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The more the merrier: enhancing traditional cross-border portfolio investment statistics using security-by-security information[1]

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The more the merrier: enhancing traditional cross-border portfolio investment statistics using security-by-security information

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European Central Bank

Introduction

- Enhancing **b.o.p./i.i.p statistics: estimating debt securities at nominal value (stocks)**
- Developed using the available **ESCB security-by-security databases: SHSDB and CSDB** (and ratings)
- Initial focus on **debt securities**
- **Additional enhancements:** by currency, risk type, …

The i.i.p. – SHSS consistency: pre-condition

- **I.i.p. – SHSS comparison for debt securities:** 2014Q1-2020Q3 coverage and correlation coefficient between i.i.p. and SHSS stocks (1st difference) at *market values*
- **Pre-conditions to compile i.i.p. stocks at *nominal values*:** high coverage ratios and correlation coefficients → SHSS prices **fit to "deflate"** i.i.p. stocks at market values → SHSS stocks at nominal values are a **good benchmark** to compile i.i.p. stocks at NV
- **Positive outcome!**

Conceptual and compilation frameworks

- **Conceptual framework:** BPM6 §7.27 and HSS Annex 1
- **Compilation framework:** SHSS price indexes following a "*bottom-up*" approach

$$Price\ index_t^{SHSS} = Debt\ securities_t^{MV,SHSS} / Debt\ securities_t^{NV,SHSS\ enhanced}$$

$$Debt\ securities_t^{NV,i.i.p.} = Debt\ securities_t^{MV,i.i.p.} / Price\ index_t^{SHSS}$$

i.i.p. stocks assets in nominal terms

$$GED\ debt\ securities\ _t^{NV} = Debt\ securities_t^{MV,i.i.p.extra\ liabilities} / Price\ index_t^{SHSS,intra\ assets}$$

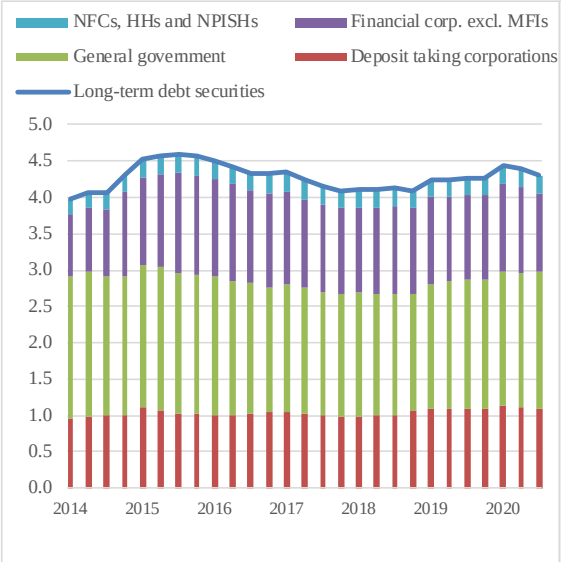
$$NED\ debt\ securities\ _t^{NV} = GED\ debt\ securities\ _t^{NV} - Debt\ securities_t^{NV,i.i.p.extra\ assets}$$

GED/NED in nominal terms

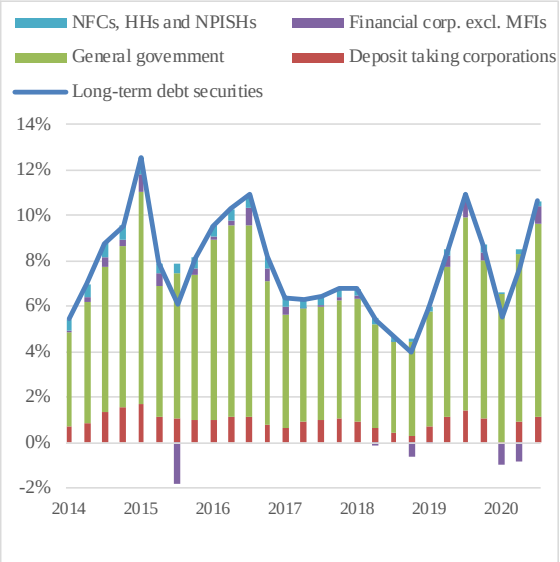
Main results: GED at nominal values

Results for GED and NED estimates as well as those for portfolio investment assets provide high value added for users

Gross External Debt. EUR trillions



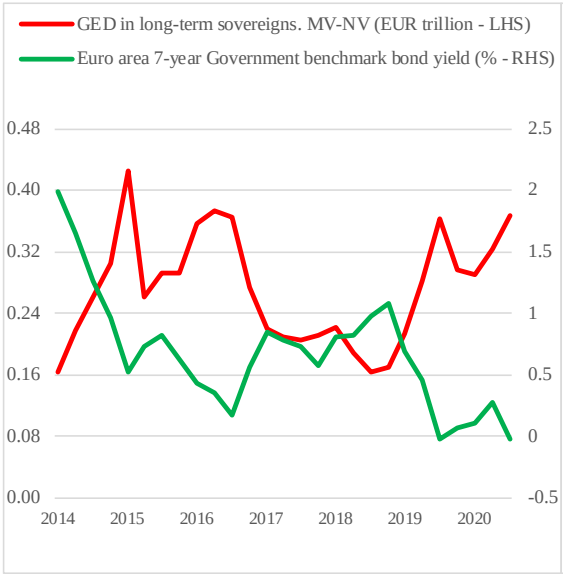
Gross External Debt. % MV stocks



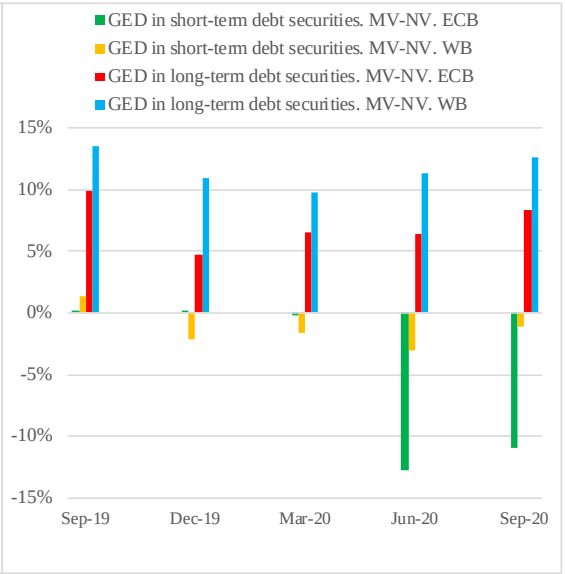
Robustness checks

Robustness checks carried out confirm estimates are of high quality!

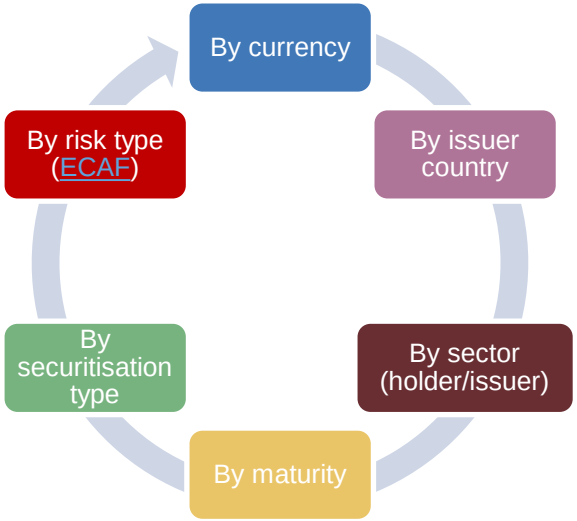
GED vs yields



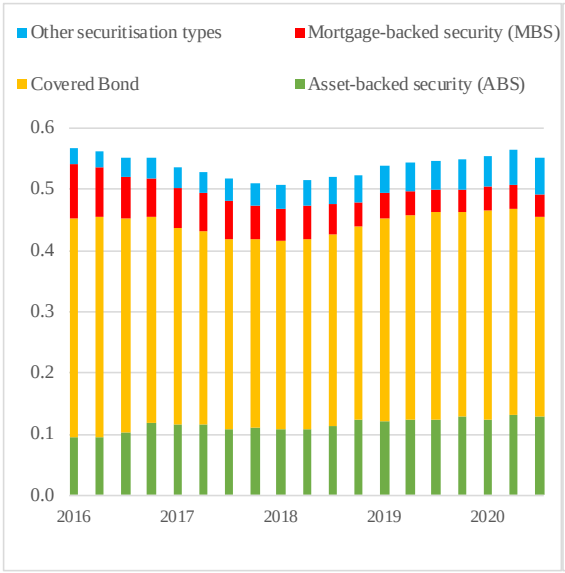
GED estimates vs WB/Bundesbank



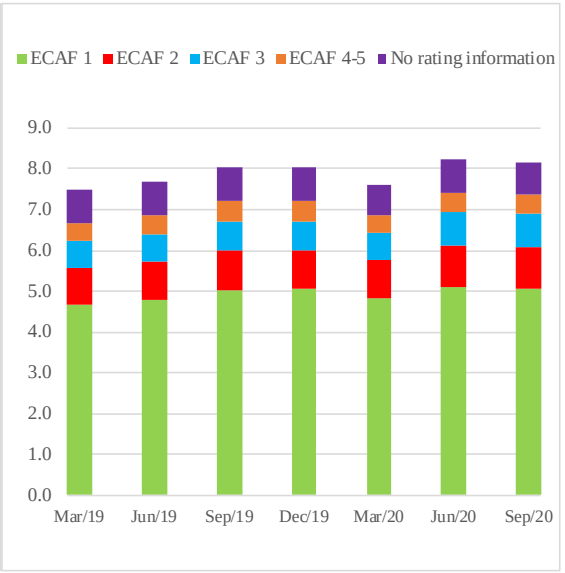
Other enhancements: SBS rich granularity



Securitisation types. EUR trillions



Risk types. EUR trillions



The more the merrier: enhancing traditional cross-border portfolio investment statistics using security-by-security information

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Abstract
This paper presents a proposal to enhance the current information available on euro area cross-border portfolio investment and external debt in international investment position (i.i.p.) statistics by using granular (security-by-security) information. This project benefits from the high consistency between the euro area i.i.p. statistics and European System of Central Banks' (ESCB) securities holdings statistics by sector (SHSS). First, nominal stock values for debt securities are compiled using the available SHSS information on securities prices. Information on debt at nominal values is useful for the analysis of debt sustainability. Second, additional details are proposed to be included in i.i.p. statistics drawing on the rich granularity of the SHSS and the ESCB's centralised securities database (CSDB). This paper suggests new i.i.p. details for debt securities by currency, maturity and counterpart issuer geographic area and sectors as well as by riskiness based on ratings. These enhancements are highly demanded by users and the suggested centralised approach at the euro area level provides an optimal cost-benefit solution from the reporting agents' perspective.

Keywords: balance of payments, securities holdings statistics, micro-data, security-by-security, portfolio investment.

1. Introduction[1]

The ECB's External Statistics Guideline describes the different collection models available to compile statistics on portfolio investment.[2] The common denominator of these methods is that stocks of securities reported to national compilers on an aggregated basis, i.e. not relying on security-by-security (SBS) information, should not exceed 15% of value of total portfolio investment stocks of assets or liabilities. This requirement is supported by the CSDB which covers reference and price information on all relevant securities. Therefore, *ex-ante* a good consistency between euro area b.o.p./i.i.p. statistics and SHSS is expected. As shown in this paper, the results for euro area i.i.p. indeed show a high consistency, making the SHSS dataset appropriate to enhance the data available in euro area portfolio investment and external debt.
This paper presents a proposal for selected enhancements to euro area i.i.p. and external debt statistics using SHSS(/CSDB) data, with an initial focus on debt securities. Section 2 briefly describes the main results of the comparison between i.i.p. and SHSS data and further identifies the items for which enhancements are deemed feasible. Section 3 explains the proposed methodology to compile debt securities at nominal value, while Section 4 shows the main results. Section 5 introduces additional enhancements. Finally, Section 6 concludes.

2. Consistency between i.i.p. statistics and SHSS data

The comparison between i.i.p. and SHSS data highlights the high consistency between both domains for debt securities in the period from 2014Q1 to 2020Q3 (**Table 1**). The average coverage ratio of SHSS to i.i.p. data on euro area holdings of debt securities issued by non-

[1] We acknowledge the research assistance provided by Carles Gómez Llabrés and Matteo Paolo Pirone as well as the comments received from Jorge Diz Dias and members of the ESCB Working Group on External Statistics.
[2] Refer to the European Central Bank (ECB) Guideline ECB/2011/23 in the field of external statistics as amended, particularly by Guideline ECB/2018/19 ("external statistics Guideline" hereinafter) Annex VI.

euro area residents was within the expected range for long-term debt securities (at 95%), while it was lower for short-term debt securities (76%), but still providing a consistent picture between both domains. In the context of this exercise, it is also relevant to assess to what extent the evolution over time observed in SHSS data is consistent with that of i.i.p. data. Hence information on the correlation between holdings at market values is considered in terms of first differences. The high correlation coefficients suggest that the implicit prices derived from SHSS data can be used to "deflate" i.i.p. data at market prices. For the resident and counterpart sectors, a general positive assessment is obtained for both the extra- and intra-euro area perspectives.[3] The cases recording either relatively low correlations and/or coverage refer to details with relatively low amounts that in the most recent reference periods recorded substantial improvements.[4] Summing up, the presence of both a high coverage ratio and correlation coefficient between both domains shows that the pre-conditions for compiling i.i.p. portfolio investment data in nominal terms based on SHSS data are fulfilled.

Table 1. Coverage and correlation between i.i.p. and SHSS stocks at market value

Period 2014Q1 - 2020Q3	Average coverage		Correlation coefficient		Average coverage		Correlation coefficient	
	Intra euro area	Extra euro area	Intra euro area	Extra euro area	Intra euro area	Extra euro area	Intra euro area	Extra euro area
Short-term debt securities excl. Eurosystem	**94%**	**76%**	**98%**	**91%**				
	By resident sector				By counterpart issuer sector. Eurosystem holdings included in i.i.p.			
Eurosystem	-	-	-	-	-	364%	-	61%
Deposit taking corporations except Eurosystem	98%	82%	98%	93%	89%	79%	95%	84%
Money market funds	92%	82%	95%	93%	-	5987%	-	12%
General government	71%	95%	89%	99%	85%	72%	96%	98%
Financial corporations other than MFIs	97%	65%	75%	68%	85%	66%	55%	68%
NFC, HHs and NPISHs	78%	64%	58%	99%	123%	29%	80%	1%
Long-term debt securities excl. Eurosystem	**94%**	**95%**	**97%**	**98%**				
	By resident sector				By counterpart issuer sector. Eurosystem holdings included in i.i.p.			
Eurosystem	-	-	-	-	-	410%	-	52%
Deposit taking corporations except Eurosystem	98%	98%	98%	95%	86%	98%	89%	80%
Money market funds	104%	129%	84%	82%	-	366%	-	16%
General government	57%	50%	31%	48%	80%	93%	94%	98%
Financial corporations other than MFIs	94%	95%	95%	99%	84%	88%	53%	82%
NFC, HHs and NPISHs	85%	89%	30%	39%	88%	95%	94%	99%

Sources: ECB (i.i.p. statistics and SHSS) and author's calculations.

3. Compilation of debt securities at nominal values: proposed methodology

Market valuation (MV) is the standard to follow when compiling debt securities according to BPM6 (IMF, 2009): stocks should be valued at the end of period market value. In particular, the so-called "dirty" price applies (BPM6 §7.27). This means that for debt securities, the accrued interest not yet paid is included in the price. The default face value (FV) stocks available in the SHSS dataset do not contain the accrued income component. They are defined in BPM6 §3.88 (d) as the "*undiscounted amount to be paid to the holder at maturity*". Therefore, the following adjustment is implemented at the SBS level in this exercise to obtain nominal values (NV):

$$[1]\ Accrued\ income_t^{SHSS} = Debt\ securities_t^{FV,SHSS} * Accrued\ income\ factor_t^{SHSS}$$

$$[2]\ Debt\ securities_t^{NV,SHSS\ enhanced} = Debt\ securities_t^{FV,SHSS} + Accrued\ income_t^{SHSS}$$

where $Accrued\ income\ factor_t^{SHSS}$ refers to the annualised accrued income, i.e. interest accrued for not yet paid coupons and the discount factor due to the difference in issue and redemption price. The Handbook on Securities Statistics (HSS) provides in its Annex 1 a detailed explanation of how to reconcile market and nominal valuations for debt securities. Nominal valuation is defined in HSS §A1.3 as follows: "…*the sum of funds originally advanced, plus any subsequent advances, less any repayments, plus any accrued interest*" and considering also the revaluations owing to exchange rates fluctuations. Therefore, and as mentioned in paragraph HSS §A1.5, the only difference between market (MV) and nominal valuations (NV)

[3] One of the main concerns given the magnitude of the underlying stocks concerns the low ratio for holdings of long-term debt securities held by the general government. This mainly reflects the non-inclusion of the holdings of the nationalised German bank Hypo Real Estate in the SHSS dataset.

[4] Neither the Eurosystem nor money market funds (MMFs) issue debt securities as such instrument types are out of the scope of their regular activities. Hence debt securities issued either by the Eurosystem or MMFs are set to zero by default in the compilation process as not being plausible.

for debt securities stocks in a specific moment of time T and as available in the SHSS dataset concerns the impact of the cumulative revaluations arising from (market) price changes:

$$[3]\ Debt\ securities_t^{MV,SHSS} = Debt\ securities_t^{NV,SHSS\ enhanced} + \sum_{t=1}^{T} Price\ changes\ revaluations_t^{SHSS}$$

It is proposed that i.i.p. asset stocks in nominal terms are derived as follows:

$$[4]\ Price\ index_t^{SHSS} = Debt\ securities_t^{MV,SHSS} / Debt\ securities_t^{NV,SHSS\ enhanced}$$

$$[5]\ Debt\ securities_t^{NV,i.i.p.} = Debt\ securities_t^{MV,i.i.p.} / Price\ index_t^{SHSS}$$

In a first step, the $Price\ index_t^{SHSS}$ indicator is calculated as shown in Equation [4] using the available information in the SHSS dataset, i.e. the ratio between the stocks at market and (enhanced) nominal values. Such index, as mentioned in the HSS §A1.4, reflects the changes in stocks at market values vis-à-vis nominal amounts owing to (accrued) changes of the market price. In a second step, the $Price\ index_t^{SHSS}$ is applied as in Equation [5] to derive the corresponding i.i.p. stocks in nominal amounts following a "bottom-up" approach: the lower items (e.g. short-term debt securities assets by resident sector) are aggregated to obtain the corresponding upper item (e.g. total short-term debt securities assets).

The final step of this compilation process is to derive euro area external debt in nominal terms. This paper includes a proposal based on the use of $Price\ index_t^{SHSS}$ obtained for intra euro area debt securities holdings. We assume that non-euro area investors follow the same investment patterns as euro area-based investors with regard to securities issued by euro area residents: they invest in similar instruments/securities and in similar proportions.[5] Hence equation [6] is used to derive euro area gross external debt (GED) for debt securities in nominal terms:

$$[6]\ GED\ debt\ securities\ _t^{NV} = Debt\ securities_t^{MV,i.i.p.extra\ liabilities} / Price\ index_t^{SHSS,intra\ assets}$$

where $Debt\ securities_t^{MV,i.i.p.extra\ liabilities}$ refers to euro area debt securities held by non-euro area investors at market values in i.i.p. statistics, and $Price\ index_t^{SHSS,intra\ assets}$ to the corresponding price indicator of the same instruments held by euro area investors as available in the SHSS dataset. Finally, the last step is to derive the corresponding euro area net external debt (NED):

$$[7]\ NED\ debt\ securities\ _t^{NV} = GED\ debt\ securities\ _t^{NV} - Debt\ securities_t^{NV,i.i.p.extra\ assets}$$

where $Debt\ securities_t^{NV,i.i.p.extra\ assets}$ are the extra euro debt securities i.i.p. stocks obtained in Equation [5], including also those being held as reserve assets by the Eurosystem.

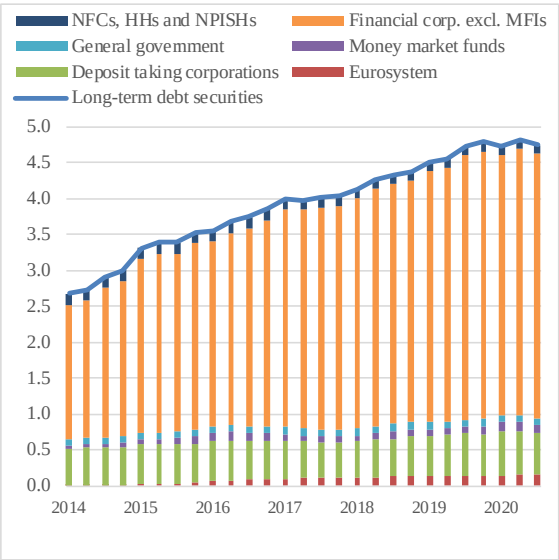
4. Main results of the compilation of debt securities at nominal values

As expected, the estimates for long-term debt securities at nominal value follow a similar pattern to the corresponding stocks at market values as shown in **Chart 1**. The main differences are found in the financial corporations excluding MFIs subsector (the major resident sector) and reflecting significant economic developments or shocks (e.g. the COVID-19 impact in 2020Q1). The differences between market values and nominal estimates is explained by the price changes "premium" (defined as the difference between the $Price\ index_t^{SHSS}$ and 1) in the context of low interest rates: for the period from 2014Q1 to 2020Q3 it was below 10% in absolute terms with very few exceptions. This price changes "premium" may be triggered by specific circumstances such as changes in the perceived creditworthiness of the issuer (reflected in the rating information), changes in the market liquidity of the specific instrument or in the key ECB reference rates. A similar assessment also applies to short-term debt securities and intra euro area cross-border holdings as well as the other additional categories considered in this exercise.

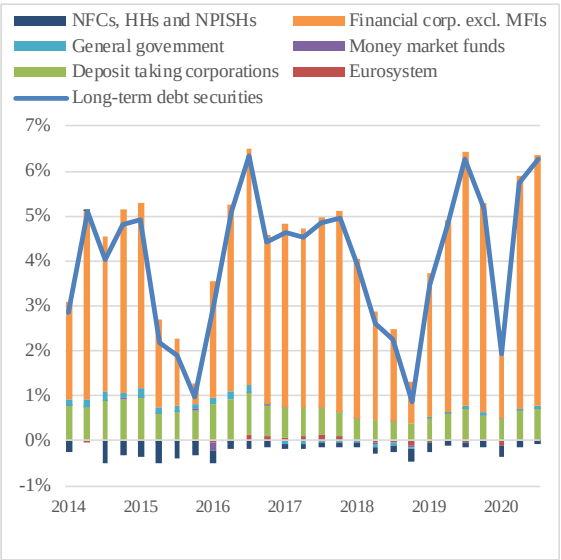
[5] This assumption is debatable especially when considering the impact of the Eurosystem's holdings in the euro area portfolio rebalancing in the context of the Eurosystem's purchase programmes (PSPP), see Bergant and Schmitz (2019). However, the robustness checks implemented in Section 4 validate our assumption.

Chart 1. Extra euro area long-term debt securities assets (stocks) by resident sectors

A. Nominal values (EUR trillions)



B. Market minus nominal stocks (% of MV total stocks)

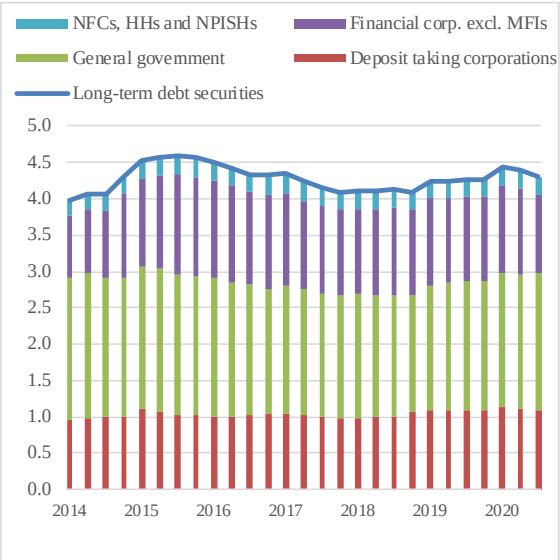


Sources: ECB (i.i.p. statistics and SHSS) and author's calculations.

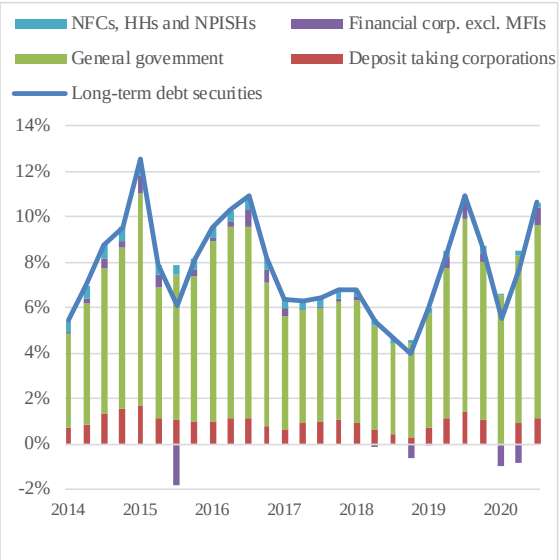
The GED debt securities estimates in nominal terms are also generally in line with the stocks at market values as shown for long-term debt securities in **Chart 2**, with the main differences arising for debt securities issued by the government. A similar picture also holds true regarding the NED indicator for debt securities.

Chart 2. GED in long-term debt securities

A. Nominal values (EUR trillions)



B. Market minus nominal stocks (% of MV total stocks)



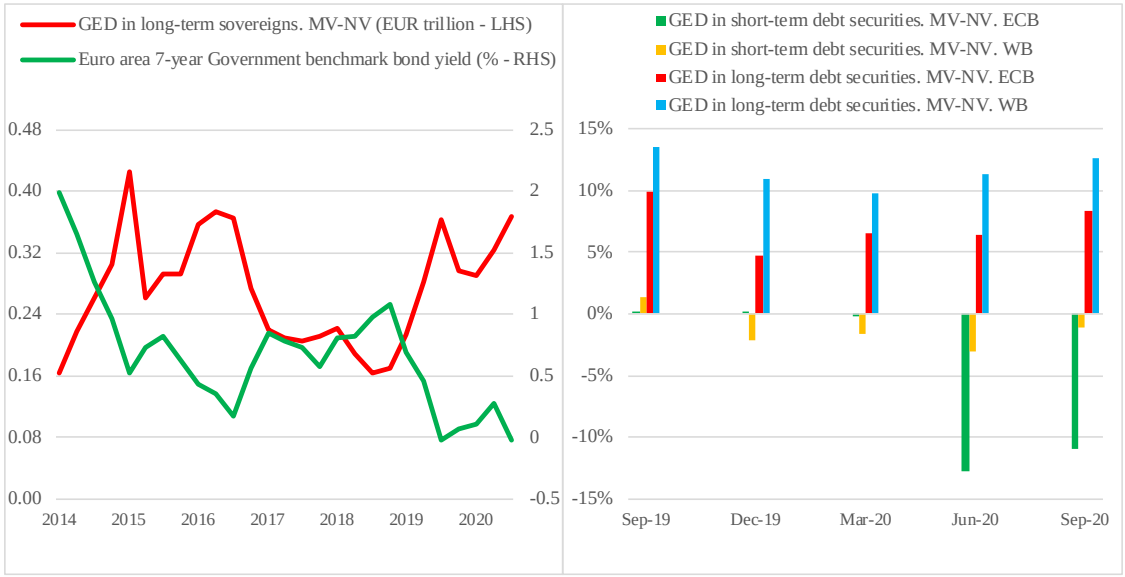
Sources: ECB (i.i.p. statistics and SHSS) and author's calculations.

Two sets of robustness checks were carried out with a focus on the GED indicators. First, the evolution of GED in long-term debt securities issued by the general government was compared with the underlying yields, namely the euro area 7-year sovereign benchmark bond yield. Panel A in **Chart 3** shows the comparison is in line with expectations as there is a consistent negative correlation between interest rates and the implicit impact on bond prices (-67%). Second, the GED nominal stocks data available in the World Bank website and

referring to Germany were compared with the estimates obtained following the compilation approach of this document. As shown in Panel B in **Chart 3**, the results are consistent especially for long-term debt securities as showing a similar MV-NV gap and trend, while differences are more pronounced for short-term debt securities, although being based on lower underlying stocks. Hence, the overall outcome of the robustness check is very encouraging, confirming the high quality of the euro area nominal stocks estimates and validating the assumptions of the compilation model.

Chart 3. Robustness checks for GED nominal stocks

A. GED long term sovereigns and yields evolution B. GED estimates vs World Bank data for Germany (% of MV stocks)



Sources: ECB (i.i.p. statistics and SHSS), World Bank and author's calculations.

5. Additional enhancements using SBS data

Additional details for debt securities stocks at market values can be included in i.i.p. statistics drawing on the rich granularity of the SHSS (/CSDB) datasets, namely:

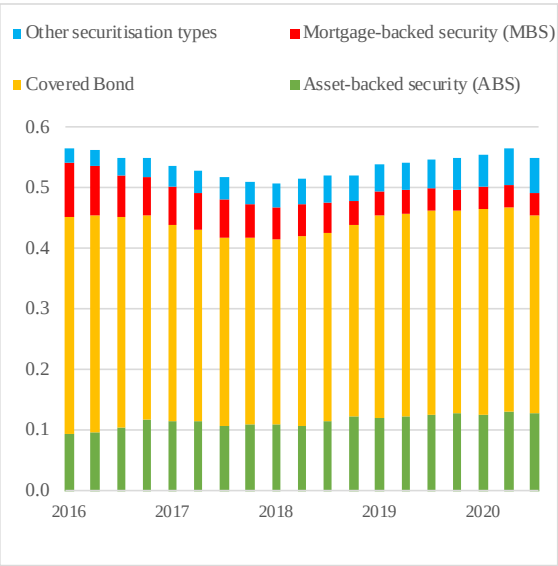
- By currency: seven additional currencies (on top of the already available euro, US dollar and Japanese yen) are covered with an original maturity breakdown.[6]
- By issuer country: new aggregate counterparties relevant for analytical purposes (i.e. OECD, OPEC, ASEAN and Latin America), and Cayman Island and Jersey enriching the "of which" detail of offshore financial centres with an original maturity breakdown.
- By resident and counterpart issuer sectors: they are enriched with the split between insurance corporations and pension funds, and additional granularity for the other financial institutions sector with an original maturity breakdown.
- By maturity: six maturity brackets are included both for the original and residual maturity perspectives and broken down by resident sectors.[7]
- By securitisation type: the CSDB provides rich reference information on the securitised debt securities traded by the euro area investors distinguishing four categories – asset backed securities, mortgage backed securities, covered bonds and other securitisation types. This information is available only since 2016Q1 (see **Chart 4**A).

[6] The Australian dollar, Brazilian real, Swiss franc, British Pound, Danish Krone, Mexican peso and Swedish krona are included, representing around 10% of the total.
[7] Below three months, above three months and below 1 year, between 1 and 2 years, between 2 and 5 years, between 5 and 10 years, and above 10 years.

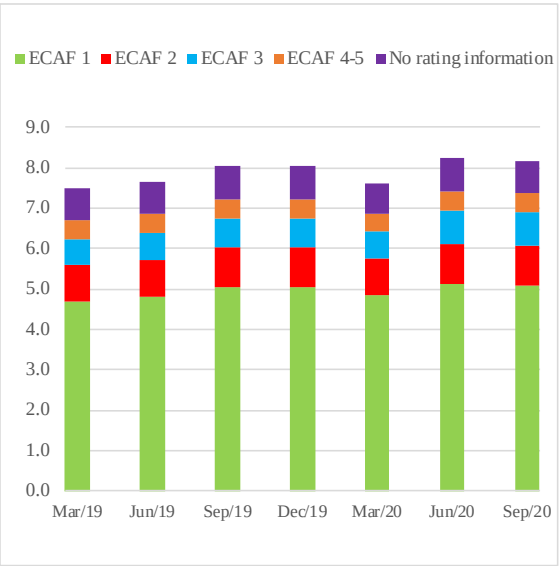
- By risk type: an additional dataset of the CSDB, i.e. the ratings data, is used to classify the euro area cross-border debt securities stocks according to the Eurosystem Credit Assessment Framework (ECAF) [8] broken down by original maturity (see **Chart 4**B).

Chart 4. Selected additional enhancements in non-euro area long-term debt securities

A. By securitisation types (EUR trillions)



B. By risk type (EUR trillions)



Sources: ECB (i.i.p. statistics, SHSS, CSDB and ratings database), and author's calculations.

6. Conclusions

This paper provides an overview of the proposed approach ("bottom-up" and based on SHSS price indicators) to compile euro area portfolio investment debt securities i.i.p. stocks at nominal values which also offers the possibility to derive GED (and NED) in nominal amounts. The estimates included in this document provide high quality results not only for the portfolio investment assets component, but also for GED (and NED) indicators.

Moreover, additional details are suggested to be compiled and drawing on the rich granularity of the SHSS and CSDB datasets. The enhanced set of portfolio investment debt securities series can cover detailed information, e.g. by currency or risk type. This information provides high value added for users in terms of economic, monetary policy and financial stability analysis purposes (Lane, 2015).

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[8] The ECAF framework provides a harmonised rating scale classifying ratings into five credit quality steps. The first step includes securities rated from AAA to AA-, the second from A+ to A-, the third from BBB+ to BBB-. In addition, the fourth category includes all rated securities with a rating below credit quality step three and the fifth category reflects those securities without a rating.