BIS database for debt service ratios for the private non-financial sector

Data documentation

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The debt service ratio (DSR) is defined as the ratio of interest payments plus amortisations to income. As such, the DSR provides a flow-to-flow comparison – the flow of debt service payments divided by the flow of income.

To derive the DSR on an internationally consistent basis, the BIS applies a unified methodological approach and uses, as much as possible, input data that are compiled on an internationally consistent basis. The data inputs are reviewed in this note, and country-specific details are provided in the tables at the end of the document. Drehmann et al (2015) explain the key concepts underlying the compilation of the series, and discuss the economic rationale and the robustness of the series in greater detail.[1]

Data are available at the BIS Statistics DSR homepage.

Methodology

The methodology follows the approach used by the Federal Reserve Board to construct DSRs for the household sector (Dynan et al (2003)).[2] It starts with the basic assumption that, for a given lending rate, debt service costs – interest and amortisations – on the aggregate debt stock are repaid in equal portions over the maturity of the loan (instalment loans). The justification for this assumption is that the differences between the repayment structures of individual loans will tend to cancel each other out in the aggregate.[3] Using a number of simulations, Drehmann et al (2015) show that this indeed seems to be the case.

By using the standard formula for calculating the fixed debt service costs of an instalment loan and dividing it by income, the DSR for sector *j* at time *t* is calculated as:

$$DSR_{j,t} = \frac{i_{j,t}}{\left(1-\left(1+i_{j,t}\right)^{-s_{j,t}}\right)} * \frac{D_{j,t}}{Y_{j,t}}$$

[1] M Drehmann, A Illes, M Juselius and M Santos, "How much income is used for debt payments? A new database for debt service ratios", *BIS Quarterly Review*, September 2015.

[2] K Dynan, K Johnson and K Pence, "Recent changes to a measure of US household debt service", *Federal Reserve Bulletin*, vol 89, no 10, October 2003, pp 417–26.

[3] For example, consider 10 loans of equal size for which the entire principal is due at maturity (bullet loans), each with 10 repayment periods and taken out in successive years over a decade. After 10 periods, when the first loan falls due, the flow of repayments on these 10 loans will jointly be indistinguishable from the repayment of a single instalment loan.

where $D_{j,t}$ denotes the total stock of debt, $Y_{j,t}$ denotes quarterly income, $i_{j,t}$ denotes the average interest rate on the existing stock of debt per quarter and $s_{j,t}$ denotes the average remaining maturity in quarters.

The non-linearities in the instalment loan formula can generate an approximation error when aggregate data are used. However, this approximation error turns out to be relatively independent of average interest rates, debt-to-income ratios or maturities (Drehmann et al (2015)). Thus, the methodology should correctly capture how the DSR in a particular country changes over time, even if it does not necessarily accurately measure its *level* relative to what one could obtain from the correct micro data.

For practical purposes, the difficulties in pinpointing the level imply that it is most meaningful to compare DSRs over time – by, for instance, removing country-specific means.

Sectors

DSRs are derived for the household sector, non-financial corporations (NFCs) and the total private non-financial sector (PNFS).

Frequency

DSRs are compiled at quarterly frequency.

Data

The ratio uses input data from the national accounts, as detailed below. If these data are not available, alternative sources are used.

Stock of debt: Debt is defined as credit (in terms of loans and debt securities[4]) from all sources to the PNFS, as compiled by the BIS. This includes information for the household and NFC sectors.

Average interest rate on the existing stock of debt: To accurately measure aggregate debt servicing costs, the interest rate has to reflect average interest rate conditions on the stock of debt, which contains a mix of new and old loans with different fixed and floating nominal interest rates attached to them.

The average interest rate on the stock of debt is computed by dividing gross interest payments plus financial intermediation services indirectly measured (FISIM) by the stock of debt. FISIM is an estimate of the value of financial intermediation services provided by financial institutions. When national account compilers derive the sectoral accounts, parts of interest payments are reclassified as payments for services and allocated as output of the financial intermediation sector. In turn, this output is recorded as consumption by households and NFCs. As the aim is

[4] Excluding SDR allocations, deposits and other accounts receivable, which include trade credits.

to identify the total burden of interest payments on borrowers regardless of their economic function, FISIM is added back to interest payments reported in the national accounts to derive effective interest payments.

Income: Income in this context corresponds to the amount of money available to economic agents to pay debt service costs. Gross disposable income (GDI) is a close approximation. GDI measures the income available to households and NFCs after interest payments and, in the case of NFCs, dividends. Hence, to accurately reflect the amount of money available to service debt, GDI has to be augmented by interest payments (and dividends for the NFCs). GDI complemented with these other items is called "augmented GDI". Below is the definition of augmented GDI for each sector.

Household sector: Augmented GDI is equal to GDI plus interest payments *excluding* FISIM (item D41). FISIM is not added to augmented GDI for the household sector because it is not considered an element of intermediary consumption and is therefore not deducted from the various types of income households earn to get GDI. FISIM is a service that is included in final consumption.

NFC sector: Augmented GDI is equal to GDI plus interest payments *including* FISIM (item D41g) and distributed income (dividends). FISIM is an element of intermediate consumption, which is deducted from the various types of income NFCs earn and has to be added to GDI to reflect the income available to NFCs.

Total PNFS: The sum of the two income measures from the household and NFC sectors comprises the income of the total PNFS.[5]

Average remaining maturity: For the household and NFC sectors, 18 and 13 years are assumed, respectively, which is fixed across time and countries. The maturity of the total PNFS is the average of the remaining maturities of the two subsectors, weighted by the stock of debt of each sector.

Data adjustments

Smoothing of some components of income: Four-quarter moving averages are applied to GDI and dividends paid.

Interpolation and extrapolation: Some data in a number of countries are originally compiled at an annual frequency. In these cases, quarterly series are derived by interpolating the annual data with the Chow-Lin method (Chow and Lin (1971)),[6] using nominal GDP for GDI as well as dividends, and average bank lending rates for the average interest rate on the stock of debt.

[5] This is the best approximation for the income of the PNFS, which correctly matches the definition and scope of the credit series. There is a degree of double-counting, though, as some dividends from the NFCs are paid to households. However, the amount concerned is very small and does not have a significant impact on the income measure and hence on the final DSR.

[6] G C Chow and A I Lin, "Best linear unbiased interpolation, distribution and extrapolation of time series by related series", *Review of Economics and Statistics*, vol 53, no 4, 1971, pp 372–5.

To derive the most recent quarters following the last available annual data point, series are extrapolated using the growth rate of nominal GDP for both GDI and dividends, and the change in average bank lending rates for the average interest rate on the stock of debt.

Series used when national accounts sectoral data are not available

For data from 15 countries, there is only information to construct the DSR for the total PNFS. For many of these countries, information on sectors from the national accounts is limited, and data are not available to derive average interest rates and income as detailed above. In these cases, the series are proxied as follows:

Average interest rate on the existing stock of debt: The average interest rate on the stock of debt is proxied by the average lending rates on loans from depository corporations (or monetary and financial institutions (MFIs)) to the PNFS. Most of the time, these lending rates are available for the household and NFC sectors separately, and a weighted average is calculated for the total PNFS, using the stock of debt in each sector as weights.

For a few countries, no lending rates on outstanding MFI loans are available. In these cases, the average lending rate on the stock of debt is proxied by the short-term money market rate plus 2.18 percentage points – the average markup between lending rates and the money market rates across countries. In addition, a smoothing factor calibrated on a cross-country data set is applied.[7]

Income: The income measure for the total PNFS is proxied by the nominal quarterly GDP series. Four-quarter moving averages are applied to the raw GDP data.

[7] The markup and smoothing factor are derived in M Drehmann and M Juselius, "Do debt service costs affect macroeconomic and financial stability?", *BIS Quarterly Review*, September 2012, pp 21–34.

Overview of the data sources used in calculating the DSRs

The DSRs available are for the households, NFCs and PNFS of the following 17 countries, at quarterly frequency starting in 1999.

The input data are income, interest rates, average remaining maturity of the debt, and the stock of debt of the sector. The data for debt are taken from the BIS credit database (www.bis.org/statistics/totcredit.htm). For the income and interest rate data, the table below shows the description and the source. The income, debt and interest payments for the PNFS are the sum of the two sectors, while the average remaining maturity is the average of the two sectors, weighted by the stock of debt.

	Households and NPISHs		**Non-financial corporations**	
	Income①	**Average interest rate on the stock of debt②**	**Income①**	**Average interest rate on the stock of debt②**
Generic case / definition: quarterly data unless otherwise indicated	Augmented GDI = gross disposable income + interest payments *excluding* FISIM	Average interest rate = interest payments *including* FISIM / debt	Augmented GDI = gross disposable income + interest payments *including* FISIM + dividends paid	Average interest rate = interest payments *including* FISIM / debt
Euro area countries: source of national accounts data is Eurostat, unless otherwise indicated				
Belgium		Annual data on interest payments Interpolation: Interest rates on outstanding MFI loans for house purchases and consumption (source: ECB)		Annual data on interest payments Interpolation: Interest rates on outstanding MFI loans to NFCs (source: ECB)
Finland				
France				
Germany				

	Households and NPISHs		Non-financial corporations	
	Income①	**Average interest rate on the stock of debt②**	**Income①**	**Average interest rate on the stock of debt②**
Italy				
Netherlands				
Portugal		Annual data on interest payments Interpolation: Interest rates on outstanding MFI loans for house purchases and consumption (source: ECB)		Annual data on interest payments Interpolation: Interest rates on outstanding MFI loans to NFCs (source: ECB)
Spain				
Other European countries: source of national accounts data is Eurostat, unless otherwise indicated				
Denmark				
Norway	Annual data on all components of income	Annual data on interest payments Interpolation: Interest rate on outstanding bank loans to households (source: central bank)	Annual data on all the components of income	Annual data on interest payments Interpolation: Interest rate on outstanding bank loans to NFCs (source: central bank)
Sweden				
United Kingdom				
Other economies				
Australia: source of national accounts data is Australian Bureau of Statistics (ABS)		Annual data on interest payments including FISIM③		Annual data on interest payments including FISIM③
Canada: source of national accounts data is Statistics Canada		Interest payments including FISIM estimated using the published property income paid④		Interest payments including FISIM are estimates based on the proportion of FISIM from household data ④

	Households and NPISHs		Non-financial corporations	
	Income①	**Average interest rate on the stock of debt②**	**Income①**	**Average interest rate on the stock of debt②**
Japan: source of national accounts data is Cabinet Office			Annual data on all components of income	Annual data on interest payments Interpolation: Interest rate on long-term loans (source: central bank)
Korea: source of all data is the central bank	Annual data on all components of income	Annual data on interest payments estimated⑤ Interpolation: Interest rate on outstanding bank loans to households	Annual data on all components of income	Annual data on interest payments estimated⑤ Interpolation: Interest rate on outstanding bank loans to NFCs
United States: source of national accounts data is the Bureau of Economic Analysis		Annual data on interest payments Interpolation: Interest rate on conventional mortgages, 30-year maturity (source: central bank), smoothed		Annual data on interest payments Interpolation: Bank prime lending rate (source: central bank), smoothed

FISIM = financial intermediation services indirectly measured.

① For GDI and dividends paid, nominal GDP is used for extrapolation, and if only annual data are available, interpolation using the Chow-Lin method. ② For interest payments, lending rates are used for extrapolation, and if only annual data are available, interpolation using the Chow-Lin method. Lending rates on amounts outstanding are preferable, but when these are not available, a smoothing factor is applied to the data. At the time of writing, the ECB data on MFI interest on loans to households for consumption purposes are available only for new business. ③ For Australia, *annual* interest payments including FISIM are interpolated using the published *quarterly* interest payments excluding FISIM. ④ For Canada, data on household interest payments *including* FISIM are estimated using published data on property income paid (Statistics Canada table 380-0073, Selected indicators for households). Property income paid consists of interest payments, rents and other items. Household interest payments are estimated to be 95% of property income paid, based on estimates for other countries. For NFCs, only data on interest payments *excluding* FISIM are available, so FISIM is added by assuming that NFCs pay the same proportional amount as households. ⑤For Korea, data on FISIM are not published. In this case, total FISIM is assumed to be 5% of GDP, which is then distributed to the different sectors based on the proportion of the published interest payments excluding FISIM.

Alternative measures

The following 15 countries have data for the total PNFS only, at quarterly frequency starting in 1999. Nominal GDP is used as a proxy for the income measure for this sector. The table below shows the interest rates used.

For the countries where PNFS lending rates are not available, interest rates (*ir)* are proxied by the short-term money market rates (*mm)* plus 2.18 percentage points – the average markup between lending rates and the money market rates across countries. In addition, a smoothing factor is applied, so that $ir_t=\alpha*ir_{t-1}+(1-\alpha)(mm_t+2.18)$ with α=0.8 in EMEs and α=0.9 in advanced economies.

	Interest rates①
Brazil	Interest rate on outstanding amounts of bank loans to businesses and households from 2011, weighted by loan amounts (source: central bank/Datastream), backdated with IMF-IFS code 60P
China	Rate on working capital loans of one-year maturity (IMF-IFS code 60P)
Czechia	Three-month money market rate (source: central bank)
Hong Kong SAR	Three-month money market rate (source: central bank)
Hungary	Three-month money market rate (source: OECD-MEI)
India	Three-month money market rate (source: central bank)
Indonesia	Three-month money market rate (source: central bank/Datastream)
Malaysia	Three-month money market rate (source: central bank/Datastream)
Mexico	Three-month money market rate (source: central bank)
Poland	Three-month money market rate (source: central bank)
Russia	Weighted average rate charged by other depository corporations on loans to non-financial institutions in national currency with maturity of up to one year. The rate is weighted by loan amounts (IMF-IFS code 60P)
South Africa	Three-month Treasury bill rate (source: central bank)
Switzerland	Three-month money market rate (source: BIS)
Thailand	Three-month money market rate (source: central bank/Datastream)
Türkiye	Interest rate on outstanding amounts of bank loans to businesses and households, weighted by loan amounts (source: central bank)

① Some interest rate series are backdated with data from Global Financial Data. IMF-IFS = IMF, *International Financial Statistics;* OECD-MEI = OECD, *Main Economic Indicators*.