

# **Task Force on Portfolio Investment Income**

## **Supplementary document 3: empirical evidence on aggregate versus security-by-security recording**

### **Introduction**

1. This document aims at carrying out a comparison between two distinct approaches which may be used for the calculation of income on securities:

(i) *Security-by-security approach.* This approach entails combining resident investors' holdings of foreign securities and non-resident holdings of domestic securities (by individual securities) with the information available (e.g. in a master file database) regarding the interest rate associated to each individual security.

(ii) *Aggregate approach.* This approach entails combining portfolio investment stocks stratified by categories of securities (determined by the type of securities, original maturity, market of issuance, economic sector of the issuer, etc.) with benchmark yields

2. Of course, there are other possibilities to compile income figures on an accruals basis. For instance, an other alternative is receiving the final information as directly provided by reporters, who would then be requested to perform themselves the calculation of accruals and split the results by type of securities, counterpart country, and any other required statistical classifications. Normally this approach relies on the fact that resident issuers/investors have direct access to the whole of the information which is necessary to carry out these calculations, e.g. individual securities and the associated coupon. Therefore, respondents would most probably follow the first approach in their internal calculations, even though the final provision of information to the b.o.p. compiler often takes place on an aggregated basis. The caveats of this approach with respect to calculations performed by the b.o.p. compiler security-by-security are well known (e.g. less checking procedures available, dependence on respondents' judgement and interest, use of accounting rules rather than statistical methods, etc.), but this choice has not directly been considered by the subgroup.

3. This note is in three sections. The first one briefly summarises pros and cons of security-by-security versus aggregated reporting in very general terms (i.e. not specifically for the calculation of income). Section two presents advantages and disadvantages of both approaches for the calculation of income, from the individual countries' perspective in terms of e.g. resources for both respondents and compilers, availability of information on (domestic and foreign) individual securities/associated coupon, accuracy of the results, etc. Section three introduces the results of two empirical exercises carried out in Spain and the UK which aimed at assessing the differences in the outcome (i.e. income

figures) produced under both approaches (i.e. aggregate and security-by-security). Section four concludes.

## **Pros and cons of a security-by-security versus an aggregated reporting: general overview**

4. This section briefly recalls advantages and disadvantages of recording information on portfolio investment flows and stocks and income figures using two different approaches: on the one hand, by individual securities and, on the other hand, by aggregate types of securities. There are no new ideas in this section, which is basically a summary of the most salient points contained in the final report of the Task Force on Portfolio Investment Collection Systems. For this reason, this section is intentionally kept short. Additionally, the specific features of income compilation compared with that of portfolio investment might be worth a warning as regards the wide-ranging validity of all points mentioned in this section.

### ***Advantages of the security-by-security approach:***

5. Using the security-by-security approach, the statistical breakdowns are calculated in a standardised way by the compiler. This avoids potential miscalculation or the use of non-generalised aggregation procedures by the different reporting entities, with clear advantages in terms of quality and homogeneity.<sup>1</sup>

6. The security-by-security approach increases the quality of the data as it allows additional checking procedures and greater accuracy in the calculation of stock and/or flow data. For example: it may enable the identification of double-counting among custodians and sub-custodians; it allows reconciliation of flows and stocks at a security level and improves bilateral geographical comparisons of data; it allows detailed comparisons of outstanding amounts and reported securities deposits indicating gaps or double reporting.

7. Another feature of the security-by-security approach is the greater flexibility to take care of new/additional output requirements (for example change in the geographical zones, in the instrument breakdown or a split by currency) and to easily obtain consistent time series. This is most often possible, without additional requests to the reporting entities, by means of adaptations in the aggregation procedures managed by the compiler.

8. The availability of more detailed data allows synergies with other statistics such as financial account statistics, monetary statistics, securities issues statistics.

9. Data on a security-by-security basis also allow a much more precise calculation of accrued interest, at the level of individual securities.

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<sup>1</sup> The quality of the results (in terms of e.g. accuracy, consistency, etc.) would be significantly enhanced with the availability of the Centralised Securities Database.

10. Elaborating further on this argument, security-by-security reporting would reduce the amount of details (in terms of breakdowns) to be reported by respondents, with a consequent reduction in their reporting burden. The reduction of details is strictly connected to the existence of a securities database, available to the compiler. It also allows a more efficient dialogue with the respondents.

***Disadvantages of the security-by-security approach:***

11. The likely complexity in the internal procedures to be run by the b.o.p. compiler may imply a deterioration in timeliness for the provision of the final product.

12. The compiler has to bear the cost of buying/managing a securities database, of developing compatible software in order to receive the information from the respondents and to develop/update the aggregation procedures. Moreover, in a security-by-security system the volume of information recorded and its treatment by the compiler implies an adequate data processing system (in terms of capacity and complexity). Also from a human resources point of view the security-by-security reporting requires specifically skilled operators (staff well trained for properly working within the highly automated system and with an additional expertise in financial markets and instruments). It must also be stressed though that the amortisation of the initial investment for the SDB, procedures and employees' training can be considered to be rapid as the system is usually very intensively used.

13. Especially for very short-term securities or other less liquid instruments (e.g. private placements or mutual funds' units in some countries), no unique and internationally standardised identifier (such as an ISIN code) might be available, at the time the respondent is asked to report the data. Moreover there is the problem of private placements for which the issuer does not care to retrieve an ISIN code from the national numbering agency. Consequently there might be the need to use generic codes and/or employ some supplementary aggregated reporting. According to recent experience, the assignment of ISIN codes is fast becoming more widespread, although the problem of lack of ISIN codes for e.g. private placement remains.

***Summary***

14. In conclusion, the choice of the security-by-security reporting means essentially to translate the bigger part of the costs to the compiler. The advantages in terms of quality, standardisation and of synergies with other statistics are very relevant. The amortisation of the initial investment (securities database, procedures, etc.) by the compiler can be considered rapid if the system is very intensively used. Because of the wide range of the reports' design (from paper form to electronic data) a compiler is currently obliged to run a professional data processing system in which adding new fields imply increasing costs. The introduction of security-by-security techniques would imply that the marginal costs of additional breakdowns would diminish. The availability of a CSDB would largely improve the degree of standardisation and harmonisation.

## **Advantages and disadvantages of both approaches for the compilation of income figures from the individual countries' perspective**

### *Spain*

15. The decision on the most suitable approach to compile income figures should be taken under the assumption that, in principle, the best results are obtained using as much information as possible.

16. Regarding the collection of income figures using aggregate stocks of securities and benchmark yields, a first difficulty is that it is not easy to choose the most appropriate benchmark yield and the results are quite different according to the interest rate chosen.<sup>2</sup> This choice may be crucial in obtaining results closer to the target (which may be represented by the product obtained using the security-by-security approach). Unfortunately, according to the results got through the empirical exercise carried out in Spain, those benchmark yields that would enable results closer to the target are not always the ones which are publicly available (i.e. pure market averages).

17. This issue may be somehow connected with the controversy debtor/acquisition/creditor approach, since market yields can only be used to the extent that the compiler wants to stick to the creditor approach. The conclusion would be that it might be difficult to choose the most appropriate yield for the accrued income on portfolio investment liabilities.

18. These problems are even more apparent for the calculation of accrued income on portfolio investment assets, due to the difficulties to access representative benchmark yields in foreign markets. However, the option of calculating income by individual securities would only alleviate the problem to the extent that the necessary information could be available on a centralised basis, e.g. through a Centralised Security Database.

19. One additional factor that could be worth considering concerns the possible asymmetries in the compilation of assets and liabilities, with obvious implications for the calculation of the euro area aggregates. If the calculation procedure is not consistent (i.e. either aggregated or security by security) between the country of the issuer and the country of the investor, the results can be very different, even if the same interest rate (in terms of nominal or market interest rate) is used, as non-resident investments do not necessarily have to be homogeneously distributed among all domestic securities (i.e. the weights implicit in any average could not necessarily be representative of the specific securities which are most attractive to foreign investors).<sup>3</sup>

20. As regards portfolio investment liabilities, the issuer country will most probably have access to very extensive information about domestic issues. But considering portfolio investment assets, taking a decision on the most appropriate level of aggregation is not an easy task. In addition, each country may have its own criteria to decide on aggregate levels, relevant market yields, etc. This fact

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<sup>2</sup> See the results of the empirical exercise carried out in Spain, presented in the following section.

<sup>3</sup> Please refer again to the results of the empirical exercise.

would be at the origin of problems of comparability across countries and, what may be more worrying, asymmetries in the calculation of the euro area aggregates.

21. Both problems mentioned for the correct application of the aggregate approach (which, though not ideal, could still be an option to some compilers due to the above-mentioned arguments of costs, timeliness, resources, etc.), i.e. choosing the appropriate interest rate and applying them to the appropriate categories of holdings, could only be solved having access to security-by-security stocks and detailed information on interest rates also security by security. This requires the availability of a securities database, and only if this database were a “centralised” one, all countries could theoretically use the same interest rates for each security.

22. To conclude, with the objective of ensuring that the calculation of accrued income for portfolio investment is performed in a homogeneous way by all countries, and the results obtained are accurate enough, the security-by-security approach is the most appropriate. The correct application of this method requires the availability of the information contained in a Centralised Securities Database.

## ***UK***

23. This note will discuss some issues relating to aggregate and security-by-security collection of portfolio investment income data in the UK. Conclusions on this topic will largely be determined by the feasibility studies commissioned as a result of the TF-PICS report. The Bank of England is conducting a study into security-by-security reporting and the ONS is investigating the collection of monthly aggregate flows and quarterly aggregate stocks. This means that many of the issues discussed below are outside the scope of the TF-PII. However, these arguments are still relevant to the choice of collection system for portfolio investment income, flows and levels from the UK’s perspective.

## ***Costs***

24. The main issue surrounding the set-up of a security-by-security collection system is the cost. There would have to be a considerable investment in technology, time, resources and training. Obviously, most of these are up-front costs. However, there would still be costs in terms of regular data production due to the sheer number of securities traded in London.<sup>4</sup> Discussions up to now have focussed on the fact that a high volume of securities transactions will make the collection of flows particularly difficult. Indeed, the UK is only considering the collection of stock on a security-by-security basis in the feasibility study. However, there would also be similar problems if an attempt was made to calculate the income accrued on each individual security.

25. There would also be non-monetary costs associated with moving from an aggregate collection system to security-by-security approach. There is a great deal of knowledge and information in

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<sup>4</sup> One Global Custodian estimated that around one million securities transactions were recorded on its books in one month. Not all of these would be UK balance of payments transactions, but the figure provided is a useful guide to the potential numbers involved. In the UK we would probably need to collect data from around 10 custodians in order to obtain a large enough sample.

current systems that would potentially be lost. Furthermore, there may be costs to the users of the data if there are significant breaks in series after the introduction of a new collection system.

26. Conversely, it is possible that the costs of aggregate reporting may fall in the future. Various initiatives, such as global reporting and electronic links to accounting software (e.g. XML and XBRL) may reduce the compliance burden and overall costs of data collection in a country.

### ***Data quality***

27. A second major issue to be considered is the quality of portfolio investment income data that could be collected through a security-by-security system. In particular, there are two instances where data may be attributed to portfolio investment income incorrectly. These problems are not confined to the UK, but the points are still relevant. First, it is unlikely that direct investment income can be collected directly from a security-by-security system at present. These data would probably have to be collected separately. This is a particularly important aspect of the UK balance of payments accounts, due to the large number of non-resident owned branches and subsidiaries operating in the UK.

28. A second problem is the collection of income on repos. Again it is not clear how securities traded in their own right can be distinguished from securities that are used as collateral in repo and reverse repo transactions. This means that income on securities used in repo transactions would be incorrectly attributed to the cash lender in the repo, rather than the actual owner of the security. However, this is less of an issue with investment income than with the financial account. A sub-group of the TF-PICS concluded that although repos do have a large impact on the flows, there is a much lesser effect on the levels (income data would be derived from levels). Furthermore, this issue could potentially be resolvable as US custodians may soon have to separately identify repo transactions for statistical purposes.<sup>5</sup>

29. Another point to raise is sampling. The UK's feasibility study is considering the collection of security-by-security data from around ten different custodians. These data would then be grossed-up to the whole population. The current aggregate reporting system samples companies from different sectors in the economy using a stratified approach (i.e. data are collected from a stratified sample of securities dealers, a stratified sample of pension funds, etc.). The issue is whether a sample of the largest custodians, representing different sectors of the economy, would provide data that were of similar quality to data collected using a stratified sample from several economic sectors. However, this issue could be addressed if data were collected from end-investors on a security-by-security basis, rather than custodians. The ONS should be able to assess whether end-investors would be able to send security-by-security information after their proposed survey of end-investors (part of the feasibility study following the conclusions of the TF-PICS).

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<sup>5</sup> Recent technological advancement in the US means that it is now possible to separately identify repo transactions. It is likely that the US authorities will ask custodians to provide them with these data.

30. One final point linked to data quality is the briefing provided to users alongside the figures. Stories and anecdotal evidence can add real value to the data and can help to validate the figures. This information is best collected directly from the investor and thus most easily available from aggregate reporting systems. It would be very difficult to obtain stories from custodians as they would not necessarily have that information. Furthermore, for confidentiality reasons, custodians may not be able to provide the information on their clients that would allow compilers to contact the companies directly.

### ***Data coverage***

31. The third major issue is the coverage of data available. Custodians in the UK have stated that they will not be able to provide the sector of the resident holding the securities. This is because they do not hold information on the industrial classification of their clients, as there is no need to do so for business reasons. This means that there would be a gap in the data required in BPM5. Furthermore, the data source for the UK's rest of world sector would also be missing and, potentially, a separate collection system would be required for national accounts. One of the strengths of the UK's current aggregate system is that the data used in balance of payments statistics are also used in the rest of the world sector in the national accounts. Again, this issue could potentially be resolved if end-investors were able to supply security-by-security data (see paragraph 7 above).

32. Finally, custodians would only supply data on the UK's assets (holdings of securities issued by non-residents). Data for UK liabilities would presumably be compiled using either counterpart asset data collected by other countries (perhaps using the results of the IMF CPIS, although clearly this would only work correctly if all countries that invest in the UK were able to supply data), or by using a residual method (as is currently employed in aggregate reporting systems).

## **Empirical exercises**

### ***Spain***

#### ***Introduction***

33. This empirical exercise aims at exploring whether there are significant differences between two distinct ways of compiling portfolio investment income, i.e. security by security and aggregating securities, respectively.

#### ***Methodology applied***

34. The data used in this exercise have been taken from the 2001 stock of non-resident holdings of Spanish euro-denominated bonds and notes issued by the General Government, i.e. only portfolio investment liabilities have been considered. The main reason to use these data is the availability of two pieces of information which are basic for the analysis: (i) daily balance of securities owned by non residents and broken down by issue; and (ii) interest rates associated to each issue.

35. These two pieces of information should enable the calculation of accrued income security-by-security. The Entry-Book Department of the Banco de España provides the first piece of information (non-resident holdings of these securities).

#### ***First approach: accrued income security by security***

36. The amount of income corresponding to each individual issue is calculated on a daily basis by applying the debtor principle as the product of daily stocks of each security (in nominal amounts) times the nominal interest rate.

37. Subsequently, the daily results corresponding to individual issues are aggregated to obtain the total daily-accrued income. The monthly-accrued income is obtained by cumulating the daily results over each month. The outcome is, thus, obtained following a security-by-security approach.

38. This is the procedure used in the Spanish Balance of Payments to calculate the accrued interest for these securities.

#### ***Second approach: accrued income of a group of aggregated securities***

39. First of all, the daily stocks of non-resident holdings of Spanish euro-denominated bonds and notes issued by the General Government have been aggregated for each month in 2001 (see column 2, “*General government bonds and notes*”). Secondly, the monthly results were divided by the number of days of the corresponding month to obtain a monthly average based on daily stocks (see column 4 “*Monthly average balance*”). The final result consists of total amounts of outstanding securities in hands of non-resident investors without any further detail. The total is the same as in the calculation security by security.



40. The product of the monthly average balance of non-resident holdings of Spanish euro-denominated bonds and notes issued by the General Government times the appropriate benchmark yield would be the accrued income for that specific group of aggregated securities. The key point would be the selection of the appropriate benchmark yield.

41. In this exercise, three different benchmark yields have been used:

- The first one is a market average yield of issues with a maturity over two years (table I),
- the second one is a market average yield of issues with a maturity over four years (table II),
- and the third one is an interest rate calculated as an average of the nominal yields (nominal coupon paid) of each issue weighted by their circulation balance (table III).

42. It is important to bear in mind that the calculations applied for the Spanish Balance of Payments are based on nominal interest rates and performed security-by-security. The first two interest rates used above are publicly available in the Banco de España Monthly Bulletin, but they are not consistent with the ones used for the official series (i.e. nominal interest rates). For the third one, the interest rates used in both calculations (aggregate and sec-by-sec) would be consistent (i.e. nominal yields), but, as in the case of the other two yields, some discrepancies occur due to the different approaches followed.

43. Therefore, at the time of comparing the results of the aggregate approach using the two first (market) benchmark yields and those obtained through the security-by-security approach, there might be differences caused by two factors:

- (i) the interest rate applied, i.e. nominal versus market yields
- (ii) the calculation method, i.e. aggregate versus security by security

44. As mentioned above, in the third case the interest rate applied is conceptually the same as in the security-by-security calculation. Therefore, the differences are supposed to be caused only by the second factor (calculation method). However, it is important to bear in mind that this average nominal interest rates used for the calculations are not publicly available, as it can only be obtained using internally-restricted information from the Entry-Book Department of the Banco de España, which is the Spanish central depository for these securities. Therefore, external users do not have access to this third average nominal yield, and only the yields used in the first and second examples could be used under an aggregate approach.

45. The three yields have been calculated by applying the formula of the compound interest <sup>6</sup> to the yearly interest rates (the only available ones).

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<sup>6</sup> The formula of the compound interest is the following:  $(1+i)^{12} = (1+I)$ , where  $i$  is the monthly interest rate and  $I$  the yearly interest rate

46. Once the accrued income for all months in 2001 is calculated applying both methods (aggregated, on the basis of the three different yields, and security by security), the next step is to compare the results. The underlying assumption is that the accrued income calculated security by security is the most accurate. Therefore, it is sought whether the accrued income calculated for a group of aggregated securities is similar to the one calculated sec-by-sec, for the three yields applied.

### *Results of the empirical exercise*

47. Taking a look at the results of applying the three (aggregate) yields, they are totally different. In the first example, i.e. using a market average yield of issues with maturity over two years, the result differs from the accrued income calculated security by security, and the differences are not equal for all months of 2001, being sometimes positive and sometimes negative (see table I).

TABLE I

**EMPIRICAL EXERCISE  
ACCRUED INCOME SECURITY BY SECURITY VERSUS A GROUP OF AGGREGATED SECURITIES**

(USING AN AVERAGE YIELD OF ISSUES WITH MATURITY OVER TWO YEARS)

(EUR thousands)

| 1            | 2                                | 3              | 4                       | 5                     | 6                      | 7                          | 8                           | 9           |
|--------------|----------------------------------|----------------|-------------------------|-----------------------|------------------------|----------------------------|-----------------------------|-------------|
| MONTH (2001) | GENERAL GOVERNMENT BONDS & NOTES | NUMBER OF DAYS | MONTHLY AVERAGE BALANCE | YEARLY INTEREST RATES | MONTHLY INTEREST RATES | ACCRUED INCOME "AGGREGATE" | ACCRUED INCOME "SEC-BY-SEC" | DIFFERENCES |
| JANUARY      | 2,899,258,793                    | 31             | 93,524,477              | 4.978                 | 0.004056591            | 379,391                    | 406,940                     | -27,549     |
| FEBRUARY     | 2,601,469,597                    | 28             | 92,909,628              | 4.994                 | 0.004069342            | 378,081                    | 368,232                     | 9,849       |
| MARCH        | 2,924,436,814                    | 31             | 94,336,671              | 4.902                 | 0.003995996            | 376,969                    | 395,765                     | -18,796     |
| APRIL        | 2,921,141,450                    | 30             | 97,371,382              | 4.928                 | 0.00401673             | 391,115                    | 392,892                     | -1,777      |
| MAY          | 2,949,178,845                    | 31             | 95,134,801              | 5.079                 | 0.004137056            | 393,578                    | 392,943                     | 635         |
| JUNE         | 2,961,393,826                    | 30             | 98,713,128              | 5.091                 | 0.004146611            | 409,325                    | 383,244                     | 26,081      |
| JULY         | 3,147,351,517                    | 31             | 101,527,468             | 5.071                 | 0.004130685            | 419,378                    | 398,601                     | 20,777      |
| AUGUST       | 3,152,906,772                    | 31             | 101,706,670             | 4.961                 | 0.00404304             | 411,204                    | 415,353                     | -4,149      |
| SEPTEMBER    | 3,110,585,885                    | 30             | 103,686,196             | 4.829                 | 0.003937755            | 408,291                    | 402,624                     | 5,667       |
| OCTOBER      | 3,273,909,347                    | 31             | 105,609,979             | 4.666                 | 0.003807576            | 402,118                    | 425,052                     | -22,934     |
| NOVEMBER     | 3,170,636,522                    | 30             | 105,687,884             | 4.458                 | 0.003641187            | 384,829                    | 457,617                     | -72,788     |
| DECEMBER     | 3,244,102,108                    | 31             | 104,648,455             | 4.742                 | 0.003868296            | 404,811                    | 469,817                     | -65,006     |
| TOTAL        |                                  |                |                         |                       |                        | 4,759,090                  | 4,909,080                   | -149,990    |

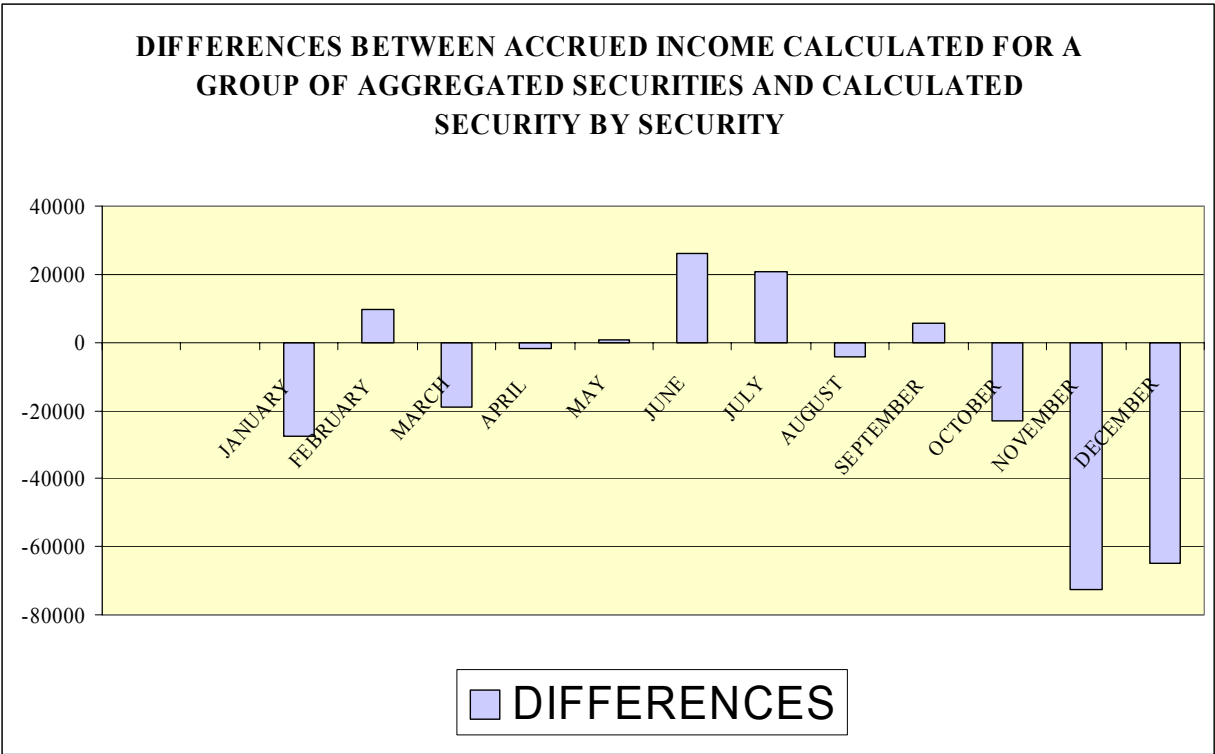
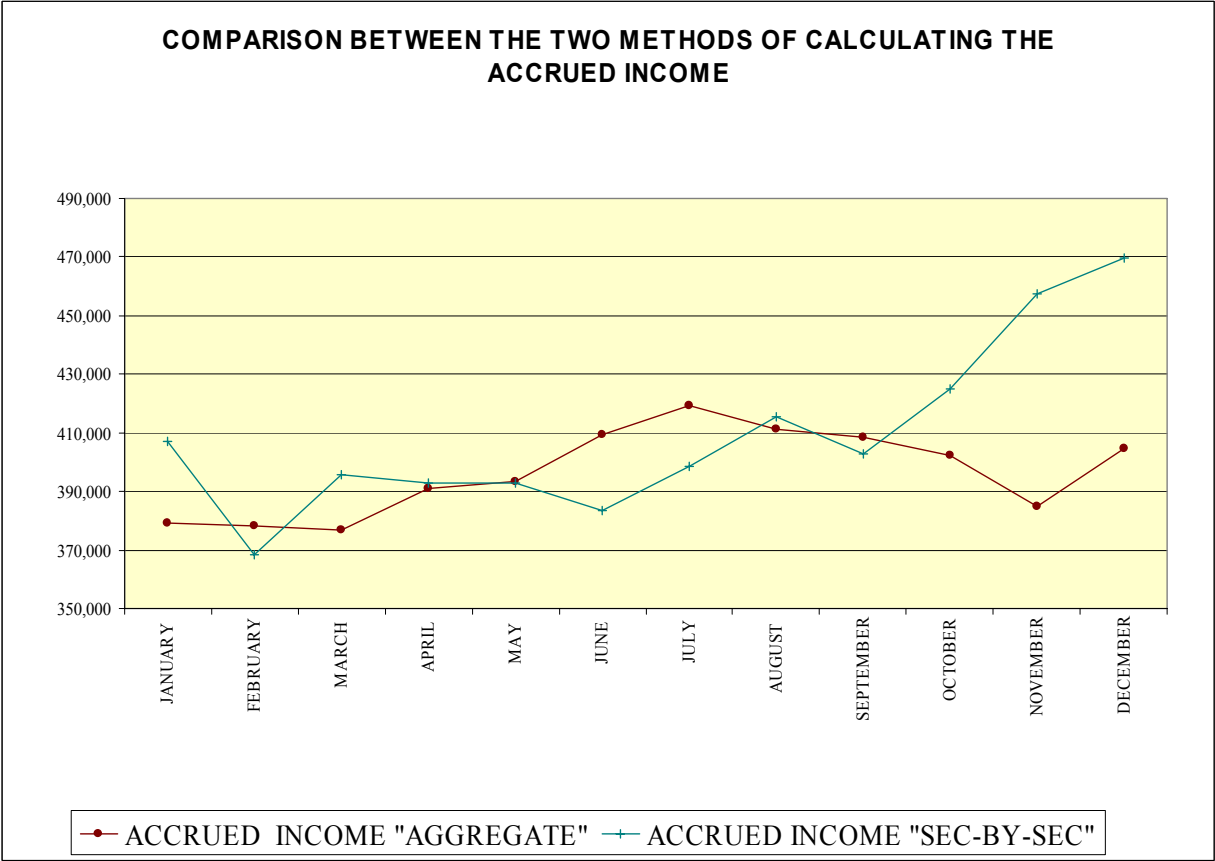
2 GENERAL GOVERNMENT BONDS AND NOTES= calculated adding the daily stocks of euro denominated bonds and notes issued by the General Government and owned by non residents(nominal amounts)

4 MONTHLY AVERAGE BALANCE= column 2 divided into column 3

6 MONTHLY INTEREST RATES= calculated applying to column 5 the formula of the compound interest

7 ACCRUED INCOME "AGGREGATE"= column 4 multiplied by column 6

9 DIFFERENCES= column 7 less column 8



48. The results of applying the second average yield (market yield of issues with maturity over

four years) to the “aggregated” average monthly balance of securities are more similar to the accrued income calculated security-by-security. This could also be observed in the column of “Differences”. The amounts of this column are smaller than in the first example. Although the results are better than applying a market average yield of issues with maturity over two years, they are not good enough. The differences are still sometimes positive and sometimes negative and very different for all the months of 2001 (table II).

**TABLE II**

**EMPIRICAL EXERCISE  
ACCRUED INCOME SECURITY BY SECURITY VERSUS A GROUP OF AGGREGATED SECURITIES  
(USING AN AVERAGE YIELD OF ISSUES WITH MATURITY OVER FOUR YEARS)**

(EUR thousands)

| 1            | 2                                | 3              | 4                       | 5                     | 6                      | 7                          | 8                           | 9           |
|--------------|----------------------------------|----------------|-------------------------|-----------------------|------------------------|----------------------------|-----------------------------|-------------|
| MONTH (2001) | GENERAL GOVERNMENT BONDS & NOTES | NUMBER OF DAYS | MONTHLY AVERAGE BALANCE | YEARLY INTEREST RATES | MONTHLY INTEREST RATES | ACCRUED INCOME "AGGREGATE" | ACCRUED INCOME "SEC-BY-SEC" | DIFFERENCES |
| JANUARY      | 2,899,258,793                    | 31             | 93,524,477              | 5.096                 | 0.004150593            | 388,182                    | 406,940                     | -18,758     |
| FEBRUARY     | 2,601,469,597                    | 28             | 92,909,628              | 5.075                 | 0.004133871            | 384,076                    | 368,232                     | 15,844      |
| MARCH        | 2,924,436,814                    | 31             | 94,336,671              | 5.003                 | 0.004076514            | 384,565                    | 395,765                     | -11,200     |
| APRIL        | 2,921,141,450                    | 30             | 97,371,382              | 5.031                 | 0.004098824            | 399,108                    | 392,892                     | 6,216       |
| MAY          | 2,949,178,845                    | 31             | 95,134,801              | 5.214                 | 0.004244498            | 403,799                    | 392,943                     | 10,856      |
| JUNE         | 2,961,393,826                    | 30             | 98,713,128              | 5.222                 | 0.004250861            | 419,616                    | 383,244                     | 36,372      |
| JULY         | 3,147,351,517                    | 31             | 101,527,468             | 5.249                 | 0.004272333            | 433,759                    | 398,601                     | 35,158      |
| AUGUST       | 3,152,906,772                    | 31             | 101,706,670             | 5.135                 | 0.00418164             | 425,301                    | 415,353                     | 9,948       |
| SEPTEMBER    | 3,110,585,885                    | 30             | 103,686,196             | 5.085                 | 0.004141834            | 429,451                    | 402,624                     | 26,827      |
| OCTOBER      | 3,273,909,347                    | 31             | 105,609,979             | 4.842                 | 0.003948129            | 416,962                    | 425,052                     | -8,090      |
| NOVEMBER     | 3,170,636,522                    | 30             | 105,687,884             | 4.669                 | 0.003809973            | 402,668                    | 457,617                     | -54,949     |
| DECEMBER     | 3,244,102,108                    | 31             | 104,648,455             | 4.928                 | 0.00401673             | 420,345                    | 469,817                     | -49,472     |
| TOTAL        |                                  |                |                         |                       |                        | 4,907,832                  | 4,909,080                   | -1,248      |

2 GENERAL GOVERNMENT BONDS AND NOTES= calculated adding the daily stocks of euro denominated bonds and notes issued by the General Government and owned by non residents(nominal amounts)

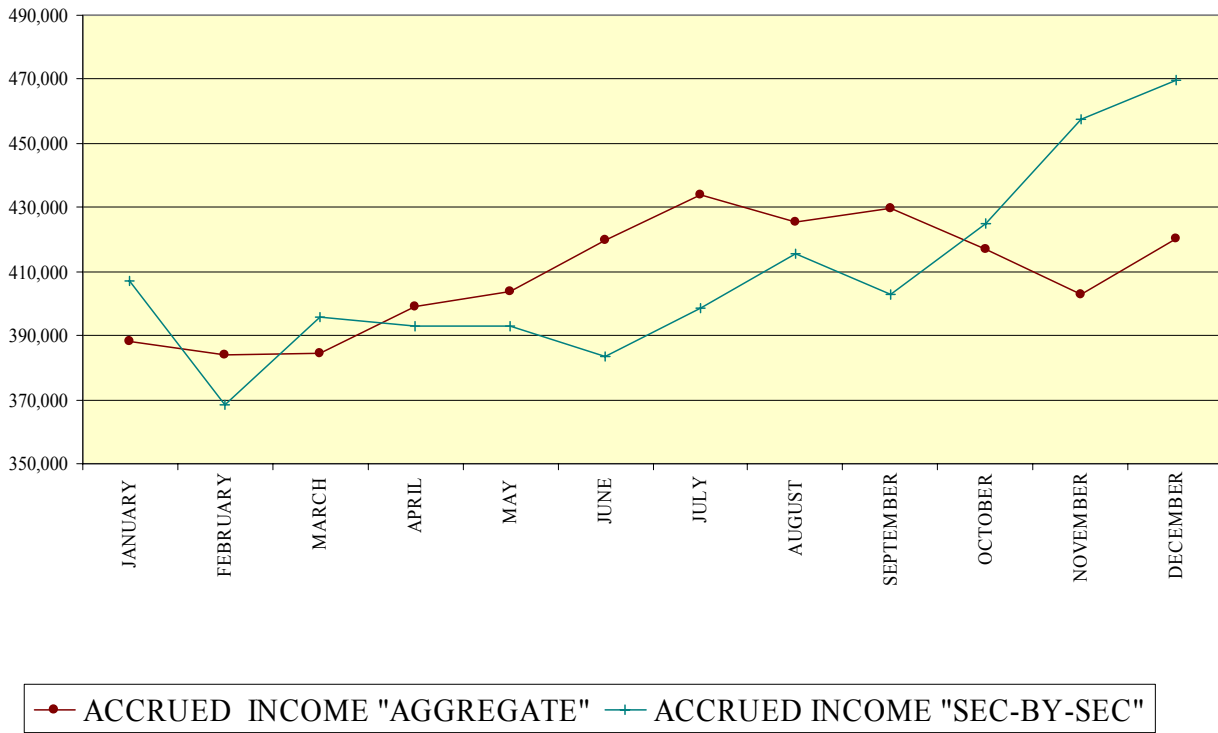
4 MONTHLY AVERAGE BALANCE= column 2 divided into column 3

6 MONTHLY INTEREST RATES= calculated applying to column 5 the formula of the compound interest

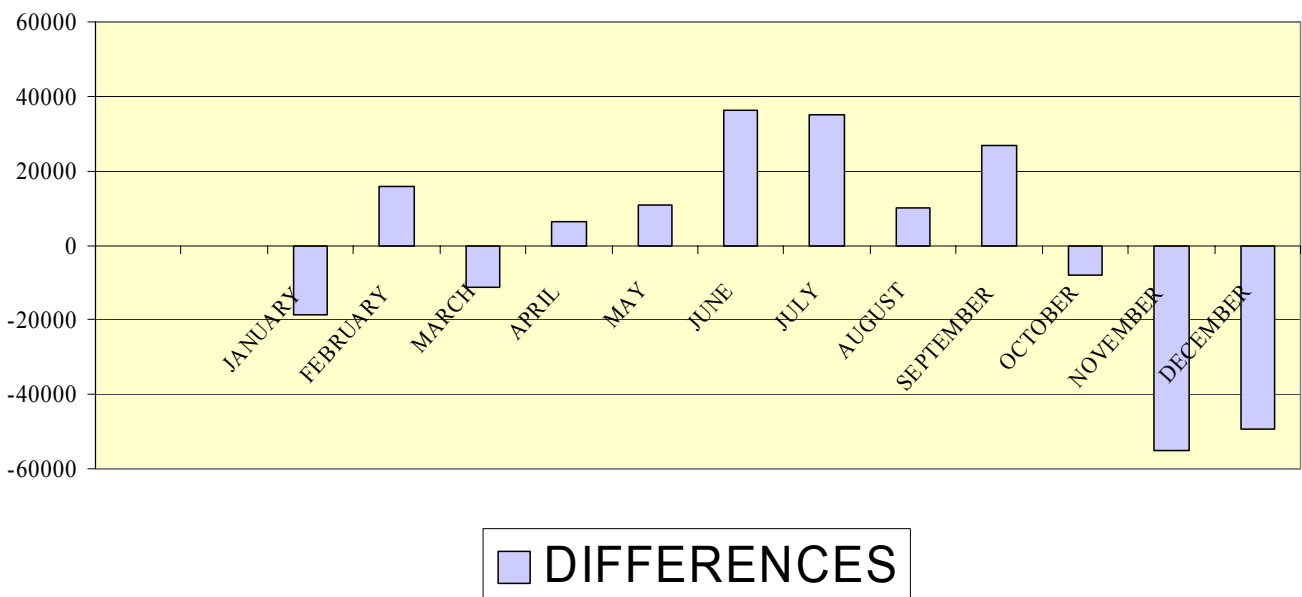
7 ACCRUED INCOME "AGGREGATE"= column 4 multiplied by column 6

9 DIFFERENCES= column 7 less column 8

**COMPARISON BETWEEN THE TWO METHODS OF CALCULATING THE ACCRUED INCOME**



**DIFFERENCES BETWEEN ACCRUED INCOME CALCULATED FOR A GROUP OF AGGREGATED SECURITIES AND CALCULATED SECURITY BY SECURITY**



49. Regarding the third approach, i.e. applying average nominal yields, it can be observed that

there are still differences with the accrued income sec-by-sec. But these differences are always positive, i.e. the evolution of income figures goes in the same direction in both methods. The yields applied are conceptually the same as the ones applied in the sec-by-sec method, but using an average (see table III).

**TABLE III**

**EMPIRICAL EXERCISE  
ACCRUED INCOME SECURITY BY SECURITY VERSUS A GROUP OF AGGREGATED SECURITIES  
(USING AN AVERAGE OF THE YIELDS PREVAILING AT THE MOMENT OF CREATION OF THE ISSUES)**

(EUR thousands)

| 1            | 2                                | 3              | 4                       | 5                     | 6                      | 7                          | 8                           | 9           |
|--------------|----------------------------------|----------------|-------------------------|-----------------------|------------------------|----------------------------|-----------------------------|-------------|
| MONTH (2001) | GENERAL GOVERNMENT BONDS & NOTES | NUMBER OF DAYS | MONTHLY AVERAGE BALANCE | YEARLY INTEREST RATES | MONTHLY INTEREST RATES | ACCRUED INCOME "AGGREGATE" | ACCRUED INCOME "SEC-BY-SEC" | DIFFERENCES |
| JANUARY      | 2,899,258,793                    | 31             | 93,524,477              | 6.051                 | 0.004908092            | 459,027                    | 406,940                     | 52,087      |
| FEBRUARY     | 2,601,469,597                    | 28             | 92,909,628              | 5.973                 | 0.004846195            | 450,258                    | 368,232                     | 82,026      |
| MARCH        | 2,924,436,814                    | 31             | 94,336,671              | 5.948                 | 0.004826849            | 455,349                    | 395,765                     | 59,584      |
| APRIL        | 2,921,141,450                    | 30             | 97,371,382              | 5.901                 | 0.00478896             | 466,308                    | 392,892                     | 73,416      |
| MAY          | 2,949,178,845                    | 31             | 95,134,801              | 5.888                 | 0.004779377            | 454,685                    | 392,943                     | 61,742      |
| JUNE         | 2,961,393,826                    | 30             | 98,713,128              | 5.873                 | 0.004766795            | 470,545                    | 383,244                     | 87,301      |
| JULY         | 3,147,351,517                    | 31             | 101,527,468             | 5.865                 | 0.004760468            | 483,318                    | 398,601                     | 84,717      |
| AUGUST       | 3,152,906,772                    | 31             | 101,706,670             | 5.865                 | 0.004760958            | 484,221                    | 415,353                     | 68,868      |
| SEPTEMBER    | 3,110,585,885                    | 30             | 103,686,196             | 5.858                 | 0.004755683            | 493,099                    | 402,624                     | 90,475      |
| OCTOBER      | 3,273,909,347                    | 31             | 105,609,979             | 5.857                 | 0.004754575            | 502,131                    | 425,052                     | 77,079      |
| NOVEMBER     | 3,170,636,522                    | 30             | 105,687,884             | 5.855                 | 0.00475308             | 502,343                    | 457,617                     | 44,726      |
| DECEMBER     | 3,244,102,108                    | 31             | 104,648,455             | 5.841                 | 0.004741539            | 496,195                    | 469,817                     | 26,378      |
| TOTAL        |                                  |                |                         |                       |                        | 5,717,478                  | 4,909,080                   | 808,398     |

2 GENERAL GOVERNMENT BONDS AND NOTES= calculated adding the daily stocks of euro denominated bonds and notes issued by the General Government and owned by non residents(nominal amounts)

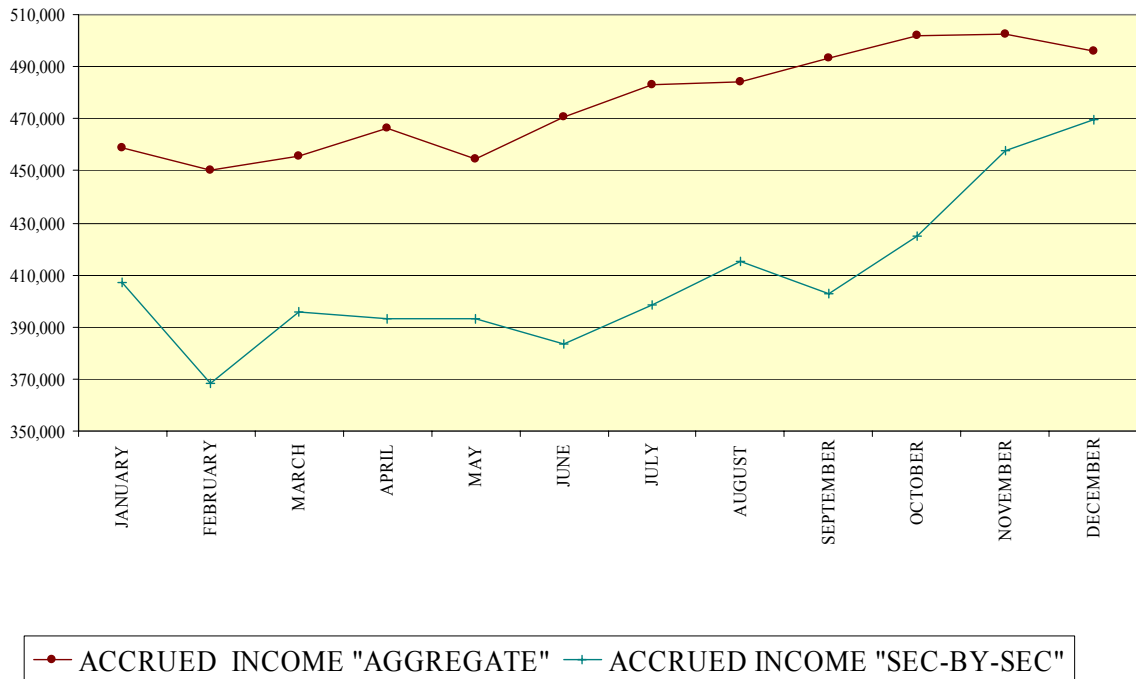
4 MONTHLY AVERAGE BALANCE= column 2 divided into column 3

6 MONTHLY INTEREST RATES= calculated applying to column 5 the formula of the compound interest

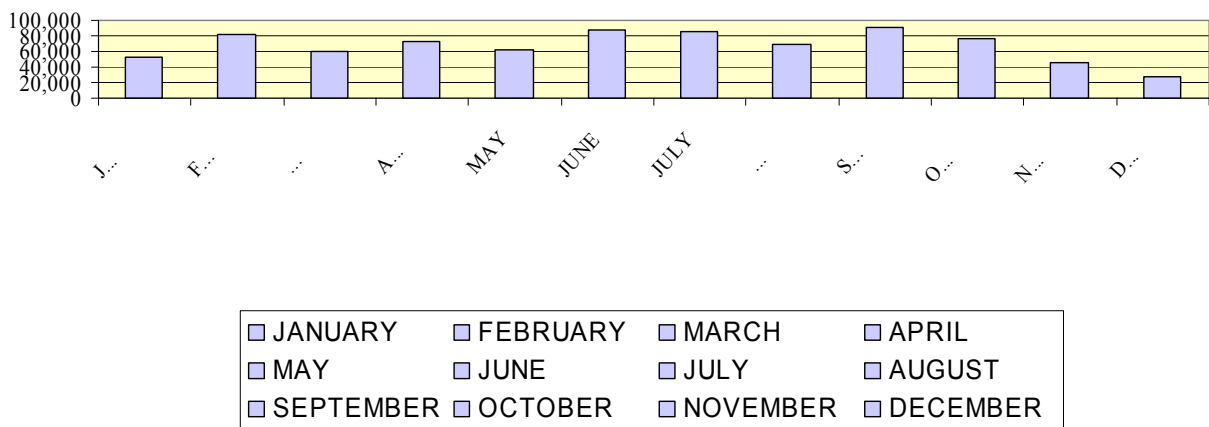
7 ACCRUED INCOME "AGGREGATE"= column 4 multiplied by column 6

9 DIFFERENCES= column 7 less column 8

**COMPARISON BETWEEN THE TWO METHODS OF CALCULATING THE ACCRUED INCOME**



**DIFFERENCES BETWEEN ACCRUED INCOME CALCULATED FOR A GROUP OF AGGREGATED SECURITIES AND CALCULATED SECURITY BY SECURITY**



### *Conclusions of the empirical exercise*

50. The first conclusion is that it is not easy to choose the most appropriated benchmark yield, and the results are quite different according to the interest rate chosen. Apparently, the market average yield of issues with maturity over two years seems to be the most appropriate, because in order to calculate the average the majority of issues have been taken into account. But the results show that this yield is not the best one. The interest rate used in the second example seems to be better than the first one. The reason is that the bulk of the issues have maturities over four years. But the results of the second example are not good either.

51. In the first two examples, the yields applied are market yields. Therefore, when the accrued income is calculated for the group of aggregated securities the underlying method is the creditor approach. If we compare the results obtained using these market yields to the accrued income sec-by-sec obtained using nominal interest rates, we are not comparing two similar amounts. However, if we compare with the results of the third example, the interest rates used are consistent. The problem is that the average nominal yields, as already mentioned, are not publicly available to the rest of the users, apart from the Banco de España.

52. It is very difficult to choose the most appropriate yield for accrued income on portfolio investment liabilities, but it is even more difficult for income accruing on portfolio investment assets. The only way to accurately calculate accrued income for portfolio investment is having available a Centralised Security Database.

53. The second conclusion is that if the calculation procedure is not the same (aggregated or security by security), the results can be very different, even if the same interest rate is used (as shown in table III), because non-resident investments are not evenly distributed among all issued securities.

54. If we consider the liability side of the balance of payments, probably the issuer country has very extensive information about their own issues. But if we take into account the asset side of the balance of payments, to take a decision on the level of aggregation is not easy. And also, each country would have its own criteria. To calculate the accrued income of portfolio investment in a homogeneous way for all countries, the security-by-security approach is the most indicated. And to apply this method in a proper way, a Centralised Security Database is necessary.

55. Both problems (choosing the appropriate interest rate and applying real interest rates to each holding) could only be solved using a method based on stocks given security-by-security and detailed information on interest rates also security by security. This requires the availability of a security database, and only if this database were a “centralised” one, all countries would use the same interest rates for each security.



## UK

### Introduction

56. This note summarises the UK's empirical study on the collection of portfolio investment income statistics using an aggregate or security-by-security approach. The UK only has an aggregate dataset, so a full comparison between aggregate and security-by-security approaches could not be undertaken. However, at the time of writing, one large custodian in the UK has supplied data to the Bank of England for holdings of non-resident securities. These figures were collected as part of the feasibility study into security-by-security reporting, following on from the TF-PICS.

57. Given the data sources available, the following exercises were conducted:

- A the implied rate of return (i.e. income credits divided by level of assets) on UK holdings of non-resident issued bonds in the published aggregate data was compared to the rate of return estimated using the sample security-by-security custodian data.
- B the sample custodian data, for securities issued in the USA, were used to see how different portfolio investment income data could be if a security-by-security or aggregate approach is used.

### Exercise A

58. The aim of this exercise is to compare the published data to the rate of return implied by the sample security-by-security data obtained from the custodian. The starting point for this exercise was the data currently published by the ONS and collected using a survey-based aggregate reporting system (Table 1).

**Table 1: UK investment in non-resident issued bonds and notes**

|                            | 2001 Q1 | 2001 Q2 | 2001 Q3 | 2001 Q4 |
|----------------------------|---------|---------|---------|---------|
| Income (£ billion)         | 6.0     | 5.4     | 5.3     | 5.1     |
| Level (£ billion)          | 454.4   | 448.4   | 455.6   | 448.1   |
| Implied rate of return (%) | 5.3     | 4.8     | 4.7     | 4.5     |

*Source: ONS and Bank calculation*

59. There are four main issues that should be borne in mind when assessing this study. First, the data from the custodian only represent a small part of the overall UK figure.<sup>7</sup> This means that we are assuming that the custodian's holdings are representative of the whole UK. Secondly, the custodian's

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<sup>7</sup> It is estimated that the sample custodian's data represent around 5% of the total UK holdings of non-resident issued bonds and notes.

data are a snapshot of holdings at end-December 2001. Therefore, the results can only be used for different periods in time if we assume that the relationship between the custodian’s data and the published data is constant. Thirdly, the yields of some of the securities held by the custodian were not available from our data source. These securities were excluded from my study. Finally, time constraints meant that only the interest on securities issued by the USA could be calculated on a full security-by-security basis (see paragraph 60 below).

60. The custodian’s data were used to estimate an implied rate of return on bonds and notes. This was calculated by weighting yields for securities issued in each of the main countries by the value of the holdings of the securities in each country. For the USA, the yield was compiled by calculating the interest on a security-by-security basis and aggregating this so that one yield for the USA could be estimated (where yield is total interest divided by total amount outstanding). For other countries, a benchmark yield was used.

61. The implied rate of return from the custodian’s data was 4.4%, which compares favourably with the 4.5% in the aggregate published data (table 2). Subject to the issues raised above (paragraph 59), this shows that a similar result can be obtained by using either an aggregate or security-by-security approach.

**Table 2: Calculation of the implied rate of return on the custodian’s data**

| <b>Country of issuer</b> | <b>Type of bond</b> | <b>Weight</b> | <b>Yield (%)</b> |
|--------------------------|---------------------|---------------|------------------|
| United States            | Government          | 17.9          | 4.3              |
| Germany                  | Government          | 16.4          | 4.5              |
| France                   | Government          | 9.7           | 4.5              |
| Germany                  | Corporate           | 9.3           | 5.3              |
| Luxembourg               | Corporate           | 8.5           | 5.3              |
| Netherlands              | Corporate           | 8.1           | 5.3              |
| Japan                    | Corporate           | 7.7           | 1.0              |
| Japan                    | Government          | 5.8           | 1.0              |
| United States            | Corporate           | 5.5           | 6.5              |
| Cayman Islands           | Corporate           | 3.8           | 6.0              |
| Canada                   | Corporate           | 3.5           | 4.9              |
| Netherlands              | Government          | 1.9           | 4.6              |
| Canada                   | Government          | 1.8           | 4.4              |
| <b>Total</b>             |                     | <b>100.0</b>  | <b>4.4</b>       |

**Exercise B**

62. This exercise used the custodian’s data for bonds issued in the USA. There were 677 bonds issued in the USA listed by the custodian (342 government bonds and 335 corporate bonds). The interest figure was calculated for each security and this was aggregated to produce a figure for total income from the USA (this was sub-divided into government and corporate bonds). This figure was compared to an aggregate approach where interest was calculated by taking the total amount outstanding and applying a benchmark yield to estimate income (again the data were sub-divided into government and corporate bonds).

63. This study also showed that reasonably similar results are produced by the security-by-security and aggregate approaches (table 2). The results were more similar for government bonds than corporate bonds, although this is not surprising given the wide range of yields on corporate bonds. The results could be improved by further sub-dividing the corporate bonds (e.g. by broad credit rating category).

**Table 3: Results of Exercise B**

Format: income (£mn) | rate of return (%)

|                  | Aggregate | Sec-by-sec | Difference | % difference |
|------------------|-----------|------------|------------|--------------|
| Government bonds | 32   4.7  | 28   4.3   | 3   0.5    | 10.3         |
| Corporate bonds  | 12   5.6  | 13   6.5   | -2   -0.9  | -15.1        |
| Total            | 43   5.0  | 42   4.8   | 2   0.2    | 3.5          |

*Source: Bank calculations*

**Conclusion**

64. The two empirical studies conducted here suggest that reasonably similar data can be produced using either an aggregate approach or a security-by-security approach. Obviously, the less aggregated the data, the more similar the aggregate approach will be to the security-by-security approach. However, it should be noted that these are two limited studies and the results are subject to a number of important caveats (discussed in paragraph 59, above).

## Summary and conclusions

65. The controversy between aggregated and security-by-security collection systems has been at the origin of an exhaustive debate in the framework of portfolio investment collection systems. However, any conclusions at the level of portfolio investment cannot be directly applicable to the collection of portfolio investment income figures. In order to extract conclusions which may be deemed valid for portfolio investment income, the analysis needs to be slightly adapted to some other specific problems.

66. Along these lines, the starting point for the work of this subgroup was the assumption that the most accurate results are obtained through a compilation procedure run at the level of individual securities, by applying the coupon inherent to each specific security. The availability of portfolio investment stocks security-by-security is a necessary prerequisite.

67. Provided the security-by-security approach would offer the most precise results, other considerations could nevertheless compel b.o.p. compilers to consider a more simplified approach. These considerations are mostly related to costs (in terms of technology, time, resources and training of staff, etc.), but also some other factors such as likely difficulties to collect income on direct investment and repos could be additional obstacles for the adoption of a security-by-security approach.

68. Against this background, the target of the empirical exercises was precisely to determine to which extent the quality of the final product (income figures) could be affected if the b.o.p. compiler, on the basis of the arguments mentioned in the preceding paragraph, decided to collect income figures following a simplified (aggregated) approach, i.e. by applying benchmark yields to stratified categories of portfolio investment stocks (which could be determined by the type of securities, original maturity, market of issuance, economic sector of the issuer, etc.).

69. The conclusions reached in both empirical exercises are not fully convergent. The exercise carried out in Spain (ES) clearly concludes that the differences obtained following both approaches are rather significant. On the contrary, even if the caveats of the UK exercise have been brought to the attention of the reader (e.g. that the securities analysed only represent a small proportion of the total portfolio investment stocks in the UK i.i.p.), it concludes that both approaches may get to reasonably similar results.

70. A factor that could affect the comparability of the results obtained through both exercises is the fact that the results of the exercise carried out in ES are presented in levels (i.e. in terms of differences in the monthly income flows), while most of the discrepancies in the exercise performed in the UK are presented in percentage (i.e. by analysing the difference between the implicit rates of return), due to the unavailability of complete information (i.e. total income figures). In the case of the second exercise, this fact could hide significant differences, since just a few percentage points of difference applied over a sizeable stock (as portfolio investment stocks in the UK) could produce significant differences in the levels obtained.

71. Another factor that could stand behind these not fully coincident results is the fact that the analysis in the UK refers to one point in time and used annualised yields, due to lack of security-by-security data, while the exercise in ES shows monthly differences. In this latter case, the two first differences obtained through the first two aggregated approaches (based on market yields) tend to be less pronounced over longer periods of time (i.e. the whole year), as they switched from positive to negative or vice versa over the months.

72. These two empirical exercises offered some other interesting features. For instance, the exercise carried out in ES proves that any aggregated approach which tries to combine stocks and yields which are not conceptually consistent (for instance, stocks of securities in nominal value and marked-to-market yields) may offer extremely incoherent results (see results with the first two aggregate market yields applied on nominal portfolio stocks).

73. An other remarkable result in the UK exercise is that the differences are more relevant for securities issued by private companies than for General Government securities, which, broadly speaking, account for the largest proportion of portfolio investment stocks. As it could be logically expected, the less aggregated the data (calculations made by additional categories of securities), the closer the results to the security-by-security approach.

74. Finally, at the time of elaborating final recommendations, there is an important point to be borne in mind: the risk of asymmetric treatments between the country of the issuer and the country of the holder. If both are euro area countries, this may certainly jeopardise the compilation of the euro area aggregates. For this reason, the TF-PII should ensure that the results obtained through all approaches finally recommended are reconcilable. To this aim, for any aggregated approach included in the final recommendations of the TF-PII, it would be important considering asymmetries in the access to the relevant information (i.e. nominal/marked-to-market stocks and nominal/market benchmark yields) between the b.o.p. compiler of the country of the issuer and that of the final holder of the relevant securities.

75. Furthermore, even if the same interest rate is used by both counterparts (in terms of nominal or market interest rates), if the calculation procedure is not consistent (i.e. aggregated versus security by security) the results can be very different, as non-resident investments do not necessarily have to be homogeneously distributed among all domestic securities. This means that in the application of any average yield there is an inherent error since the weights implicit could not necessarily be representative of the specific securities which are most attractive to foreign investors.

76. The only widespread solution which can fully ensure absence of asymmetries would be a calculation performed at the level of individual securities. However, even if that is the case, the use of identical features for all individual securities can only be possible if the information is centrally available, for instance, through the Centralised Securities Database.

**The conclusions of the subgroup can be summarised as follows:**

- **The security-by-security (s-by-s) approach offers the most precise results, provided all the necessary information is available to the compiler at a sufficient level of quality. It is assumed the CSDB will be essential to meeting this requirement in the future.**
- **The s-by-s approach is the only way to fully rule out asymmetries among countries. The existence of centralised information (e.g. through the CSDB) would be an additional key factor in reducing asymmetries further, regardless the approach followed.**
- **Nevertheless, different circumstances (mainly associated to cost arguments, availability of appropriate information, internal compilation processes and checking procedures, available resources, etc.) could lead b.o.p. compilers to a more simplified approach like the aggregated one**
- **At the time of deciding on the two components of the aggregated approach (i.e. stocks by categories of securities and relevant benchmark yields), it is important to:**
  - (i) Select consistent components (nominal/marked-to-market stocks always combined with nominal/market yields)**
  - (ii) Minimise the risk of asymmetries**
- **A way to minimise asymmetries would be the use of information which may be publicly available in the calculation of both assets/credits and liabilities/debits (e.g. stocks of securities marked-to-market and market benchmark yields), and which may also be reconcilable with other countries' results computed at the level of individual securities**
- **In order to minimise asymmetries among countries following distinct approaches (i.e. s-by-s versus aggregated), the ideal solution would be that the CSDB could include exhaustive information on each individual security (especially on the associated interest). This information could be used to calculate benchmark yields for each aggregation level on a centralised basis, thus promoting the use of more homogeneous information among countries.**
- **The second component of these calculations (i.e. stocks of securities by categories) should also be standardised to the extent possible. To this aim, it is recommended to establish a minimum level of categories of securities (to which the appropriate benchmark yields should be applied).**