugal.

Considering Chart 1, Portuguese households have made relevant changes in their investment strategy. Between 2013 and 2015, this sector had negative transactions in debt securities, mainly those issued by banks. This disinvestment was partially offset in the following years, through investment in public debt. It is possible to observe, for the entire period, a positive investment in non-resident investment fund shares, and a positive and significant investment in resident investment funds, in 2013 and from 2017 onward.

Chart 2 • Euro area comparison of negotiable financial instruments load in total financial assets (excluding other accounts receivable) held by households - end of year stocks
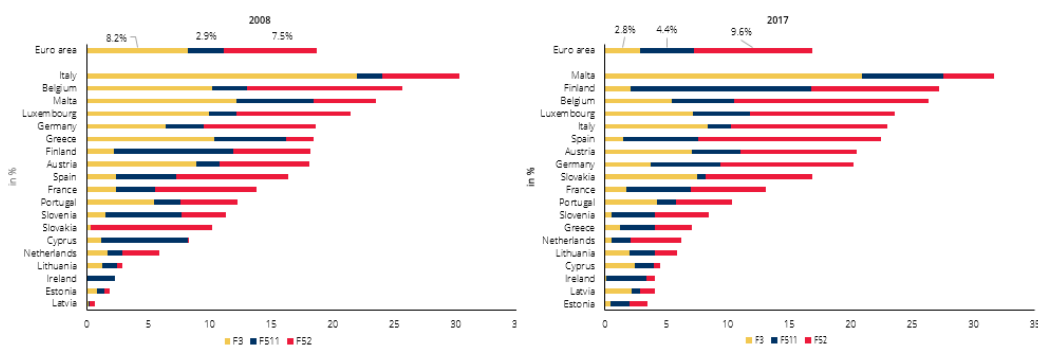
Sources: Banco Portugal and Eurostat.

When compared to other euro area countries, Portuguese households have a lower preference for investing in negotiable instruments, as shown in Chart 2 (10.4% of total financial assets in Portugal compared with 16.9% in the euro area in 2017). The exposure of Portuguese households to financial negotiable instruments decreased from 12.3% in 2008, to 10.4% in 2017, a pattern also presented by the euro area where this reduction was from 18.7% to 16.9%. There is a relevant reduction in the importance of debt securities (from 5.5% to 4.2%) for Portugal. In the euro area, there is also a noticeable reduction in the importance of debt securities (from 8.2% to 2.8%),

partially offset by an increase in the weight of investment fund shares (from 7.5% to 9.6%). There was also an increase in listed shares (from 2.9% to 4.4%), which was not followed by Portuguese households. Despite the aforementioned changes, the ranking of Portugal compared to other countries remains. Using survey data, one can observe that the preferences for investing in these instruments depend on the demographic and economic conditions of households. According to (Costa, 2016), younger households and families with higher income and wealth show greater preference for investing in negotiable instruments. This economic relationship is also true for the euro area, despite the older age of the households (ECB, 2016) investing in these instruments, when compared to the Portuguese case.

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Uses of mirror data: estimation of households' assets with banks

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Abstract[1]

This paper aims to analyse and estimate cross-border assets of households in the form of bank deposits and bank loans. Such data are scarce and there is no comprehensive system to collect and compile this information directly. The lack of available information combined with a complex delimitation of this institutional sector represent challenging issues to the compilers. The international locational statistics of the Bank for International Settlements (BIS) cover cross-border assets and liabilities of reporting banks broken down by counterparty sector in individual countries around the world. We apply a mirror data approach to derive the assets of the households sector in a given country using source data as the cross-border liabilities of banks to this sector in respective countries. In addition, we apply our method to estimate data backwards for periods when International Banking Statistics (IBS) data for this sector are either limited from 2013 Q4 or not available prior to 2013 Q4.

Keywords: Data gaps; foreign assets/liabilities; households; international banking; mirror data.

1   Introduction

In a more globalised world, the institutional sector "households" is a statistical challenge for the compilers due to non-availability of data or access to accurate data. We address this issue by focusing on cross-border assets/liabilities of this sector vis-à-vis foreign banks using the BIS locational banking statistics (LBS). We apply the mirror data approach which refers to complementary sources that capture similar concepts and is indeed a crucial statistical tool that allows to fill in data gaps. The mirror data approach involves comparison of different statistical data sets that can be analysed within one country, or across/between countries aiming to compare the same statistical data under a dual perspective (e.g. creditors versus debtors). Falcão Silva, João & Pradhan, Swapan-Kumar (2018) demonstrated the importance of mirror data to enhance statistical quality as well as coverage of data across comparable statistical domains.

In the absence of data confidentiality restrictions, a mirror data exercise is an important tool to improve the quality of the data, fill in data gaps and reduce bilateral asymmetries. In the case of households, mirror data exercises can perform better estimates of their financial assets/liabilities because households do not disclose amounts/locations of their cross-border positions (assets/liabilities) either directly or through a survey.[2] As confidentiality constraints of bilateral data at granular level prevents knowing banks' locations (BIS reporting countries), we also provide an estimation method at an aggregate level. Furthermore, we demonstrate that our methods provide better estimates of households' cross-border positions in a given country, when bilateral data are disclosed for a majority of reporting countries. We apply our methodology to the Portuguese data as a country-case example.

Finally, as the financial assets/liabilities of households are commonly considered as a statistical gap in the balance of payments/international investment position (BoP/IIP) and the rest of the world (RoW) accounts compilation, this approach could also support these two statistical domains.

2   Compilation of data for households sector – main challenges

The compilation of data for the household sector raises some difficulties related to data availability and accuracy. One of the main issues is the accountability because there is no full set of accounts or ability to draw up sets of accounts for the household sector.[3] Households' surveys constitute one source to surpass this issue. Nevertheless, some drawbacks are associated with non-responses, estimation or underreporting of their financial assets and income. The System of National Accounts (SNA) 2008[4] states an example associated with people earning income arising from illegal activities who may be very reluctant to provide this information and may choose not to participate in the survey. Similarly, it is common for households at the very top/bottom of the distribution to be omitted from the survey either by design or on the grounds of practicality. Low frequency and long lag in data availability are other critical issues. Currently, there is a lack of regular information on households' assets and liabilities broken down by financial instrument types such as deposits, loans and

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[2] Such information from creditor/debtor sources (banks where their deposits are located) would be complementary sources for the purpose.

[3] That includes also non-profit institutions serving households.

[4] Paragraph 24.24.

securities. Data sources are scarce and obtaining accurate/comparable data is very difficult within each country and across different countries.

The issues relating to demographic changes cannot be ignored. When the population changes, an effect on households' well-being and resources is observable and, consequently, calls for policy-actions. For example, under an ageing population, there is less demand for educational services and more demand for health services.[5] Another concern is whether pension benefits are sufficient to support individuals in retirement age without any government intervention. According to the SNA, a focus on such issues might suggest sub-sectoring households according to income earner categorisation.[6] In addition, demographic patterns will likely put pressure on potential output growth rates, the natural rate of unemployment, and the long-term equilibrium interest rate and on the monetary policy transmission mechanism. The magnitude and timing are uncertain as they depend on the behaviour of consumers and businesses. Rising fiscal imbalances are projected to lead to higher government debt-to-GDP ratios, potentially putting upward pressure on interest rates, and crowding out productive investment.

Finally, greater international labour and capital movements have significant implications on the international connections between resident households and non-residents and cannot be ignored.

3 Methodology

We use the LBS as the main data source to perform this empirical exercise. These statistics are consistent with the BoP/IIP methodology, as they correspond to claims/liabilities of residents in one country vis-à-vis those of other countries. In addition, the LBS are best suited for macro analyses of economic and financial stability issues. The linkages with these and other statistical domains cannot be disregarded and should be part of the statistical analysis. The LBS data covers information on the financial instruments (e.g. loans and deposits and debt securities), currency, counterparty sector (e.g. intragroup, central banks, unrelated banks and non-banks) and counterparties' geographical composition of resident banks' balance sheets. While the LBS data capture the non-bank sector since 1977, the claims/liabilities of banks vis-à-vis subsectors of non-banks (households in particular), are available only from end-December 2013.

There are some issues associated with the use of LBS as a data source. Firstly, data on banks' liabilities[7] to households are collected on an encouraged basis only from end-December 2013, which does not ensure full data coverage.[8] Secondly, only 13 countries started reporting these data from the end-December 2013 and another 17 countries started reporting in subsequent

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[5] Paragraph 24.42, SNA 2008.

[6] If households sector is in work, relevant categorisation of working age but not in work or in retirement (paragraph 24.43).

[7] Same for claims on households sectors but we focus on liabilities of banks to estimate assets of this sector with banks abroad.

[8] The non-financial subsectors were introduced in the BIS international banking statistics as part of a series of enhancements to the statistics starting from end-December 2013. National authorities started to report the enhanced data at different times and, as a result, global coverage has been incomplete during the implementation phase. The BIS does not yet publish data for these subsectors, but plans to release these data by end 2019.

quarters.[9] Thirdly, due to confidentiality reasons, data for some countries is not published and thus we cannot disclose all the estimates on bilateral data.

The following table shows the mapping of sector hierarchy between the SNA and BIS LBS and the reported liabilities (deposits) in the LBS as of Q4 2018:

LBS sector code/name	Amounts [in $bn]	SNA code
A: All sectors	20,550	S1
B: Banks, total (sub-sectors exists)	12,688	S121+S122
N: Non-banks, total	7,678	(S123+S124+S125+S126+S127+S128+S129) + (S11+S13+S14+S15)
F: Non-bank financial institutions	4,141	S123+S124+S125+S126+S127+S128+S129
P: Non-financial sectors	3,168	S11+S13+(S14+S15)
C: Non-financial Corporations	1,199	S11
G: General Government	89	S13
H: Households including NPISHs	673	S14+S15
K: Non-financial sectors, unallocated	1,208	
X: Non-banks, unallocated	369	
U: Unallocated by sector	184	

Although the counterparty sector breakdown into **F** and **P** (see Table above) are required, as of Q4 2018 about 5% of the total deposit liabilities to the non-bank sector was classified under the category "X: Unallocated non-banks". The further breakdown of **P** into subsectors **C**, **G** and **H** shows that at sub-hierarchy, the share of "K: Unallocated non-financial sector" is about 16% of sector **N,** and 38% of sector **P** (i.e. at the aggregate level 38% of liabilities to sector **P** are not classified to sectors **C**, **G** and **H**).[10]

The interlinkages with other data sources using the mirror data is crucial when analysing the households sector. It offers the use of debtor banks' liabilities to derive assets of the households with banks. We consider BIS reporting banks' cross-border liabilities to the households sector as the measure of assets of this sector with banks abroad in two alternative methods: using aggregate and bilateral data.

We noted that the coverage of reported data differs across counterparty countries. In the overall aggregate as of Q4 2018, 38 of 47 countries reported subsectors **F** (54%) and **P** (41%) of sector **N** with coverage of 95% and remaining 5%, accounted by 9 countries, do not report any sub-sectors

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[9] Currently 47 countries report LBS data. We thus deal with two types of estimations, one for 17 countries that started after 2013Q4 and another for remaining 17 countries that have not yet started reporting these data (countries with large cross-border positions in the latter group are China, Hong Kong SAR, Japan, Singapore and the United States).

[10] Seventeen countries do not report subsectors of P: Bahrain, Brazil, Chile, China, Curaçao, Finland, Greece, Hong Kong SAR, Japan, Jersey, Macao SAR, Mexico, Panama, Philippines, Singapore, Turkey and United States.

of sector **N**.[11] While the estimation of the remaining 5% into subsectors **F** and **P** could be done by various methods, a simple way is to use the proportional approach.[12] If this approach is adopted, the share of **F** and **P** would be 57% and 43% respectively. As shown in Graph 1 we estimate amounts from Q4 2011 (i.e. for a period when no information on subsectors was available) for all subsectors of non-banks in all counterparty countries (top right panel) and of which those in Portugal (bottom right panel). These estimates are based on aggregated data of all reporting countries using simple proportional approach, both for the aggregate of all counterparty countries and of which those in Portugal.[13]

I – Aggregate level estimations

When confidentiality for bilateral data restrictions arises, mirror data exercises can only be applied at an aggregate level. According to the LBS information each country can estimate its deposits abroad by using the reported information for the aggregate of 'all reporting countries' vis-à-vis sectors **F, P** and subsectors of **P** and in particular sector **H**, with possible alternatives.[14] This procedure provides estimated amounts for a given country at aggregate level in the presence of confidentiality restrictions. The consequence is that aggregate estimations are broad based, less precise and may not provide good results for distant historical quarters, nor to estimate bilateral positions. The gap in amounts between the estimated figure from 'all reporting countries' and that from the sum of leaf-level reported plus estimated amounts is narrowed down when the coverage for a counterparty country is high as in the latest quarters for Portugal (coverage more than 95%). One of the main consequences of using aggregate estimations is the bilateral asymmetries that will occur as the statistical estimations are not based on a country-by-country data.

II – Bilateral level estimations

In the cases where there is reported data on a bilateral basis by LBS reporting country vis-à-vis the domestic country, mirror data exercises are more effective and precise. The term 'domestic country' used below refers to the country of which we wish to estimate households' cross-border deposits. The following three scenarios are defined according to the available information for counterparty sectors **N**, **F**, **P** and **H**:[15]

[11] Of these 9 countries, Singapore comprises about 60%, Jersey and Bahrain each comprise about 15% and rest by another 6 countries (Brazil, Chile, Curaçao, Greece, Mexico and Panama).

[12] i.e. allocate 54/95 of 5% to sector **F** and 41/95 of 5% to sector **P**.

[13] This is done in two steps: (1) Sector F and P first estimated by proportional allocation of Sector X amounts (see footnote 13). (2) New unallocated sector **K** amounts, after estimating **P**, were allocated in the same way proportionally to sectors **C, G** and **H**.

[14] All countries do not yet report full breakdown of non-bank subsectors. Thus the sector-breakdown of aggregate positions by banks in 'all reporting countries' vis-à-vis individual counterparty countries are incomplete. We propose to proportionally allocate residual amounts to reportable subsectors (see footnotes 13 and 14). The average share for each reportable sub-sectors (i.e. after reallocating residual amounts) from the latest quarters are applied to sector N amounts for all previous quarters when none of the sub-sectors of **P** are available. An improved alternative is to use moving average or average from the latest 4 or 8 quarters and apply the share to reported sector N amounts.

[15] See footnote 13. We propose applying the same method for individual reporting countries to obtain better estimates not only for bilateral positions but also for total of 'all reporting countries' when re-aggregated.

1. Deposits placed by households (H) – liabilities of banks vis-à-vis sectors H and N are reported:

In this first scenario, households' deposits abroad correspond to the bilateral deposit liabilities of the counterpart reporting country to the domestic country. Such data available only from Q4 2013. If both sectors **P** and **H** are not reported, bilateral positions can be estimated backwards by applying in each quarter the weighted average[16] of the reported households sector (**H**) in the sector **N** to the non-banks sector (**N**) positions.

2. Deposits placed by households (H) – liabilities of banks vis-à-vis P amounts are reported prior to sector H:

In this second case, subsector **H** is reported at a later stage than sector **P**, we propose using information of **H** when available and estimating **H** positions for each of the non-reported quarter using, the average[17] weight of the households sector (**H**) in the total amount of sector **P** (from the quarters with reported data on sector **H**), which is more precise than using sector **N** mentioned above.

3. Deposits placed by households (H) – liabilities of banks vis-à-vis sector H are not reported for any quarters – we consider two different cases:

3.1 Liabilities of banks vis-à-vis sectors F and P are reported (but not subsectors of P):

We first examine if deposit liabilities of banks vis-à-vis sector **P** of the domestic country are reported. If reported, we apply estimation using available data of banks in other reporting countries to get an average value for sector **H** vis-à-vis the domestic country (i.e. we propose using average share of **H/P** from other reporting countries) and also estimate back-quarters as mentioned before in the second method.[18] If sector **P** amounts are not reported vis-à-vis the country, no estimate should be considered for subsector **H**.[19]

3.2 Liabilities of banks vis-à-vis sectors F and P are not reported (i.e. only sector N reported):

There is no mirror information regarding sector **F** and **P**. In this case, if deposit liabilities of banks to sector **N** are reported vis-à-vis the country, we propose applying average estimation for all quarters using available data of banks in other reporting countries to get value for sector **H** (eg use average share of **H/N**) and this is similar to the first method but uses (aggregated) reported data of banks in other countries.[20]

Finally, we do not propose any estimation procedures for the situations where liabilities of banks vis-à-vis sector **N** of the country are not reported (sector **N** value is either zero or missing).

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[16] Which can be a simple / weighted or moving average.

[17] Which can be a simple / weighted or moving average.

[18] For example, US reports sectors **F** and **P** but does not report subsectors of **P** for deposit liabilities. In this case, we examine if sector **P** vis-à-vis a given domestic/counterparty country (e.g. PT) is reported. If reported, we apply estimation using reported share from other countries vis-à-vis domestic country to get value for sector **H**. If sector **P** amounts are not reported, we don't do not estimate amounts for subsector **H**.

[19] If aggregate sector **P** does not exist, subsector **H** cannot exist.

[20] SG does not report sectors **F** and **P** vis-à-vis any country: If SG reports sector N amounts vis-à-vis PT, apply estimation using reported data of other countries to get value for sector **H**). Do not estimate in any other case.

4   Results

According to our findings for Q4 2018(Graph 1b) the non-bank financial institutions represent about 57 % (or $4,350 billion) of the total non-bank amount ($7,678 billion), and the non-financial sectors represent 43% (or $3,328 billion), similar to the reported amount (see Graph 1a or Table on page 3). The estimated breakdown suggests that 34% of total non-financial sectors (sector **P**) are households (sector **H**) whereas sector **C** and sector **G** correspond to 61% and 5% respectively. Graph1b shows that there are no unallocated amounts under the estimated method and that the share of household sector in the total of non-banks represents the highest estimated increase of 12.2% approximately (from reported 2.7% to estimated 14.9%) whereas the Non-financial corporations share increase 10.9% (from 15.6% to 26.5%). On the other hand, the government sector decreases from 1.1% reported share to 0.9%.

We chose Portugal as a domestic country to estimate households' cross border positions. We find that as of Q4 2018, 97.7% of deposit liabilities to non-banks ($12.9 billion) are reported with sector breakdown in to sector **F** ($2.6 billion, 20.4%) and sector **P** ($10 billion, 77.3%). In the total reported amount for sector **N**, the share of the unallocated amounts (sector **X** plus sector **K**) correspond to 6.9%. In addition, 72.7% of deposit liabilities to sector **P** are available with subsector breakdown (Graph 1c).[21] In addition, sector **H** comprises nearly $6.9 billion, 53.6% of reported amount for sector **P**, sector **C** represents 18.8% and sector **G** has almost a nil share. The estimated amounts show that Non-financial corporations share (Graph 1d) increases by 1.6% (from 18.8% to 20.5%) and Households from a reported share of 53.6% to an estimated of 58.3%.

Our results show that this estimation method appears consistent not only for counterparties in all countries but also for individual counterparty countries such as Portugal. The estimated shares/amounts for Portugal are expected to be close to the actual amounts because coverage of reporting is as high as 93.1% for non-financial sub-sectors. However, the simple proportional estimates could be improved by estimating sub-sectors for individual reporting countries and then using a simple/weighted average of the estimated shares from the reported data to estimate the bilateral positions of countries that do not report these subsectors. Further refinement of estimates backwards could be achieved using a four or eight quarter moving average and also test the robustness of our estimation by comparing with reported data when available.
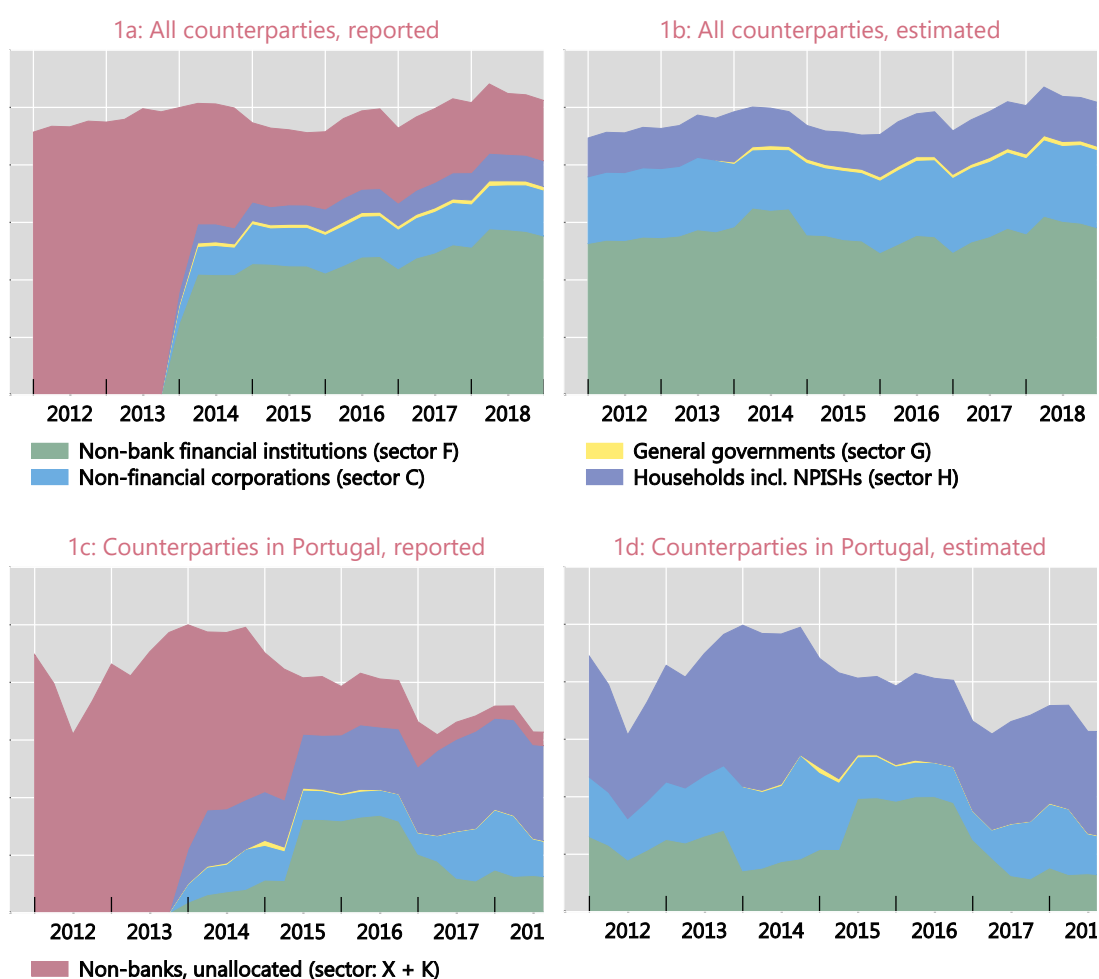
5   Discussion and Conclusion

We develop this methodological framework on uses of reported data, estimation of non-reported data and data gaps, aiming to provide users with more complete information. The detailed version of this work is in progress (at advanced stage) and will provide many more additional details that we could not include in this version for the conference due to limitation of length. It is needless to mention that the mirror data methodology we propose and have explored so far permits the validation of common data items across statistical domains and provides additional information. The effectiveness of these exercises depend on the availability of the information. We discuss

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[21] This unallocated share comes to 5.3% of total liabilities to non-banks (aggregate). As of Q4 2018, while 43 countries report liabilities to sector N of Portugal, 28 countries report cross-border deposit liabilities to sector **H** and the share of unallocated non-bank is only 7% non-bank.

methodological aspects and offer guidance on derivation of household assets abroad for individual countries. The Portuguese country-case would be beneficial for other reporting countries (some countries have already started adopting our approach that we shared).

A mirror data analysis ensures consistency and enhances statistical quality standards, which is crucial for economists, analysts and policy makers who explore this information. When these estimates are considered for both BoP/IIP and RoW financial accounts purposes, there is also a need to consider impacts on the other flows (exchange rate, price and volume changes). Furthermore, this approach can be seen as generic as it can be extended to the other sectors (in fact applied the estimation to sectors **F**, **P**, **C**, **G** and **H**).

Chart 1 • Assets (claims) of non-bank subsectors with banks abroad[a] | Amounts outstanding, in USD billion

1a: All counterparties, reported

1b: All counterparties, estimated

- Non-bank financial institutions (sector F)
- Non-financial corporations (sector C)
- General governments (sector G)
- Households incl. NPISHs (sector H)

1c: Counterparties in Portugal, reported

1d: Counterparties in Portugal, estimated

- Non-banks, unallocated (sector: X + K)

Note: (a) Use of mirror data on liabilities of banks to non-bank subsectors; see methodology on estimation and allocation of non-available breakdown including unallocated sector amounts.

Sources: BIS locational banking statistics (by residence); authors' calculations.

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Annex: Statistical formulation of scenarios under method II

The following scenarios are defined according to the available/reported information on counterparty sector **N**, **F**, **P** and **H**:[22]

1. **Deposits placed with banks by households** (H) **of a country** – liabilities of banks vis-à-vis sectors **H** and **N** are reported [available since Q4 2013]: We use reported data without any change.[23] If banks in country i report **H** sector vis-à-vis country j, country j should use directly the information reported from country i for its sector **H** for all reported periods:

    $H_t^{j,i}(\text{asset}) = H_t^{i,j}(liabilities); t = 1,2,...,n$ stands for periods on a quarterly basis (1 is the latest period and n the first reporting quarter).

    For the non-reported periods (prior to Q4 2013), the estimation procedure follows two steps:

    a) Calculate the (simple/weighted/moving) average of the Households weight in the Non-banks sector (**N**) for the available periods ($\bar{H}_{n,N}$):

    $$\bar{H}_{n,N}^{i,j} = \frac{\sum_{t=1}^{n} \frac{H_t^{i,j}}{N_t^{i,j}}}{n}$$

    b) Apply the average in a. to the Non-banks sector **N** for periods where no information is available ($\hat{H}_{i,t+k}$):

    $$\hat{H}_{t+k}^{j,i}(asset) = N_{t+k}^{i,j} \times \bar{H}_{n,N}^{i,j}(liabilities) \; ; t = n \, and \, k = 1,2,...,m.$$

2. **Deposits placed with banks by households** (H) **of a country** – liabilities of banks vis-à-vis **P** amounts are reported prior to sector **H** [ie sector **H** available from quarter later than Q4 2013]: We use reported data from available quarters and apply estimation method such as 1a. (simple/weighted/moving average from reported data of sector **H**) to earlier periods back to Q4 2013.[24] For quarters prior to Q4 2013, apply 1b. including estimated data up to Q4 2013.

    However, if for certain periods, country i reports sector **P** but no subsectors of **P** vis-à-vis country j, we consider the following approach:

    a) Calculate the average over reported 'n' quarters of the households (**H**) weight to sector **P** for the reporting country 'i' vis-à-vis country j ($\bar{H}_{n,P}^{i,j}$)

    $$\bar{H}_{n,P}^{i,j} = \frac{\sum_{c=1}^{n} \frac{H_c^{i,j}}{P_c^{i,j}}}{n}$$

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[22] In cases when subsectors are partially reported, we proportionally allocate residual amounts to reportable subsectors (eg N= F+P+X where F>0, P>0 and X>0, amount in X are proportionally allocated to F and P. The same rule is adopted for residual amounts in sector K)

[23] For example, Austria reports deposit liabilities vis-a-vis sector H of Portugal (PT) since Q4 2013.

[24] For example, Spain reports deposits liabilities vis-à-vis sector H of PT from Q1 2017.

b) Apply $\bar{H}_{n,P}^{i,j}$ to the reported amount of Non-financial sector **P** for c periods:

$$\bar{H}_t^{j,i}(asset) = P_t \, X \, \bar{H}_{n,P}^{i,j} \text{ (liabilities); } t = 1,2,\dots,c \text{ stands for periods with sector } \mathbf{P} \text{ without its subsector.}$$

c) For the non-reported periods, we adopt 1a and 1b. In other words, calculate the average for the estimated periods of the weight of the estimated Household amounts on the Non-bank sector, 'N', ($\bar{\bar{H}}_N$):

$$\bar{\bar{H}}_N = \frac{\sum_{t=1}^n \frac{\widehat{H}_t}{N_t}}{n}$$

d) Apply the average in c. to the Non-banks sector **N** for the periods where no information is available ($\bar{\bar{H}}_{t+k}$):

$$\bar{\bar{H}}_{t+k}(assets) = \bar{\bar{H}}_N \times N_{t+k} \text{ (liabilities); where } t = n \text{ and } k = 1,2,\dots,m.$$

3. **Deposits placed with banks by households** (H) **of a country** – liabilities of banks vis-à-vis sector H are not reported for any quarters - we consider two different cases:

   a) **Case 1**: A country reports sectors **F** and **P** but does not at all report subsectors of **P** for deposits liabilities. We first examine if sector **P** vis-à-vis a given counterparty country is reported. If it is reported, we apply estimation (simple/weighted/moving average) using available data of other reporting countries to get an average value for sector **H** (e.g. use share **H/P**, from other countries including estimated data proposed in 2a above).[25] If sector **P** amounts are not reported vis-à-vis a given counterparty country, don't estimate amounts for subsector **H**.[26]

   b) **Case 2**: A country does not report sector **F** and **P** vis-à-vis any country. In this case, if it reports sector **N** amounts vis-à-vis the counterparty country, we propose to apply estimation (simple/weighted/moving average) for all quarters using available data of other reporting countries to get value for sector **H** (e.g. use share **H/N** from other countries vis-à-vis given counterparty country including estimated data proposed in 1a and 1b). If it is not the case, do not estimate.[27]

Finally, we do not propose any estimation procedure for the situations where countries do not report aggregate the **N** sector vis-à-vis country i.

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[25] For example, US reports sectors **F** and **P** but does not report subsectors of P (C, G and H) for deposit liabilities. In this case, we examine if sector **P** vis-à-vis a given domestic/counterparty country (e.g. PT) is reported. If US reported, we apply estimation using reported data of other countries to get value for sector **H**. If sector **P** amounts are not reported, we do not estimate amounts for subsector **H**.

[26] If aggregate sector **P** does not exist, subsector H cannot exist.

[27] SG does not report sectors **F** and **P** vis-à-vis any country: If SG reports sector N amounts, say vis-à-vis PT, apply estimation using reported data of other countries vis-à-vis PT to obtain value for sector H). If SG does not report sector N amounts vis-à-vis PT, sector H is nil or zero.